Edited by Rocio Fernández-Ballesteros

Encyclopedia of Psychological Assessment

VOLUME 1
A - M

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Reader's Guide

This list is provided to assist readers in locating entries on related topics. It classifies entries into nine general categories: (1) Theory and Methodology; (2) Methods, Tests and Equipment; (3) Personality; (4) Intelligence; (5) Clinical and Health; (6) Educational and Child Assessment; (7) Work and Organizations; (8) Neurophysiopsychological Assessment; and (9) Environmental Assessment. Some entry titles appear in more than one category.

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Preface

Psychological assessment is the discipline of scientific psychology devoted to the study of a given human subject (or group of subjects) in a specific applied field (clinical, educational, work, etc.), by means of scientific tools (tests and other measurement instruments), with the purpose of answering clients' demands that require scientific operations such as describing, diagnosing, predicting, explaining or changing the behaviour of that subject (Fernández-Ballesteros et al., 2001). Therefore, from this perspective, psychological assessment cannot be reduced to any of its applied fields (it has sometimes been reduced to the clinical field: e.g. Meyer et al., 2001; Fernández-Ballesteros, 2002) or to specific scientific tools (it has been reduced to psychological testing: e.g. Anastasi, 1988) or to a scientific operation (in the past it was usually reduced to diagnosis and prediction).

Psychological assessment is one of the key disciplines of psychology, being an ever-present applied task in the activity of any psychologist (Bomholt, 1996; Greenberg, Smith & Muenzen, 1995). Researchers and professionals of all kinds (in the clinical, work, educational, etc., fields) are faced with the task of assessing, in one way or another, relevant variables in the particular individual or group of individuals that constitute the object of study. Whether this assessment is made by means of sophisticated equipment in the laboratory, through psychological tests, or through non-structured interviews and other qualitative techniques, the same condition applies: any type of psychological assessment device requires methodological evaluation and scientific guarantees.

The *Encyclopedia of Psychological Assessment* (EPA) will cover the following objectives:

1 To present the reader with a comprehensive network for psychological assessment as a conceptual and methodological discipline, and as a professional activity.
2 To make the reader aware of the complexity of assessment, which involves not only testing, but also a process of decision-making for answering relevant questions (diagnostic, prediction, personnel selection, treatment, etc.) that arise in the different applied fields.
3 To present relevant issues from basic theory (theoretical perspectives, ethics, etc.), methodology (validity, reliability, item response theory, etc.) to technology (tests, instruments and equipment for measuring behavioural operations, etc.).
4 To congregate the diverse applied field form in a comprehensive text: from the most traditional such as clinical, educational, and work and organizational psychology to the most recent applications linked to health, gerontology, neuropsychology and psychophysiology, and environmental assessment.

The Encyclopedia will be oriented to the psychology community, from psychology students to academics and practitioners. It may also be of interest to other professionals, such as health professions, educators, sociologists and other social scientists involved in assessment and measurement.

The Encyclopedia might be considered as supplementary reading for psychological assessment courses, as well as for courses related to theory, methodology, psychometrics, measurement, and areas such as counselling, programme evaluation or personnel selection.

The two volumes of the *Encyclopedia of Psychological Assessment* contain a series of 234 entries (of different lengths depending on their importance), organized alphabetically, and covering a variety of fields: theoretical, epistemological, methodological, technological, basic psychological constructs (personality and intelligence), and applied. Each entry includes a general conceptual and methodological overview, a section on relevant assessment devices and a list of references. Every entry provides a list of cross-references for entries and related concepts.

The *Encyclopedia of Psychological Assessment* has four main characteristics:

1 The EPA presents a semantic network for improving communication, serving as a useful epistemological tool for students, academics and practitioners.
2 The EPA attempts to offer an international perspective, both in terms of the selected authors (from twenty countries and five continents) and of the entries (which will require authors to give a cross-cultural panorama of a given topic).
3 The EPA aims to provide an integrated view of assessment, bringing together knowledge dispersed throughout several basic, methodological and applied fields, but united in its relevance for assessment.
4 The EPA can be considered as a source of information about psychological instruments for the collection of both qualitative and quantitative data from basic and widely used tests to other procedures for data collection.

Rocío Fernández-Ballesteros
Editor-in-Chief

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ACHIEVEMENT MOTIVATION

INTRODUCTION

Human life can be described as a continuous work at tasks. Individuals may or may not be successful in facing these tasks. The psychology of achievement motivation is engaged to run research projects aiming at a better understanding of individual performance and the nature of human resources as well as at the development of assessment and intervention techniques to increase achievement motivation. Tasks in industrial settings and in service organizations become more and more complex and underlie dynamic changes arising from changing market demands. To keep individuals highly achievement motivated while doing their jobs, tasks have to be designed with high motivating potentials.

From a motivational perspective the action process is divided into two parts. The first part describes the development of achievement motivation as a consequence of a fit between the achievement motive and the achievement-oriented motivating potentials of the situation. *Achievement motivation* initiating action arises through interaction of achievement-oriented *motivating potentials* of the task in its situational context and the strength of the *achievement motive* on the side of the performing person. Personal goals controlling actions result directly from the strength of this achievement motivation (Figure 1). The second part of the motivation process responsible for the translation of motivation into action is often called the volitional phase in the control of behaviour (Heckhausen, 1989); during this phase, goal-oriented action turns into outcomes controlled by the degree of *goal commitment*. Goal commitment affects the way persons choose to reach their goals and the selection of strategies they pursue (Brandtstädter & Renner, 1990). Examples for such strategies are to pursue a goal persistently even in cases of hindrance or to adapt flexibly to changing aspects of the situation. The translation process works better when more specific and concrete goals are set; the higher the goal commitment the more effective the chosen strategies of goal pursuit (Vroom, 1964; Locke & Latham, 1990; Kleinbeck, 2001).

A goal-oriented course of action immune to disturbances is especially supported by specific and concrete goals (goal characteristics; Figure 1).

Because of the many single concepts subsumed under the label of achievement motivation, it is necessary to develop as many measurement tools as possible to differentiate between the concepts. Outside current research projects, measures of achievement motivation are principally used in industrial settings, in service organizations and in educational fields. Here achievement motivation measurement is used to investigate the motivating

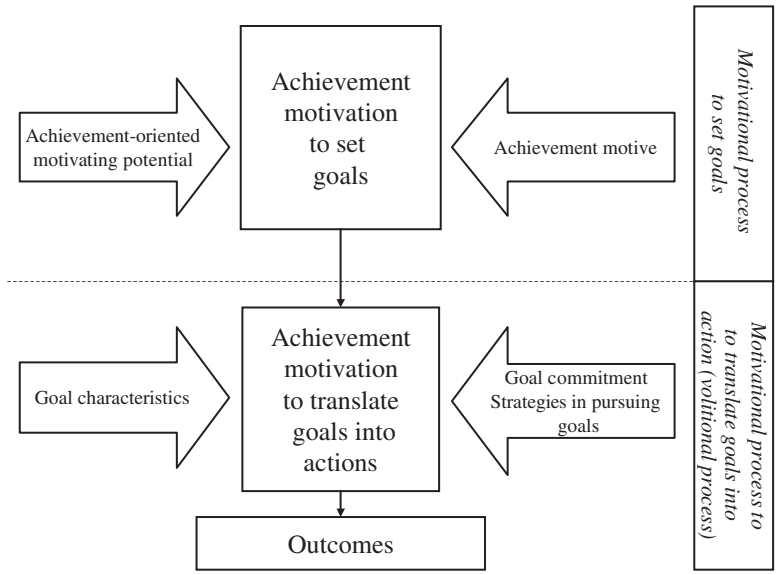

Figure 1. Components of achievement motivation.

potentials of work tasks and work contexts to make full use of individual resources.

INSTRUMENTS TO ASSESS ACHIEVEMENT MOTIVATION

The theory of achievement motivation describes performance as multidimensional and as influenced by many different factors. The main personal factor is the achievement motive; the main task-specific factor is the motivating potential of the situation. For diagnostic information about mode and strength of the achievement motive there are three different sources (see Schneider & Schmalt, 2000: 50–56):

1 Self-judgement
2 Judgement by others
3 Behavioural indices

Assessing the strength of the achievement motive, different strategies are used according to these sources: operant procedures (e.g. the Thematic Apperception Test – TAT) and respondent procedures (e.g. questionnaires), and the grid technique that according to Schmalt (1999) lies in its methodological background between the first two types of measurement. Due to this fact, one can differentiate implicit and explicit components of the achievement motive. Using the material of the TAT with pictorial presentations of situations it becomes possible to penetrate implicitly into the achievement motive system, because this kind of measurement allows one to approach materials of memory relevant for the motive system. Filling out questionnaires requires ego involvement, self-insight and self-reflection, and also explicit memory, because the answers to the questions can only be given with the help of conscious reflection to earlier experiences (Graf & Schacter, 1985: 501).

Schmalt and Sokolowski (2000) discuss the quality of the different techniques to measure the achievement motive and conclude that all available instruments work reliably. TAT and the grid technique have comparable and widely diversified validity ranges that are related to respondent and operant behaviour. Questionnaires used to diagnose motives seem to be specialized to predict respondent behaviour and conscious experiences (Spangler, 1992).

To measure the achievement-oriented motivating potentials of tasks, Hackman and Oldham (1975) developed and presented an instrument, the Job Diagnostic Survey (JDS), that has well proven its validity (Fried & Ferris, 1987). The JDS measures the motivating potentials of tasks in work situations and also of tasks that students are confronted with in learning situations (Schmidt & Kleinbeck, 1999). Measuring the achievement motive and the

motivating potentials of tasks allows one to determine the strength of achievement motivation.

Rheinberg, Vollmeyer and Burns (2001) present an instrument to measure achievement motivation as a comprehensive construct. With 18 items, four components of the current state of achievement motivation are measured: (1) fear of failure; (2) probability of success; (3) interest; (4) challenge. In its German and English version, the instrument shows satisfying consistencies and according to the first validation data, the measured components of current achievement motivation correlate positively with learning behaviour and performance. Schuler and Prochaska (2000) define achievement motivation as a general behavioural orientation. The instrument they developed – the Hohenheim Test of Achievement Motivation (HTML) – allows measuring achievement motivation with 17 scales in a highly differentiated way. The results of the HTML measures correlate significantly with neuroticism and conscience in the five-factor model of personality (Costa & McCrae, 1989). Measures in HTML are positively related to success at school, university and work so that one can expect a successful application in personality research and in educational and occupational testing.

To measure goal characteristics (e.g. goal specificity and goal difficulty) that influence the achievement-oriented process of translating goals into action, Locke and Latham (1990) present a questionnaire that has been used mainly in research settings. Other questionnaires try to measure clarity of tasks and goals (Sawyer, 1992), clarity of methods (Breaugh & Colihan, 1994; Schmidt & Hollmann, 1998) and also clarity of performance judgements (Breaugh & Colihan, 1994; Kleinbeck & Fuhrmann, 2000). These components of achievement motivation measured by the mentioned questionnaires affect the motivation to translate goals into action and as a consequence performance outcome.

Recently researchers began to measure goal commitment (Hollenbeck et al., 1989). They invested considerable effort because goal setting is no homogeneous construct. As Tubbs (1993) could show there are three different components of goal commitment: the first component has to do with processes of weighing and evaluating the potential goals. During these processes, one calculates mainly values and expectancies that affect the strength of motivational tendencies for specific goals. The second component contains the result of these evaluative processes focussing on calculations of values and expectancies and leading to setting a personal goal. This component is also related to the decision to attain this

Table 1. Instruments for measuring components of achievement motivation

Instruments	Author	Concepts measured	Method used
TAT	Murray, 1943; McClelland et al., 1953	Achievement motive and other motives	Content analysis of stories (operant)
OMT	Kuhl & Scheffer, 2000	Achievement motive	Content analysis of written stories (operant)
MARPS	Mehrabian, 1968	Achievement motive	Questionnaire (respondent)
Grid-technique	Schmalt & Sokolowski, 2000	Achievement motive	Judgement of fit between pictures and motive-related statements
Questionnaire for current motivational states	Rheinberg et al., 2001	Current motivation for learning and performance	Questionnaire (respondent)
AVEM	Schaarschmidt & Fischer, 1996	Current work motivation	Questionnaire (respondent)
HLMT	Schuler & Prochaska, 2000	Achievement motivation	Questionnaire (respondent)
JDS	Hackman & Oldham, 1975	Motivating potential of tasks	Questionnaire (self-judgement and judgement by others)
Fragebogen für Zielcharakteristika	Locke & Latham, 1990	Goal specificity and others	Questionnaire (respondent)
Goal commitment	Hollenbeck et al., 1989	Goal commitment	Questionnaire (respondent)
Strategies of goal pursuit	Brandtstädter & Renner, 1990	Strategies of goal pursuit	Questionnaire (respondent)

particular goal. The third component of goal commitment is characterized by maintaining the set goal and by staying persistent even when faced with hindrances. Future research will show whether it will be possible to develop differentiated measurement procedures on the basis of these considerations.

With respect to goal commitment in goal-oriented action, people seem to be able to use stable dispositions. They either persist tenaciously in pursuing their goals or they adjust flexibly to new or other goals. Brandtstädter and Renner (1990) described two scales to measure 'tenacious goal pursuit' and 'flexible goal adjustment'. Their results show relations between these different strategies and age. Older people adapt more often flexibly instead of pursuing their goals tenaciously against hindrances. Table 1 summarizes the instruments for measuring components of achievement motivation.

FUTURE PERSPECTIVES

The current state of research can be described as presenting a set of different measurement approaches for the central components of achievement motivation. Future tasks for research and applications mainly in work and educational settings will be to determine the range of validity for the different measures more exactly. This can help to decide under what circumstances specific instruments can be used profitably. Although there are now some reliable and valid instruments to measure single components of achievement motivation, it would be helpful to have new instruments and procedures to relate them to each other.

CONCLUSIONS

A high achievement motivation in people guarantees success and wealth in human societies. To produce adequate conditions for the development of a high achievement motivation it is necessary to understand how achievement motivation is formed and how it can be translated into successful action. In accordance with the importance of this kind of motivation, a series of instruments have been designed to measure the different components of achievement motivation reliably, validly and practically. The existing instruments can be used in research and practical settings.

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Uwe Kleinbeck

RELATED ENTRIES

Applied Fields: Organizations, Applied Fields: Work and Industry, Personnel Selection, Leadership in Organizational Settings, Leadership Personality, Motivation

ACHIEVEMENT TESTING

INTRODUCTION

Achievement testing plays a central role in education, particularly given the current context of high-stakes educational reform seen in countries like the United States. This entry provides a brief overview of achievement testing beginning with a description of its role in education. Different types of achievement tests, commonly used derived scores, recent advances such as performance assessments, and future directions are described (Hambleton & Zaal, 1991).

ACHIEVEMENT TESTING AND ITS ROLE

Achievement tests are designed to measure the knowledge and skills that individuals learn in a relatively well-defined area through formal or informal educational experiences. Thus, achievement tests include tests designed by teachers for use in the classroom and standardized tests developed by school districts, states, national and international organizations, and commercial test publishers.

Achievement tests have been used for: (a) summative purposes such as measuring student achievement, assigning grades, grade promotion and evaluation of competency, comparing student achievement across states and nations, and evaluating the effectiveness of teachers, programmes, districts, and states in accountability programmes; (b) formative purposes such as identifying student strengths and weaknesses, motivating students, teachers, and administrators to seek higher levels of performance, and informing educational policy; and (c) placement and diagnostic purposes such as selecting and placing students, and diagnosing learning disabilities, giftedness, and other special needs.

The most controversial uses of achievement testing have been in high-stakes accountability programmes and minimum competency testing (MCT). Accountability practices vary and may include financial rewards for improved

performance to providing remediation for students who perform poorly to sanctions such as public hearings, staff dismissals, and dissolution of districts. Two negative consequences that have been associated with high-stakes accountability include a pattern of inflated achievement results as highlighted by Cannell's (1988) finding that all states were reporting that their students were scoring above the national norm (Lake Wobegon effect), and the narrowing of instruction or 'teaching to the test' so that student scores compare favourably to norms.

MCT programmes were implemented in response to concerns about high levels of illiteracy and innumeracy and subsequent poor 'work force readiness' among high school graduates. In addition to course completion requirements, such programmes require students to pass tests of minimal basic skills (usually in reading, writing, and arithmetic) to graduate from high school. Legal cases such as *Debra P.* vs. *Turlington* raised questions about what constitutes minimum competency, whether the skills assessed are reflected in school curriculum, and whether students have been given adequate opportunity to learn the skills required (Anastasi & Urbina, 1997).

STANDARDIZED ACHIEVEMENT TESTS

Standardized tests may be classified using the overlapping categories of purpose, breadth, administration, item format, and interpretation.

Purpose

Screening tests tend to be relatively brief with only one subtest covering each subject area. These tests are useful in determining if more expensive comprehensive testing is warranted. Screening tests include the *Wechsler Individual Achievement Test* (WIAT) – *Screener*, *Wide Range Achievement Test – 3*, and *Basic Achievement Skills Individual Screener* (BASIS). Comprehensive or diagnostic tests typically include more than one subtest per subject area so each can be explored in depth. Examples of these tests include the *WIAT – Comprehensive Test*, *Woodcock–Johnson Complete Battery III*, *Gates–McKillop–Horowitz Reading Diagnostic Test*, *Comprehensive Tests of Basic Skills*, and *Terra Nova*.

Breadth

Single-subject tests include a number of subtests ranging from lower to higher skill levels to assess different aspects of a subject area. Single-subject tests include the *Woodcock Reading Mastery Tests – Revised* and *KeyMath – Revised*. Multiple-subject tests assess at least the three commonly taught subject areas of reading, mathematics, and written language. Such tests include the *Iowa Tests of Basic Skills*, *California Achievement Test*, *SRA Achievement Series*, *Stanford Achievement Test Series*, and *Tests of Achievement and Proficiency*.

Administration

Group administered achievement tests are usually multiple-subject tests that contain comparable subtests for students in different grades. These tests usually are administered within the classroom and are used throughout school districts or states. Examples include the *Iowa Tests of Basic Skills*, *Metropolitan Achievement Test 8*, *Iowa Tests of Educational Development*, *Gray Oral Reading Test – 3*, and *Sequential Tests of Educational Progress – III*. Individually administered achievement tests may include single- or multiple-subject tests and typically are administered in clinical and educational settings. Such tests include the *Kaufman Test of Educational Achievement*, *Wide Range Achievement Test – III*, *Gates–MacGinitie Reading Test*, and *Peabody Individual Achievement Test – Revised*.

Item Format

Fixed-response items include multiple-choice, true–false, matching, and stem completion items. A key advantage of fixed-response items is that considerable material can be covered in a relatively short period of time. Criticisms of these items are that they emphasize recall of facts over higher order thinking and problem-solving, they are susceptible to guessing and testwiseness, and they discourage creative thinking. They also tend to be difficult items to prepare. Nonetheless, multiple-choice items are the most

common item format used in standardized achievement tests.

Constructed items include short answer and essay responses. The advantages of constructed items are that they require students to construct a response rather than simply recognize the correct answer, they assess students' ability to organize, connect ideas, and problem-solve, they reduce the impact of guessing, and preparation of questions is relatively quick and easy. Disadvantages of constructed items are that relatively few questions can be asked and thus adequate coverage of the subject area may not occur, they are susceptible to bluffing, and scoring is time-consuming, requires considerable subjective judgement, and is less reliable than scoring of fixed-response items.

Interpretation

When achievement test results are interpreted with reference to a normative group, the test is referred to as a norm-referenced test (NRT). Students' NRT scores usually are expressed in age- or grade-equivalent scores, standard scores, or percentiles. NRTs are designed to discriminate among students' performance; they do not provide information on the amount of information learned. Most of the tests discussed already are NRTs. When test results are interpreted in terms of whether each student has mastered specific knowledge and skills without reference to other students or a normative group, the test is said to be criterion-referenced (CRT). Students' CRT scores are usually expressed as per cent correct or by descriptors such as mastery/non-mastery. Most CRTs are developed by schools or states. Examples are the *Basic Skills Assessment Program*, *Kentucky Instructional Results Information System*, and *Louisiana Educational Assessment Program* (LEAP 21). Some NRT tests also provide CRT interpretations such as *BASIS*.

DERIVED SCORES ASSOCIATED WITH ACHIEVEMENT TESTS

Raw scores obtained on achievement tests typically are converted to derived scores, so we can make comparisons among test scores. Commonly found derived scores include age- or grade-equivalent scores, standard scores, and percentile scores. Age- or grade-equivalent scores ('developmental scores') reflect average performance at different age and grade levels. These scores are often (a) misinterpreted when individual performance is compared to the wrong reference group, and (b) inappropriately used as standards of performance when teachers and parents expect all students in a particular age group or grade to achieve age- or grade-equivalent scores.

Standard scores provide an indication of a student's relative performance on a test in terms of how far his/her score is from the mean in standard deviation units. Common types of standard scores are z-scores, T-scores, deviation IQ scores, and stanines. Standard scores are the most highly recommended derived scores.

Percentiles (percentile ranks) indicate the point in a distribution at or below which the scores of a given percentage of students fall and should not be confused with percentages or per cent correct. Percentiles are the most easily interpreted derived scores. However, percentiles do not represent equal intervals across the distribution, which means that they magnify small differences near the mean and minimize large differences in the upper and lower ends of the distribution.

RECENT ADVANCES IN ACHIEVEMENT TESTING

Computer Adaptive Testing

Computer adaptive testing (CAT) attempts to match the difficulty of test items to the knowledge and skill level of the student being assessed by tailoring the test so that a pre-selected sequence of items is administered based on whether or not the response to the previous item is correct. The advantages of CAT over traditional achievement tests include reduced testing time, the need for fewer items at a given level of measurement error, minimized frustration for students who perform poorly, and more precise estimates of achievement across the entire distribution.

Large-Scale Assessments

Large-scale assessments are conducted by the district, state, or nation(s) to examine the educational achievement of groups. The best-known large-scale assessments today are the *National Assessment of Educational Progress* (NAEP) in the United States and the surveys

conducted by the International Association for the Evaluation of Educational Achievement (IEA). The purpose of NAEP, which was first introduced in 1969, was 'to improve the effectiveness of our Nation's schools by making objective information about student performance in selected learning areas available to policymakers at the national, State and local levels' (Public Law 100-297, Section 3401). The IEA has conducted numerous international achievement surveys since its first cross-national survey in 1959 and is best known for the longitudinal *Third International Mathematics and Science Study* (TIMSS) first conducted in 1995.

Performance Assessments

Increasing attention has been paid to performance assessments (also known as authentic or alternative assessments), which consist of students' constructed responses to 'real world' (authentic) tasks and problems and the cognitive skills and processes involved in the construction of those responses. Examples of performance assessments include portfolios of students' work over time, poetry, science experiments, conversations in a foreign language, and open-ended mathematics problems. The students' work is judged using an agreed-upon set of criteria. The advantages of these assessments are that they are meant to measure processes involved in the acquisition of knowledge and skills in ways that make the link between learning and instruction clearer. Disadvantages are that fewer tasks can be included given time constraints, creating agreed-upon criteria for scoring is time-consuming, and judgement of students' work is highly subjective, all of which make performance assessment expensive and open to bias.

Standards-Based Assessments

Standards-based reform describes efforts to improve education for all students through the setting of high standards. Its beginnings rest with the 1983 National Commission on Excellence in Education report, *A Nation at Risk: The Imperative for Educational Reform*, and it has culminated in the passing of 'Goals 2000: Educate America Act' by the U.S. Congress in 1994.

Standards-based approaches include content and performance standards, assessments that are aligned with these standards, and accountability measures. Content standards define what a student should know and be able to do and thus drive curriculum. Performance standards define how much a student should know and be able to do, and thus set the benchmarks or expected levels of achievement to be used for accountability. Standards-based assessments (also known as standards-referenced testing) are based on content and performance standards, involve multiple measures of student performance, and apply to all students. A critical aspect of such assessments is to produce and use 'better tests' such as performance assessments. Accountability measures focus on strengthening standards-based reform initiatives by rewarding teachers and schools whose students meet performance standards and sanctioning those who do not.

FUTURE PERSPECTIVES AND CONCLUSIONS

Current and future advances in achievement testing appear to be focussed on the development, improvement, and evaluation of standards-based and performance assessments. Five areas for future development include: (1) best practices for developing, and methods for evaluating, performance assessment scoring rubrics, (2) comparisons of the various types of data to be used in accountability models such as mean scores, value-added data, and residual scores adjusted for socio-economic status, (3) longitudinal research examining the impact of performance and standards-based assessments on student achievement, instructional practices, and student learning, (4) comparisons of traditional standardized testing (including multiple-choice formats) and performance assessments as measures of student achievement, and (5) exploration of computer-based, and notably Internet, delivery and scoring of performance assessments for large scale assessment.

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RELATED ENTRIES

Applied Fields: Education, Achievement Testing, Criterion-Referenced Testing: Methods and Procedures, Norm-Referenced Testing: Methods and Procedures, Item Response Theory: Models and Features, Adaptive and Tailored Testing

ADAPTIVE AND TAILORED TESTING (INCLUDING IRT AND NON-IRT APPLICATION)

INTRODUCTION

In computerized adaptive testing (CAT), a computer administers the items and gathers the examinee's responses, but its most distinctive feature is that the items finally administered depend on the examinee's ability. The test then adapts to the examinee's performance on the items. The idea of adaptive measurement can be traced back to Binet, but it never became a reality until the appearance of the item response theory (IRT) and the development of the computer. However, adaptive testing is also possible without IRT, as will be seen later. The first ideas on CAT appeared in the early 1970s (Lord, 1970). CAT has spent in the laboratory the greater part of the elapsed time since then, because the main concern of the researchers has been to obtain the most efficient, precise and possible strategies for item selection. They have become operational only in the last decade. Computerized adaptive tests were administered to more than a million people in 1999 (Wainer, 2000). Its main applications are to the areas of personnel selection, educational assessment, certification and licensure. Due to its practical applications, new concerns such as test security, profitability and social impact have arisen.

BASIC PRINCIPLES

The basic principles of a CAT are well established. Its aim is to apply to each examinee only the items that best serve to assess his/her level of ability. Its main advantage is that more efficient measurements are obtained. It needs fewer items (sometimes, less than half) than conventional tests to achieve the same level of precision as a full-length test. The elements that make up a CAT are: an item pool with known properties, a heuristic to choose the items, a method to evaluate ability and a criterion to end the application. Though they are all important, the efficiency of a CAT mostly depends on two closely related complementary processes: the statistical method of estimating ability and the criterion for item selection. This explains the great amount of procedures known and why they are two of the most studied aspects of CAT.

ITEM BANK

A CAT chooses items from a database (item bank) containing the available items and various information about each item, such as its stem, correct and incorrect options, item parameter estimates under an appropriate IRT model, classical item difficulty and discrimination indices, information on the specific domain the item measures, the proportion of times the item has been administered, etc. The bank has to be calibrated and its unidimensionality and acceptable fitting to an IRT model should be checked and accepted. Item banking and IRT are specific entries in this encyclopedia, and further details can be found there.

A CAT does not need a specific item format. A CAT may be developed both for dichotomous and polytomous items, and for multiple-choice or

open-ended items. Items may be visual, auditory and also multimedia items. It is also possible to consider a testlet (cluster of related items) instead of single items as the analysis unit.

An important question to pay attention to is bank size. Well-known high-stake CATs, such as CAT-ASVAB (Sands et al., 1997), have more than one thousand items, but CATs for other uses ordinarily have smaller banks (even below 150 or 200 items). The number of items also depends on the restrictions the item-selection algorithm has implemented and the IRT model in use.

An item bank should also consider the ability prospective examinees have and the intended test use. It should contain discriminative items for the entire range of ability. The information function of the item bank should match these requirements.

Banks should be updated, both in the information on each item, as this information changes after each item administration, and also in the items themselves, because as the CAT is increasingly administered, new items should be added and old ones removed. Online calibration deals with effective procedures to carry-out bank updating.

ADAPTIVE HEURISTICS

A CAT needs four components in order to measure an examinee: (a) a procedure to select the first item to administer; (b) a method to estimate the examinee's ability and precision after each administered item; (c) an algorithm for selecting the remaining items; and (d) a criterion to end the test administration.

There are some alternatives available for selecting the first item. If we know the examinee's grade on other variables, and his/her course, this information may be used to predict the examinee's ability by linear regression. The first item is then selected to match the predicted ability. If no information on the examinee is available, the first item will then match a random ability selected from the central values of the ability distribution.

After each item is administered the examinee gives his/her response. The CAT needs to obtain the ability estimation from the observed responses to the set of administered items. The examinee's test score will be his/her ability estimate when the test is over. The most widely used methods of estimation are based on the principle of maximum likelihood or Bayesian procedures. These methods have good properties when the number of items is high. Nevertheless, CATs are far from this ideal situation because they use very few items. This circumstance gives place to biased estimations, especially in the early stages of the test. So, a problem with CAT is to find a method that provides accurate estimations, which are unbiased and computationally efficient. Wang and Vispoel (1998) and Cheng and Liou (2000) have compared the characteristics (standard error, bias, efficiency, etc.) of the IRT estimation methods to determine when they are advisable in CAT. Since one of the problems that has been paid the most attention is the bias of the estimations, several strategies have been proposed for its control. Other questions, like the initial estimation and the effects of non-model fitting responses, have generated interest from researchers.

Once some items have been administered and an ability estimate for the examinee obtained, a new item has to be selected from the unused items remaining in the item pool. Two common principles are used to guide item selection. Under the *maximum information* principle, the information provided for each unused item for the last ability estimate is computed. The item with the highest information value is selected and administered. In other words, the more helpful item in order to increase precision is selected. The maximum information principle faces some difficulties when the ability estimate is biased or inaccurate, which is often the case when the test is short. If the estimate separates appreciably from the final estimation, the more informative items for these provisional estimations will be less informative for the final estimation. As a result, some items will have been of little use in the test. Cheng and Liou (2000) have proposed the use of alternative information measures in order to circumvent this difficulty. Under the *maximum expected precision* criterion, the item selected will minimize the expected value of the variance of the Bayesian posterior distribution of ability. Several item-selection criteria based on this principle have been proposed (van der Linden, 1998).

Both the procedures share a problem derived from choosing in each test the best items in

the pool: some items are administered in most tests (even in more than 50% of the tests), risking test security and validity, whereas others are never shown (in one particular CAT, 80% of the items were never selected). To sort-out this difficulty, control exposure methods have been implemented. These methods trade-off precision with security. When a CAT has in use an exposure control method, such as the Sympson–Hetter method (Sympson & Hetter, 1985), precision of measurement is not as high, but the exposure rate of the most useful items is held under control, and the smaller exposure rates are obtained. Experimental CATs may have implemented one of the two pure item-selection procedures indicated above, but if a CAT has to give valid measures it needs to attend to other considerations in order to select items, such as the appropriate representation of the content or subject areas, the guarantee that the composition of the test is similar for all examinees, the control of the presence of items that should not appear together in the same test, etc. Item-selection rules should then consider not only the basic principles indicated above, but also item-control exposure and other restrictions. Linear programming techniques are often used to make item selection feasible when different restrictions have to be simultaneously considered.

The administration of items ends when either the test length or ability precision reach their preset values. In the second case, all the examinees will be measured with the same precision, but the number of items administered and testing time will differ. Sometimes the stopping criterion is mixed: the test stops after presenting a preset number of items if it does not reach the targeted precision.

PSYCHOMETRIC PROPERTIES

As in a conventional test, reliability and validity studies have to be carried out in a CAT. Besides traditional reliability methods, such as test–retest, simulation may be used to obtain information on test functioning. Indices such as RSME, bias and efficiency can be easily computed. Concerning validity, the procedures in use for conventional tests are applicable to CATs. For further details on this, see Chapters 7 and 8 of Wainer et al. (2000).

OTHER RESEARCH TOPICS

New Types of CATs

Most of the CATs have been elaborated to measure intelligence, aptitudes or achievement, and they are based on IRT models for unidimensional dichotomous items. However, other alternatives have been considered in the past few years. The need to measure other constructs such as attitudes, whose items have the format of ordered categories, and the possibility of using the incorrect options of the multiple-choice items to improve the estimation of ability, started a new line of work interested in elaborating CATs based on diverse types of polytomous models. Also, the acknowledgement that more than one trait intervenes in almost all the tasks has led to the use of multidimensional CATs (Segall, 2000).

CATs in Intelligent Tutoring Systems

The use of IRT in CATs imposes a few important constraints (Almond & Mislevy, 1999): (a) IRT has a simple way of representing knowledge and skills that intervene in complex tasks (unidimensionality); (b) it establishes strong assumptions that can be violated on some occasions (conditional independence); (c) it requires large samples to estimate the item parameters; and (d) it offers a score to express the level of ability, which does not exactly indicate what the subjects know or can do (diagnosis). All these aspects reduce their use in measuring domains that require multiple knowledge, skills and abilities, as in educational and job performance assessment. There is a tendency in education to integrate measurement, assessment, diagnosis, teaching and learning. This means that it is necessary to know in detail the knowledge and skills dominated by the students, the kinds of mistakes they make, the strategies they use, etc. to be able to adapt the contents and pedagogic strategies to them. To what extent can this be achieved by available CATs? Hardly at all, unfortunately.

This orientation in performance assessment is creating the need to introduce important changes in CATs, most of them coming from the literature on intelligent tutoring systems (ITS). In computerized teaching, since the ITS appeared,

there has been a growing interest in giving it more capacity of accommodation for the candidates, including a CAT in its module of assessment. Most of these systems do not use IRT, they are based instead on other methodologies, such as the rule-space methodology (Tatsuoka & Tatsuoka, 1997), the knowledge spaces (Hockemeyer & Albert, 1999), Bayesian networks, or graphical models (Almond & Mislevy, 1999), etc.

Conditions of Application

Lastly, many practical problems emerge when CATs become operative instruments used in real life. One main concern is how to guarantee the security of the item pool against attempts at illegitimate appropriation of its contents as well as the complexity and high costs of the elaboration process, maintenance and renewal. A second topic of interest tries to make the conditions of test administration better psychologically for the candidates, such as obtaining optimum adjustment in the difficulty of the test, allowing review of the answers, and controlling the difficulty of the items to reduce anxiety.

FUTURE PERSPECTIVES AND CONCLUSIONS

From a technical perspective, there have been significant steps made in ability estimation methods. Likewise, the item-selection heuristics have reached a level of sophistication that makes it capable of guaranteeing the elaboration of tests that meet multiple requirements. In the next generation of CATs, new models will be used. Very soon we will be able to see comparative studies that analyse these new models that are multidimensional and can handle polytomous response data. However, the CATs elaborated from these models have yet to prove that their advantages are worth the additional effort their elaboration requires. This is especially true for multidimensional models.

Many practical problems have emerged with CAT going operational (Wise & Kingsbury, 2000), especially those related to test security and costs. Wainer (2000) provided a critical discussion of the supposed advantages attributed to CATs in the 1980s, from the experience accumulated on their massive use in the 1990s. His conclusion, though not very favourable, is not discouraging. Wainer argues for more focus on areas where CATs will be useful: (a) when the construct cannot be measured easily without a computer, (b) when the test has to be continuously administered, and (c) when it is important for everyone involved to get the right measurement.

In the past few years, a growing tendency to extend the use of CATs to the Internet, using its Web service (CAT-Web), has been appreciated. This tendency basically responds to the interest of having the distance learning system also offering an individualized assessment. In this way, more ITS destined to the Internet are continuously being released, and some of them already include a CAT-Web.

Finally, two challenges that CATs will face in the future will be to offer diagnostic information of quality on multiple abilities and to substantially reduce the costs associated with the elaboration of the item pool. In the first place, CATs have to go further than the unidimensional dichotomous IRT models, and especially to solve in an efficient way the problem of multidimensionality. Moreover, according to the objectives of the test, offering quantitative scoring may not be enough. The solution could be far from the IRT. The possibilities offered by the models of measurement based on knowledge, like the Bayesian inference network or the knowledge space theory, would have to be seriously considered. In the second place, an alternative to *online* calibration and the automatic generation of items that could serve to reduce costs is to elaborate *instruments of measurement that learn to measure*. The necessary elements would be a theoretical model of the construct that is well supported, a psychometric model, a group of experts on the subject to obtain the initial parameters and an algorithm of learning. The test will modify the initial estimates of the experts from the empirical information collected, and from its execution in activities in which it could be trained through simulation. The algorithm of learning would bring the values of the parameters up to date so they would adapt to the predictions of the theoretical model and the available empirical evidence. The uses of the scoring would be conditioned to the degree of competence achieved by the test. Although it may seem far-fetched, some attempts are being made in this direction in CATs of some ITS.

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RELATED ENTRIES

COMPUTER-BASED TESTING, ITEM BANKING, ITEM RESPONSE THEORY: MODELS AND FEATURES, AUTOMATED TEST ASSEMBLY SYSTEMS, THEORETICAL PERSPECTIVE: PSYCHOMETRICS

AMBULATORY ASSESSMENT

INTRODUCTION

Ambulatory assessment designates a new orientation in behavioural and psychophysiological assessment. This approach relates to everyday life ('naturalistic' observation) and claims the ecological validity of research findings. Methods of recording psychological data in everyday life have a long history in differential psychology and clinical psychology. Event recorders for the timed registration of stimuli and responses, 'beeper' studies in which a programmable wristwatch prompts the subject to respond to a questionnaire, self-ratings on diary cards, and electronic data loggers have all been used for this purpose. The arrival of pocket-sized (hand-held, palm-top) computers has eased the acquisition of data considerably. Computer-assisted methodologies facilitate investigations in real-life situations where relevant behaviour can be much more effectively studied than in the artificial environment of laboratory research. Such field studies are essential, for example, in research on stress–strain or in research on mechanisms that trigger off psychological and psychophysiological symptoms.

Ambulatory assessment originated from a number of previously rather independent research orientations with specific objectives. *Clinical (bedside) monitoring* was introduced as a means of continuously observing a patient's vital functions, e.g. respiratory and cardiovascular

parameters under anaesthesia, during intensive care and in perinatal condition. If relevant changes occur, i.e. if certain critical values are exceeded, an alarm is set off. *Biotelemetry* employs transmitter–receiver systems (radio-telemetry) in order to measure physical functions in real life, e.g. cardiovascular changes during intense strain at the workplace or during athletic performance. Radio equipment basically makes two-sided communication possible, i.e. feedback, telestimulation and telecommand, in addition to telemetry. *Ambulatory monitoring* means continuous observation of free-moving subjects (patients) in everyday life as compared to stationary, bedside ('wired') monitoring. Ambulatory monitoring can be conducted either by biotelemetry or by a portable recording system. This methodology is appropriate for patients who exhibit significant pathological symptoms which, for a number of reasons, cannot be reliably detected in the physician's office or hospital as compared to a prolonged observation in everyday life. Such cases include ventricular arrhythmia, ischaemic episodes, sleep apnea, and epileptic seizures. Here, ambulatory monitoring furthers valid diagnoses as well as the stabilization of medication. *Field research* comprises observation in natural settings in contrast to the laboratory. Field research is an essential methodology in cultural anthropology, social research, and ethology. Likewise, in psychology and psychophysiology some research issues require field studies to obtain valid data (see Kerlinger & Lee, 2000; Patry, 1982). *Behavioural assessment* methods include, besides laboratory observation, a variety of in-vivo (in-situ) tests, simulated and quasi-naturalistic settings, such as behavioural approach/avoidance tests (BATs) which were designed to assess behaviour disorders and clinical symptoms.

Ambulatory assessment brings together those research orientations that correspond to each other in their basic ecological perspective. Ambulatory assessment involves the acquisition of psychological data and/or physiological measures in everyday life according to an explicit assessment strategy which relates data, theoretical constructs, and empirical criteria specific to the given research issue. Such field studies are not solely concerned with the ambulatory monitoring of patients, but rather include a wide spectrum of objectives and applications. Common features are: recordings in everyday life, computer-assisted methodology, attempts to minimize method-dependent reactivity, maintaining ecological validity and, therefore, outstanding practical utility for various objectives – such as monitoring and self-monitoring, screening, classification and selection, clinical diagnosis, and evaluation – in many areas of psychology and psychophysiology (de Vries, 1992; Fahrenberg & Myrtek, 1996, 2001a, 2001b; Littler, 1980; Miles & Broughton, 1990; Pawlik & Buse, 1982, 1996; Pickering, 1991; Suls & Martin, 1993).

ACQUISITION OF PSYCHOLOGICAL DATA BY HAND-HELD PC

In psychology the hand-held PC so far has been predominantly used for recording self-reports on mood and other aspects of subjective state, including physical complaints and symptoms; that is, as an 'electronic diary' (e.g. job stress diary, pain diary). There are other kinds of data, which can be obtained in field studies: objective features of a behaviour setting, behaviour observations, behaviour and performance measures (psychometric testing), self-measurements of various kinds, for example blood pressure data, and, possibly, ratings of environmental aspects. Potential contents of a computer-assisted protocol may further include, for example, individual comments or self-evaluation in connection with events.

Advantages and Limitations

The application of a programmable pocket PC in ambulatory assessment has many advantages:

- alarm functions for prompting the subject at predefined intervals and a built-in reminder signal;
- reliable timing of input, delay of input, and duration of input;
- flexible layout of questions and response categories;
- branching of questions and tailor-made sequential or hierarchical strategies;
- concealment of previously recorded responses from the subjects;
- convenience and ease of transfer of data to a stationary PC for statistical analysis.

A higher technical reliability and ecological validity of computer-assisted recordings can be generally assumed compared with paper-and-pencil questionnaires and diaries that lack flexibility in data acquisition and exactness when timing responses. The versatility and wide acceptance of computer-assisted data acquisition is evident, although there are limitations and obvious restrictions. All participants of such studies will need sufficient practical training in at least the basic features of the PC and the program, to avoid malfunctions and missing data. In spite of the obvious increase in computer literacy within the general population, there are sub-populations which are less familiar with such devices or may experience problems.

Following the progress made in pocket-sized computers, software to facilitate the use of hand-held PCs in field studies has been developed in many institutions, more or less geared to the needs of certain studies. More flexible software systems suited to the requirements of a variety of applications are still an exception (AMBU for in-field performance testing, *cf*. Buse and Pawlik, Hogrefe Verlag, Göttingen, Germany; MONITOR, a flexible software system for ambulatory assessment, Psychology Department, University of Freiburg, Germany). The OBSERVER (Behaviour Observation System, Noldus Information Technology, AG Wageningen, NL, Noldus, 1991) was introduced to ease the recording of behaviour observations in field studies in animal and human ethology.

Computer-assisted self-reports require a hand-held PC with certain features: a large display, easy handling of basic controls, clock, beeper with volume control, sufficient capacity of storage, low power consumption, and a low weight. For many applications, a comparatively large alphanumeric keyboard (complete QWERTY) is also preferable in order to ease recording and, especially, to record verbal responses. The latter may involve, for example, recording reports and comments about specific events, or reporting more precisely the occurrence of physical and psychological symptoms, which in either case hardly fit pre-defined categories. For some applications it may suffice to record only 'yes' or 'no' responses or numbers. In this case, a smaller hand-held PC, e.g. the Palm™ series, may be preferable, although small keys or a stylus may present a problem for some subjects or patients.

PHYSIOLOGICAL MEASUREMENT AND MONITORING

A wide selection of physiological variables have been measured in daily life, using mostly non-invasive methods. The ECG and blood pressure enjoy by far the largest number of references in the literature to ambulatory monitoring. The application is predominantly in the medical field and only to a much smaller extent in the behavioural sciences; for example, in psychophysiology or behavioural medicine. The advances in microprocessor technology and storage capacity paved the way for multi-channel recordings and – another innovative step – led to the on-line analysis of medically important changes; for example, the immediate detection of ST-depression in the ECG.

The recording of posture and motion is another basic issue in the methodology of behaviour observation and performance measurement. Piezoresistive sensors (multi-site calibrated accelerometry) allow for:

- continuous recording and automatic detection of changes in posture and movement;
- assessment of movement disorders, such as hand tremor, restless legs syndrome;
- detection of head movement, e.g. nodding during a conversation, measured by a small accelerometer placed beneath the chin;
- estimation of gross physical activity and energy expenditure.

To assist in objective behaviour analysis, a range of interesting variables could be measured continuously:

- voice signal recorded via a throat sensor (micro);
- the temporal pattern of speech;
- ambient conditions recorded via suitable sensors for light, noise, and temperature.

Some hand-held PCs allow for audio recordings up to a number of minutes, depending on storage capacity. Digital dictating systems have a capacity up to 240 minutes in long play mode. In psychological and psychophysiological research, so far, little use has been made of digital

mini-cams or web-cams for recordings of the videostream of behaviour.

Recorder–Analyser

Today, more than a dozen recorder–analyser systems are available from international manufactures – not to mention the even greater number of long-term ECG recorders–analysers and the long-term-BP recorders. Only a few systems have a multi-channel design, the advantage of which is that they can be applied to a variety of research questions that require different recording channels (for an overview of selected multi-purpose recorder systems, see Fahrenberg, 2001). Besides the devices suitable for ambulatory recordings and their use in 24-h or long-term monitoring, a wide range of portable (mobile) equipment designed for in-field measurement does exist.

ISSUES IN AMBULATORY ASSESSMENT

Assessment strategies, designs, and data analysis

In psychological research various designs for computer-assisted ambulatory assessment have already been employed, whereby some of these assessments lasted for many days or weeks. In psychophysiology and in medicine, the restriction to a single 24-h recording appears to be the preferred format due to the costly equipment. Ambulatory assessment requires the elaboration of specific designs and strategies, for example the strategic use and integration of time and event sampling, and the development of appropriate statistical models for multi-level analyses and for rather short time series (for a discussion, see Fahrenberg & Myrtek, 2001a; Schwarz & Stone, 1998; Stemmler, 1996). It would be oversimplified to state methodological advantages of the laboratory experiment as obstacles in field studies and vice versa, i.e. to retain the notion of basically different research strategies instead of a wider perspective that includes laboratory and field as complementary approaches.

Laboratory–field comparisons are designed to examine the validity of findings obtained in the laboratory to predict performance in real life. In the development of psychological tests such empirical validation studies play an important role. More recently, it has been questioned whether certain diagnostic techniques and measurements in the physician's office or in the psychophysiological laboratory, e.g. blood pressure measurement, reliably predict individual differences in real life. Laboratory–field comparisons revealed significant discrepancies. Office hypertension is a good example of how certain features of the setting and their meaning to the subject may play an important role in assessing individual differences: blood pressure readings are elevated if the measurement is made by the physician, but normal readings are obtained in everyday life.

Laboratory–field comparisons were valuable in the evaluation of methodological issues as well as practical aspects. Field studies, apparently, are more suited for prolonged observation that may extend over days and weeks. Accordingly, there is more chance for the detection of rare events and symptoms that occur at low frequencies or only in certain settings. Generally, larger response magnitudes and more realistic effect sizes may be expected in natural settings. Prolonged observation periods make the averaging/aggregation of measurements possible so that reliability and stability of measures may increase substantially. But field studies can be seriously threatened by the confounding of multiple effects which tend to produce 'noise' and, eventually, require relatively large subject samples in order to obtain valid estimates for main effects.

Psychophysiological monitoring. Multi-modal psychophysiological 24-h monitoring methodologies were developed in many fields, especially in research on blood pressure reactivity. This method consists of multi-channel recordings of blood pressure, heart rate, physical activity, and – concurrent to each blood pressure measurement – obtained a computer-assisted self-report on setting, behaviour, emotional state, and experience.

Controlled monitoring. Recordings obtained in everyday life will often include multiple effects. Therefore, investigators may wish to control for unwanted variance, such as blood pressure changes caused by physical activity. Concurrent recordings of physical activity provided means for a segmentation of recordings according to high or low activity. Furthermore, standardized or semi-standardized measurement periods were included which served as a reference for inter- and intra-individual

comparison. As part of the standard protocol in 24-h monitoring, the subjects performed specific tasks: climbing a staircase, performing a mental test, and participating in a short interview.

Interactive monitoring. The development of recorder equipment suitable for physiological and psychophysiological recordings and on-line (real-time) analysis led to innovative research strategies. Contingent to changes of certain physiological parameters, a patient can be prompted by a beeper signal to record specific events, activities, or symptoms. Myrtek et al. (1988) developed a new methodology for interactive monitoring of 'additional heart rate' indicative for emotional states.

Acceptance, Compliance, and Reactivity

From the beginning, there have been concerns raised about the acceptance of hand-held PCs, and the validity of monitoring in daily life has been questioned. Ambulatory assessment with a pocket PC or recorder depends on the favourable attitude of the participating subjects. It is essential that the equipment is readily accepted and that good compliance to instructions is established and sustained. If the ambulatory monitoring is part of a diagnostic process or a treatment programme, the patient's compliance may be higher than in research projects. The ambulatory assessment should, of course, not cause major problems with the social environment.

The method of observation and measurement itself may cause unwanted variance because of specific interactions such as awareness, adaptation, sensitization, and coping tendencies. Three aspects of reactivity appear to be specific to ambulatory assessment. Subjects may: (1) tend to steer clear of certain settings during the recording in order to avoid being monitored there; (2) tend to unintentionally or deliberately manipulate the recording systems, shift settings of the PC and may even try to get access to the program; and (3) try to test their capacities or the equipment by unusual patterns of behaviour, exercise or vigorous movements. A comprehensive post-monitoring interview is recommended in order to obtain information on these essential aspects.

Ethical issues that are specific to ambulatory monitoring studies have hardly been discussed yet. Appropriate data protection is but one aspect, as ambulatory assessment may violate privacy more easily than other methods. Furthermore, significant others and bystanders may become involved when the observation and the evaluation of settings are demanded. Obtaining the subject's informed consent before the recording starts is essential, but may be problematic since the exact course of daily activities and events cannot be anticipated.

Acceptance and impact of computer-assisted monitoring methodology in psychophysiology and psychology. The ambulatory monitoring of BP and ECG are now indispensable routine methods in medicine. The ever more widespread application of the new methodology can be attributed to its practical usefulness which was evident in the increased validity of diagnosis and in the external validity of therapy outcome evaluation. In contrast, computer-assisted monitoring and assessment still appear to have had little impact in psychophysiology and psychology. Standard textbooks on behavioural research methods and assessment in clinical psychology hardly refer to the new methodologies based on computer-assisted data acquisition and monitoring in the natural environment.

FUTURE PERSPECTIVES

Computer-assisted ambulatory assessment is an emerging new methodology. Progress is obvious not only in instrumentation, but in assessment strategies as well. Ambulatory assessment, like any other method, has problematic aspects, in particular how to account for multiple effects in the recordings, but the benefits are evident:

- *recording* of relevant data in natural settings;
- *real-time measurement* of behavioural and physiological changes;
- *real-time assessment and feedback* by reporting physiological changes to the subject;
- *concurrent assessment* of psychological and physiological changes (detection of events, episodes);
- *correlation and contingency (symptom–context) analysis* across systemic levels as suggested in triple-response models (multimodal assessment);
- *ecological validity* of findings and suitability for direct application.

Genuine research findings in relevant fields suggest further development and application of ambulatory assessment methodology. The expectation is that the hand-held PCs and the recorder–analyser for physiological measures will in future become smaller, cheaper and more refined. Such developments may include new strategies in controlled or interactive monitoring and on-line feedback, monitoring and concurrent recording of audio and video signals (intelligently pre-processed before stored), setting-dependent sampling, new strategies in self-monitoring and self-management in chronic illness.

A hand-held PC may be useful in the diagnostic assessment of a variety of behaviour disorders, for example the assessment and self-management of drinking, smoking, and of eating disorders, and in facilitating self-management in chronic illness. Computer programs that are based on a hand-held PC can be used as a component of behavioural therapy (*cf*. a pilot study by Burnett et al., 1985).

There are noticeable developments which probably exert an essential influence on the computer-assisted methods in medicine and the behavioural sciences: the arrival of the wireless application protocol (WAP), the mobile phone short message systems (SMS), the web-based mobile telecommunication (IMT-2000 and UMTS) and the new patient monitoring equipment, which appears to revolutionize the way in which patient information is transmitted and used in the healthcare system. At present, we may only speculate about the consequences of such developing information technologies for the healthcare system and, to some extent, on subsequent developments in applied fields of psychology.

CONCLUSIONS

During the last two decades, a fast development in microprocessor technology has enabled the design of new instrumentation and, accordingly, new methodologies in medicine and the behavioural sciences. Multi-channel recorders–analysers and special purpose devices for physiological measures and convenient hand-held PCs for acquisition of psychological data are available. Such systems allow innovative research and practical application in many fields and essential findings have been obtained.

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RELATED ENTRIES

Psychophysiological Equipment and Measurements, Applied Fields: Psychophysiology, Equipment for Assessing Basic Processes, Field Survey: Protocols Development, Observational Methods (General), Self-Observation (Self-Monitoring)

A ANALOGUE METHODS

INTRODUCTION

Analogue behavioural observation (ABO) involves a situation designed by, manipulated by, or constrained by an assessor that elicits a measured behaviour of interest. Observed behaviours comprise both verbal and non-verbal emissions (e.g. motor actions, verbalized attributions, observable facial reactions).

ABO exists on a continuum of naturalism, ranging from highly contrived situations (e.g. How quickly do people walk down the hallway after being exposed to subconsciously presented words about ageing? Bargh et al., 1996) to naturalistic situations arranged in unnatural ways or settings (e.g. How do couples talk with one another when asked to discuss their top problem topic? Heyman, 2001) to naturalistic situations with some (but minimal) experimenter-dictated restrictions (e.g. family observations in the home; Reid, 1978).

WHY USE ABO?

ABO is used as a hypothesis-testing tool for three purposes: (a) to observe otherwise unobservable behaviours, (b) to isolate the determinants of behaviour, and (c) to observe dynamic qualities of social interaction. Although naturalistic observation might be preferable (i.e. generalizability inferences are minimized), the first two purposes require controlled experimentation, necessitating ABO; for the third purpose, ABO is often preferable because it allows the observer to 'stack the deck' to make it more likely that the behaviours (and/or functional relations) of interest will occur when the assessor can see them.

DOMAINS

ABO comprises two main assessment domains: individual/situation interactions and social situations. The goals of individual/situation interaction experiments are to manipulate the setting and test individual differences in response. This domain comprises a wide variety of tasks in developmental psychology (e.g. strange situation experiments; Ainsworth et al., 1978), social psychology (e.g. emotion regulation experiments; Tice et al., 2001) and clinical psychology (e.g. functional analysis of self-injurious behaviour; Iwata et al., 1994; social anxiety assessment; Norton & Hope, 2001).

The social situation domain employs ABO mostly as a convenience in assessing quasi-naturalistic interaction. The goal of such assessment is typically to understand behaviour and its determinants in dynamic, reciprocally influenced systems

(e.g. groups, families, couples). Understanding generalizable factors that promote or maintain problem behaviours in such systems typically requires more naturalistic approaches than those used in the other domain. Thus, although experimentation is often extremely useful in understanding causal relations in social situations (e.g. whether maternal attributions affect mother–child interactions; Slep & O'Leary, 1998), most such ABO investigations aim for quasi-naturalism.

CLINICAL ASSESSMENT

ABO is a useful tool in clinical assessment, although relatively few ABO paradigms have been developed specifically with this application in mind. To be clinically useful, ABO must efficiently provide reliable, valid, and non-redundant (but cost-effective) information.

An apt analogy for research-protocol based assessment vs. field-realistic assessment might be found in the treatment literature. In recent years, a distinction has evolved between efficacy studies (i.e. those studying interventions under tightly controlled, idealized circumstances, such as a trial of treatment for major depressive disorder that eliminates all potential participants with co-morbid disorders) and effectiveness studies (i.e. those studying interventions under real-world conditions). Because we do not have an adequate research body of effectiveness studies, clinicians in the field, urged to use empirically validated treatments, are expected to adapt such protocols to meet real-world demands. Similarly, clinicians should be urged to use empirically validated ABO when it would be appropriate, but should be expected to adapt ABO protocols in a cost-effective but still clinically informative manner.

ABO Protocols

Space limitations preclude a summary of the wide variety of ABO protocols. We note, however, literatures on parent–child interaction (e.g. Roberts, 2001), couple interaction (e.g. Heyman, 2001), social anxiety and social interaction skills (Norton & Hope, 2001), fear (e.g. McGlynn & Rose, 1998), self-injurious behaviour in those with developmental disabilities (e.g. Iwata et al., 1994), the effect of alcohol consumption on family interaction (e.g. Leonard & Roberts, 1998), cooperation and competition (e.g. the prisoner's dilemma paradigm; Sheldon, 1999), and aggression (e.g. Bandura, 1986).

Psychometric Considerations

Each ABO paradigm and its accompanying coding systems must be separately considered for reliability, validity, and utility. Like all psychological assessments, ABO psychometrics depend 'on the goals of assessment, the assessment settings, the methods of assessment, the characteristics of the measured variable, and the inferences that are drawn from the obtained measures' (Haynes & O'Brien, 2000: 201).

The psychometrics of ABO paradigms and coding systems has received little direct attention (see a special issue of *Psychological Assessment*, March 2001, for a notable exception). The validity of the ABO paradigms is implied by the results of studies using that paradigm. As such, ABO paradigms and their coding systems often have excellent validity and reported inter-rater agreement.

Coding

Although we have described ABO as a hypothesis testing tool, in reality it is a hypothesis testing setting; coding the observed behaviours turns ABO into a true tool. Creation or use of a coding system is a theoretical act, and the following questions should be answered before proceeding: Why are you observing? What do you hope to learn? How will it impact your hypotheses (i.e. either research questions or case-conceptualization questions)? This is especially true because coding of many ABO target behaviours is difficult to do in a reliable, valid, and cost-effective manner. Interested readers should consult several excellent resources for more complete coverage (e.g. Bakeman & Gottman, 1997; Haynes & O'Brien, 2000).

Sampling

The major sampling strategies are event sampling (the occurrence of behaviour is coded, ideally in sequential fashion), duration sampling (the length of each behaviour is recorded), interval sampling (the ABO period is divided into time blocks; during each time block, the occurrence of each

code is noted), and time sampling (intermittent observations are made, typically in a duration or interval sampling manner). Advantages and disadvantages of each are discussed in Bakeman and Gottman (1997) and Haynes and O'Brien (2000).

Choosing What to Code

Some behaviours are so concrete that the observer serves more as a recorder than a coder (e.g. duration of a discrete behaviour). Other behaviours require at least some degree of inference. Such coding necessitates the use of culturally sensitive raters, using specified decision rules, to infer that a combination of situational, linguistic, paralinguistic, or contextual cues amounts to a codeable behaviour. Concrete codes are not necessarily better than social informant-inferred codes; sometimes one allows for a more valid measurement of a construct, sometimes the other does. In accord with Occam's razor, coding should be as simple as possible to reliably capture the behavioural constructs of interest.

Global (i.e. molar) coding systems make summary ratings for each code over the entire ABO (or across large time intervals). Codes tend to be few, representing behavioural classes (e.g. negativity). Microbehavioural (i.e. molecular) systems code behaviour as it unfolds over time, and tend to have many fine-grained behavioural codes (e.g. eye contact, criticize, whine).

Topographical coding systems measure the occurrence of a behaviour (including, potentially, its duration). Dimensional coding systems measure the intensity of the behaviour. Microbehavioural systems tend to be topographical; although global systems tend to be use-rating scales, they may summarize frequency rather than intensity. Dimensional coding of intensity, especially on a point-by-point basis, has been used sparingly in ABO.

Analyses

ABO frequently uses single subject multiple baseline designs. Data are plotted and visually inspected for trends.

Statistical analysis of ABO data uses standard statistical tools. Between-groups hypotheses about behavioural frequencies are tested with ANOVA, continuous association hypotheses are tested with correlations or regressions.

When functional relations are of interest, testing how interactions unfold across time becomes important. Functional relation hypotheses can be addressed with conditional probabilities or with sequential analysis, which is similar to conditional probability analysis but which allows for significance testing. Dimensional data assessed continuously would use time-series analysis instead of sequential analysis.

CONCLUSIONS

ABO can be a good theory-testing tool because (depending on exactly how it is employed) it minimizes inferences needed to assess behaviour, it can facilitate formal or informal functional analysis, provide the assessor with experimental control of situational factors, facilitate the observation of otherwise unobservable behaviours, and provide an additional mode of assessment in a multimodal strategy (e.g. questionnaires, interviews, observation). Finally, because the assessor can set up a situation that increases the probability that behaviours of interest will occur during the observation period, ABO can be high in clinical utility and research efficiency.

Like any tool, however, ABO's usefulness depends on its match to the resources and needs of the person considering using it. ABO can be a time, labour, and money-intensive assessment strategy. The use of research-tested protocols/coding is often impractical in clinical settings; adaptations of empirically supported ABO methodology in clinical settings may render them unreliable and of dubious validity. The conditional nature of validity may make it difficult to generalize ABOs to the broad variety of real-world settings. Finally, the less naturalistic the ABO situation, the more nagging the concerns about external validity.

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RELATED ENTRIES

Observational Methods (General), Observational Techniques in Clinical Settings, Applied Fields: Clinical

ANGER, HOSTILITY AND AGGRESSION ASSESSMENT

INTRODUCTION

Over the last 25 years, interest in measuring the experience, expression, and control of anger has been stimulated by evidence that anger, hostility and aggression were associated with hypertension and cardiovascular disease (Williams, Barefoot & Shekelle, 1985; Dembroski, MacDougall, Williams & Haney, 1984). While definitions of anger-related constructs are often inconsistent and ambiguous, the experience and expression of anger are typically encompassed in definitions of hostility and aggression. Clearly, anger is the most fundamental of these overlapping constructs.

On the basis of a careful review of the research literature on anger, hostility and aggression, the following definitions of these constructs were proposed by Spielberger et al. (1983: 16):

> Anger usually refers to an emotional state that consists of feelings that vary in intensity, from mild irritation or annoyance to intense fury and rage. Although hostility involves angry feelings, this concept has the connotation of a complex set of attitudes that motivate aggressive behaviours directed toward destroying objects or injuring other people. The concept of aggression generally implies destructive or punitive behaviour directed towards other persons or objects.

The physiological and behavioural manifestations of anger, hostility and aggression have been investigated in numerous studies, but until recently angry feelings have been largely ignored in psychological research. Consequently, psychometric measures of anger, hostility and aggression generally do not distinguish between feeling angry, and the expression of anger and hostility in aggressive behaviour. Most measures of anger-related constructs also fail to take the state–trait distinction into account, and confound the experience and expression of anger with situational determinants of angry behaviour. A coherent theoretical framework that recognizes the difference between anger, hostility and aggression as psychological constructs, and that distinguishes between anger as an emotional state and individual differences in the experience, expression and control of anger as personality traits, is essential for guiding the construction and cross-cultural adaptation of anger measures.

ASSESSMENT OF ANGER: MEASURING STATE–TRAIT AND THE EXPRESSION AND CONTROL OF ANGER

The State–Trait Anger Expression Inventory (STAXI) was developed to measure the experience, expression and control of anger (Spielberger et al., 1985; Spielberger, Krasner & Solomon, 1988). The State–Trait Anger Scale (STAS) was constructed to assess the intensity of anger as an emotional state, and individual differences in anger proneness as a personality trait (Spielberger et al., 1983). State anger was defined as '... an emotional state marked by subjective feelings that vary in intensity from mild annoyance or irritation to intense fury or rage, which is generally accompanied by muscular tension and arousal of the autonomic nervous system'. Trait Anger refers to individual differences in the disposition to experience angry feelings. The STAS Trait-Anger Scale evaluates how frequently State Anger is experienced.

Recognition of the importance of distinguishing between the experience and expression of anger stimulated the development of the Anger Expression (AX) Scale (Spielberger et al., 1985). The AX Scale assesses how often anger is suppressed (anger-in) or expressed in aggressive behaviour (anger-out). The instructions for responding to the AX Scale differ markedly from the traditional trait-anger instructions. Rather than directing subjects to respond according to how they generally feel, they are instructed to report on how often they react or behave in a particular manner when they feel 'angry or furious' (e.g. 'I say nasty things'; 'I boil inside, but don't show it') by rating themselves on the same 4-point frequency scale that is used with the Trait-Anger Scale.

The identification of anger control as an independent factor stimulated the construction of a scale to assess the control of angry feelings (Spielberger et al., 1988). The content of three of the 20 original AX Scale items (e.g. control my temper, keep my cool, calm down faster), which were included to assess intermediate levels of anger-expression as a unidimensional bipolar scale, guided the generation of additional anger control items (Spielberger et al., 1985).

The last stage in the construction of the STAXI was stimulated by the research of psycholinguists, who identified English metaphors for anger, which called attention to the need to distinguish between two different mechanisms for controlling anger expression (Lakoff, 1987). The prototype of the anger metaphor was described as a hot liquid in a container, where blood was the hot liquid and the body was the container. The intensity of anger as an emotional state is considered analogous to the variations in the temperature of the hot liquid. The metaphor, boiling inside, has the connotation of an intense level of suppressed anger; blowing off steam connotes the outward expression of angry feelings; keeping the lid on implies controlling intense anger by preventing the outward expression of aggressive behaviour. Thus, Lakoff's (1987) anger metaphors suggested two quite different mechanisms for controlling anger: keeping angry feelings bottled up to prevent their expression, and reducing the intensity of suppressed anger by cooling down.

In the original STAXI scale, the content of all but one of the eight Control items was related to controlling anger-out (e.g. 'I control my temper'). Therefore, a number of new items were constructed to assess the control of anger-in by reducing the intensity of suppressed anger (Sydeman, 1995). The content of these items described efforts to calm down, cool off or relax when a person feels angry or furious. Factor analyses of the responses of large samples of male and female adults to the anger-control items identified two anger-control factors for both sexes: Anger Control-In and Control-Out.

OTHER MEANS OF MEASURING ANGER

(a) *Novaco Anger Inventory* (Novaco, 1975, 1977): this inventory is made up of 80 anger-provoking situations. Its reliability coefficient is rather high at 0.96, within a sample of 353 students (Biaggio, Supplee & Curtis 1981). This inventory has shown remarkable differences between psychiatric patients with anger problems and normal population (Novaco, 1977).

(b) *Multidimensional Anger Inventory – MAI* (Siegel, 1985): it is made up of 38 items, with a five-point 'Likert' scale. It measures anger-in with ruminations, anger-out with ruminations, anger-incited situations and hostile attitudes. It also provides a comprehensive index of anger in all its manifestations.

(c) *Harburg Anger In/Anger Out Scale* (Harburg, Erfurt, Chape, Hauenstein, Schull & Schork, 1973): this scale consists of a series of hypothetical interpersonal situations which may generate anger. It is a two-dimensional scale: it measures anger-in and anger-out, whereas at the same time it also provides a means of measuring resentment and reasoning.

(d) *Anger Self-Report Scale – ASR* (Zelin, Adler & Myerson, 1972): it consists of 74 items with a six-point 'Likert' scale. It measures anger awareness and anger expression. The anger expression scale makes a distinction between different sub-scales or levels of expression. This test has shown an average reliability coefficient in samples of psychiatric patients and students.

(e) *Anger Control Inventory*: this test consists of 134 items combining ten anger-provoking situations and six scales of anger response which describe cognitive, physiological and behavioural characteristics. Its reliability coeficient varies from 0.55 to 0.89 (Hoshmand & Austin, 1987).

(f) *Framingham Anger Scale*: these are self-report scales developed during the Framingham Project (Haynes, Levine, Scotch, Feinleib & Kannel, 1978). These scales are used to measure anger symptoms, anger-in and anger-out, and anger expression.

(g) *Subjective Anger Scale – SAS* (Knight, Ross, Collins & Parmenter, 1985): it measures the patient's proneness to experience anger by means of nine different situations and four scales of anger response.

(h) The *Anger Situation Scale* and the *Anger Symptom Scale* (Deffenbacher, Demm & Brander, 1986). They describe in detail the two worst, ongoing angering situations, and also, the two most salient physical signs of anger.

ASSESSMENT OF HOSTILITY

1 *Cook–Medley Ho Scale* (Cook & Medley, 1954). The Ho scale is a part of the MMPI. This scale, which has been widely used to measure hostility, is used in research on Health Psychology. However, its development has been shaped through research on rapport between teachers and students. Barefoot, Dodge, Peterson, Dahistrom and Williams (1989) identified two subsets of items, which represent cognitive, affective and behavioural manifestations of hostility. Another subset of items reflects the tendency to elicit hostile intent from other people's behaviour. The remaining subset of items identifies social avoidance. Its test–retest reliability has been of 0.84 in a four-year interval (Shekelle, Gale, Ostfeld & Paul, 1983).

2 *The Buss–Durkee Hostility Inventory – BDHI* (Buss & Durkee, 1957): This scale consists of 75 items, with a true–false response scheme. It is one of the most comprehensive instruments to measure hostility. It is made up of seven sub-scales: Assault, Indirect Hostility, Irritability, Negativity, Resentment, Suspicion and Verbal Hostility. The factorial analysis of these scales reveals two well-defined factors. One of them reflects hostile expression and the other experiential aspects of hostility. Its test–retest reliability, given a two-week interval, is 0.82 for the total hostility measurement (Biaggio, Supplee & Curtis, 1981).

3 *Factor L*: It is a sub-scale of a more general personality inventory – Cattell's 16 P.F. (Cattell, Eber & Tatsuoka, 1970). It is

described as a measure of suspiciousness versus trust.

CROSS-CULTURAL ASSESSMENT OF ANGER, HOSTILITY AND AGGRESSION: THE SPANISH MULTICULTURAL STATE–TRAIT ANGER EXPRESSION INVENTORY

Spanish is spoken not only in Spain, but also in more than 20 countries in Central and South America and the Caribbean, and by more than 25 million native speakers of Spanish who reside in the United States. Although Spanish is the primary language in most of Latin America and for many Hispanic residents in the US, the indigenous cultures of these people often have profound effects on the Spanish they speak, and on the development of personality characteristics that influence their behaviour. Therefore, it is important to recognize the exceptionally complex social and cultural diversity of Hispanic populations, and the fact that language differences between these groups may outweigh the similarities. Consequently, in adapting English measures of emotion and personality for use in Spanish-speaking cultures, care must be taken to ensure that the key words and idiomatic expressions used for assessing anger-related concepts have essentially the same meaning in different Hispanic cultural groups.

The STAXI-2 (Spielberger, 1999) was adapted to measure the experience, expression and control of anger in culturally diverse populations in Latin America, and in Spanish-speaking sub-cultures in the United States (Moscoso & Spielberger, 1999a). Toward achieving this goal, the Spanish Multicultural State–Trait Anger Expression Inventory (STAXI-SMC) was designed to measure essentially the same dimensions of anger that are assessed with the revised STAXI-2. Scales and sub-scales were constructed to assess the following dimensions with the STAXI-SMC: (a) State Anger, with sub-scales for assessing Feeling Angry and Feel Like Expressing Anger; (b) Trait Anger, with sub-scales for measuring Angry Temperament and Angry Reaction; and (c) trait scales for measuring four dimensions of anger expression and control: anger-in, anger-out, and the control of anger-in and anger-out (Moscoso & Spielberger, 1999b).

Factor analyses of responses to the 56 preliminary STAXI-SMC items confirmed the hypothesized structural properties of the inventory. The eight factors that were identified corresponded quite well with similar factors in the STAXI-2. These included two S-Anger factors, two T-Anger factors, and four anger expression and control factors (Moscoso & Spielberger, 1999a). In separate factor analyses of the S-Anger items, two distinctive factors were identified for both males and females: 'Feeling Angry' and 'Feel Like Expressing Anger'. However, gender differences in the strength of the item loadings on these factors raised interesting questions with regard to how Latin American men and women may differ in the experience of anger. For females, the 'Feeling Angry' factor accounted for 73% of the total variance, while this factor accounted for only 19% of the variance for males. In contrast, the 'Feel Like Expressing Anger' factor accounted for 70% of the total variance of the males, but only 13% for females.

The factor analyses of the T-Anger STAXI-SMC items also identified separate Angry Temperament and Angry Reaction factors, providing strong evidence that the factor structure for this scale was similar to that of the STAXI-2. Factor analyses of the STAXI-SMC anger expression and control items identified the same four factors as in the STAXI-2. The items designed to assess anger-in and anger-out, and the control of anger-in and anger-out, had high loadings on the corresponding anger expression and control factors, which were similar for both sexes. The alpha coefficients for the STAXI-SMC State and Trait Anger scales and sub-scales, and the anger expression and anger control scales, were reasonably high, indicating that the internal consistency of these scales was satisfactory.

In summary, the results of the factor analyses of responses of the Latin American subjects to the STAXI-SMC items of the Latin American subjects identified eight factors that were quite similar to those found for the STAXI-2. Factor analyses of the anger expression and control items also identified the same four factors that are found in the STAXI-2. Thus, the multi-dimensional factor structure of the STAXI-SMC for the Latin American respondents was remarkably similar to the factor structure of the English STAXI-2. The adaptation of the STAXI-2 test carried out in

Spain, using Spanish mainland natives (Miguel-Tobal, Cano-Vindel, Casado & Spielberger, 2001), is made up of 49 items with a similar factorial structure and the same sub-scales.

FUTURE PERSPECTIVES AND CONCLUSIONS

Over the last quarter century, interest in measuring the experience, expression and control of anger has been stimulated by evidence that anger, hostility and aggression were associated with health problems and life-threatening disease. While definitions of anger-related constructs are often inconsistent and ambiguous, the experience and expression of anger are typically encompassed in definitions of hostility and aggression. Clearly, anger is the most fundamental of these overlapping constructs.

A sound theoretical framework that recognizes the difference between anger, hostility and aggression, and that distinguishes between anger as an emotional state and hostility in the experience, expression and control of anger as personality traits, is essential for guiding the construction of anger measures and cross-cultural adaptation.

In the cross-cultural adaptation of anger measures, it is essential to have equivalent conceptual definitions in the source and target languages that distinguish between the experience of anger as an emotional state, and hostility in the expression and control of anger as personality traits. The construction and development of the Spanish Multicultural State–Trait Anger Expression Inventory was guided by definitions of state and trait anger and anger-expression and anger-control as these constructs were conceptualized in the STAXI-2.

Factor analyses of the items constructed for the STAXI-SMC identified eight factors that were quite similar to the factor structure of the STAXI-2. Research on the STAXI-2 and the STAXI-SMC clearly indicates that anger and hostility as psychological constructs can be meaningfully defined as emotional states that vary in intensity, and as complex personality traits with major components that can be measured empirically.

The importance anger and hostility have within the fields of Psychology, and particularly of Health, asks for precise means of assessment and measurement. Nowadays, there are some remarkable self-report tests available, which provide evidence of cross-cultural validity. However, in order to develop more accurate means of anger assessment, it is advisable to use and develop lesser known techniques of behavioural observation, such as self-monitoring (e.g. Meichenbaum & Deffenbacher, 1988) and interviewing. Also, research in the fields of physiological measurement and cognitive variables of anger (appraisals, attributions etc.) needs to be given a further boost. Measurement issues are a fundamental part of the research and the study of the hostility and the anger.

Table 1. Summary table of anger assessment scales

Scales	Assessment of					
	Anger	Expression of Anger	Anger-In	Anger-Out	Anger-Control	Hostility
STAXI	Yes	Yes	Yes	Yes	Yes	
Novaco Anger Inventory	Yes					
Multidimensional Anger Inventory	Yes		Yes	Yes		Yes
Harburg Anger-in/Anger-out	Yes		Yes	Yes		
Anger Self-Report Scale	Yes	Yes				
Anger Control Inventory	Yes					
Framingham Anger Scale	Yes	Yes	Yes	Yes		
Subjective Anger Scale	Yes					
Anger Situation Scale	Yes					
Anger Symptom Scale	Yes					
Cook–Medley Ho						Yes
Buss–Durkee Hostility Inventory						Yes
Factor L						Yes

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RELATED ENTRIES

TYPE A: A PROPOSED PSYCHOSOCIAL RISK FACTOR FOR CARDIO-VASCULAR DISEASES, DANGEROUS/VIOLENCE POTENTIAL BEHAVIOUR, APPLIED FIELDS: CLINICAL, APPLIED FIELDS: HEALTH

ANTISOCIAL DISORDERS ASSESSMENT

INTRODUCTION

Using a broad definition, Antisocial Disorders may be defined as pervasive, maladaptive behaviours that violate the norms and rules of a group or society, causing social impairment or distress to others. Currently, the classification and assessment of antisocial disorders may follow (a) the medical model or (b) the dimensional model:

- The medical model uses a categorical approach in which the presence of a variety of diagnostic criteria, such as persistent violations of social norms (including lying, stealing, truancy, inconsistent work behaviour and traffic arrests), is evaluated by experts (clinicians). This model relies on diagnostic criteria as outlined in the DSM-IV (Diagnostic and Statistic Manual of Mental Disorders: APA, 1994) and ICD (International Classification of Diseases: WHO, 1993).
- The dimensional model evaluates antisocial disorders along a continuum of development, from normal to pathological, focusing on behavioural and trait dimensions, and identifying clusters of highly interrelated behaviours and traits.

There is agreement among researchers about the development of antisocial behaviour: it begins early in life (infancy) with aggressive and oppositional behaviours (e.g. conduct problems), gradually advances toward more significant expressions of antisocial acts (e.g. vandalism, stealing, truancy, lying, substance abuse) during adolescence, and lastly, progresses to extreme forms of delinquency in adult life. The most recent longitudinal and retrospective studies (Patterson, Reid & Dishion, 1992) suggest that the 'early starters' (childhood and preadolescence) are at greater risk for adult involvement in delinquent acts and are more likely to move toward more serious offences that lead to a 'criminal career' compared to the 'later starters' (adolescence).

A variety of methods are used for assessing antisocial disorders; these include: self-report instruments, others' ratings, clinical interviews (structured and semi-structured), and direct behavioural observation (see Table 1).

CHILD AND ADOLESCENT ASSESSMENT

In order to establish the severity of antisocial behaviours during childhood and adolescence, it is important (a) to determine the *age of onset*; (b) to evaluate the *frequency* of aggressive acts; (c) to establish the *variety* of antisocial behaviours; and (d) to observe them in *multiple settings* (family, peers, school and community). As a necessary complement to this assessment, it is also important to evaluate other aspects of the individual's functioning in order to rule out the co-occurrence of other psychological disturbances.

For children and adolescents, the terms *conduct disorders* and *conduct problems* (aggressive and oppositional behaviours) may be used interchangeably. It is important to note that conduct disorders have different prevalence rates for boys and girls: 6 to 16% for boys, and 2 to 9% for girls.

In recent years, more complete assessment procedures have been developed to cover a full range of childhood and adolescent behaviours directly and indirectly linked to antisocial behaviours in different contexts. The advantages of these assessment procedures are (a) to have a complete picture of child and adolescent functioning for the purpose of differential diagnosis and (b) to collect data to provide empirical and theoretical support of the instruments used.

Instruments for Child and Adolescent Assessment

Here we present only a few of the numerous instruments that can be used for measuring antisocial behaviour. We included those that

Table 1. Assessment of antisocial disorder

Target	Informant	Model	Measure		
			Scale	Clinical Interviews	Observation
	Self	Dimensional	– Youth Self-Report (Achenbach, 1991c) – Behaviour Assessment System of Children–Self-Report of Personality Scale (Reynolds & Kamphaus, 1992)		
Children/ Adolescents	Others	Dimensional	– Revised Behaviour Problem Checklist (Quay & Peterson, 1983) – Child Behaviour Checklist (Achenbach, 1991a) – Teacher Report Form (Achenbach, 1991b) – Behaviour Assessment System of Scale (Reynolds & Kamphaus, 1992)		– Direct Observation Form (Achenbach, 1986) – Behaviour Assessment System of Children – Student observation system (Reynolds & Kamphaus, 1992) – Family Interaction Coding System (Reid, 1978) – Observation of Peer Interactions (Dodge, 1983)
Children/ Adolescents	Self	Categorical	– Devereux Scales of Mental Disorders (Naglieri, Lebuffe & Pfeiffer, 1994) – Eysenck Personality Questionnaire (Eysenck & Eysenck, 1993) – Minnesota Multiphasic Personality Inventory – II (Butcher et al., 1989)		

(*continued*)

Table 1. Continued

Target	Informant	Model	Measure		
			Scale	Clinical Interviews	Observation
Adults	Self	Dimensional	– Millon Clinical Multiaxial Inventory III (Millon, 1994) – Assessment of DSM-IV Personality Disorder Questionnaire – Antisocial Personality Questionnaire (Blackburn & Fawcett, 1999)	– Hare Psychopathy Checklist – Revised (Hare, 1991)	
		Categorical		– International Personality Disorder Examination (Loranger, Sartorius & Janca, 1996) – Structured Clinical Interview for DSM-IV (First et al., 1997) – Structured Interview for DSM-IV Personality Disorder (Pfohl, Blum & Zimmerman, 1995)	

provide a comprehensive assessment of different psycho-social domains and those that are in some way representative of the field of antisocial behaviour, both at the level of research and intervention.

Revised Behaviour Problem Checklist (RBPC)

The RBPC (Quay & Peterson, 1983) represents one of the first attempts to empirically classify childhood and adolescent disorders. The Revised Behaviour Problem Checklist covers the ages 5 to 17 years, and is available in two versions, one for teachers and one for mothers. It represents a revision of the original Behaviour Problems Checklist and now comprises six scales: Conduct Disorder, Socialized Aggression, Attention Problems–Immaturity, Anxiety–Withdrawal, Psychotic Behaviour, Motor Tension Excess. It allows one to distinguish between 'socialized' and 'undersocialized' conduct disorders. Socialized makes reference to antisocial behaviour within deviant peer group, unsocialized refers to impulsivity and irritability.

Child Behaviour Checklist (CBCL)

The CBCL (Achenbach, 1991a) (parent form), together with Youth Self-Report (YSR; Achenbach, 1991c), Teacher Report Form (TRF; Achenbach, 1991b) and Direct Observation Form (DOF; Achenbach, 1986), is one of the most comprehensive evaluation systems for childhood and adolescent psychopathology. It was developed by Achenbach in order to derive syndromes empirically and to allow for comparisons among different informants and cultures. The four forms share item content and can be used together to establish cross-contexts consistency.

They cover an age range of 4 to 18 years. The CBCL includes problem behaviour and social competence scales. Problem behaviour scales are: Aggressive Behaviours, Delinquency, Anxiety/Depression, Somatic Complaints, Attention Problems, Thought Problems and Social Withdrawal. In addition, there is a Sexual Problem Behaviour scale for children between 4 and 11 years old. It is also possible to derive two broader dimensions: Internalizing and Externalizing.

Behaviour Assessment System of Children (BASC)

The BASC (Reynolds & Kamphaus, 1992) is a multi-method, multidimensional assessment instrument aimed at evaluating the behaviours and self-perceptions of children aged 4 to 18 years old. Similar to the CBCL, it has several different versions: self-report, teacher rating scale, parent rating scale, student observation system and structured developmental history. The *Self-Report of Personality Scale* (6–18 years) is comprised of the following subscales: Anxiety, Attitude to School, Attitude to Teachers, Atypicality, Depression, Interpersonal Relations, Locus of Control, Relations with Parents, Self-Esteem, Self-Reliance, Sensation Seeking, Sense of Inadequacy, Social Stress, and Somatization. The *Teacher and Parent Rating Scales* (different forms for 4–5 years, 6–11 years, and 12–18 years) are comprised of the following subscales: Aggression, Conduct Problems, Attention Problems, Hyperactivity, Anxiety, Atypicality, Depression, Somatization, Withdrawal, Learning Problems, Leadership, Social Skills, Study Skills, Adaptability. The *Student Observation System* assesses a student's behaviour in the classroom such as inappropriate movement, inappropriate attention and work on school subjects.

Devereux Scales of Mental Disorders (DSMD)

The DSMD (Naglieri, Lebuffe & Pfeiffer, 1994) is designed to measure the risk for emotional and behavioural disorders in children between 5 and 18 years (5–12 years; 13–18 years). It relies on the DSM-IV, and has both teacher and parent forms. It includes scales to assess Problem Behaviours, Delinquency, Attention, Depression and Anxiety, Autism and Acute Problems. It provides three different composites: Internalizing, Externalizing and Critical Pathology.

Diagnostic Interview Schedule for Children – Child Interview (DISC-C)

The DISC-C (Costello, Edelbrock, Kalas, Kessler & Klaric, 1982) is a structured diagnostic interview that covers a broad range of DSM-IV diagnoses in children. Child, parent and teacher forms are available. Areas covered

include: Behaviour/Conduct Disorder, Attention Deficit Disorder, Affective/Neurotic Anxiety, Fears and Phobias, Obsessive-Compulsive Disorder, Schizoid/Psychotic Disorders, Affective (depression) Disorders.

Family Interaction Coding System (FICS)

The FICS (Reid, 1978) is an assessment instrument used to register interactions between family members. This coding system enables researchers and family therapists to monitor clinical cases, systematically assess the outcome of family intervention programmes, and builds a database for studying aggressive antisocial behaviours exhibited by children. It is composed of 29 categories, but the Total Aversive Behaviour score (such as physical negative, tease, noncompliance, destructiveness etc.) is mostly used (Reid, 1978).

Observation of Peer Interactions

This instrument (Dodge, 1983) is used to register interactions among peers between the ages of 5 to 8 years. It has five categories: solitary active, interactive play, verbalizations, physical contacts with peers, and interactions with adult leaders within the group. This system is associated with dimensions of social status (rejection, popularity), and therefore may be useful to obtain a more complete assessment of peer interactions.

ADULT ASSESSMENT

Albeit with some differences, antisocial disorders may correspond with the Antisocial Personality Disorder (APD) classification of DSM-IV and the Dissocial Personality Disorder classification of ICD-10. APD is characterized by criminal and antisocial behaviour, and also by deceitfulness, lack of remorse, disregard for the safety of others (DSM-IV: APA, 1994), low tolerance for frustration and a low threshold for discharge of aggression (ICD-10: WHO, 1993). The emphasis is placed on a failure to conform to social norms, and on impulsivity and irresponsibility. Although it was excluded from recent classifications of mental disorders, the assessment of Psychopathy in adults with antisocial disorders may be informative for differential diagnosis and treatment purposes. Psychopathy corresponds partially to the criteria of APD, but also includes emotional/interpersonal characteristics such as glibness, superficiality, egocentricity, grandiosity, lack of empathy, manipulativeness, and shallow emotions. When assessing antisocial disorders, it is also important to evaluate the co-occurrence of substance abuse, anxiety disorders and depression.

Instruments for Adult Assessment

As for children and adolescents, numerous instruments have been developed for the assessment of adult antisocial disorders. We have selected to present instruments that combine personality assessment (dimensional model) with classic diagnostic assessment (medical or categorical model), including interviews, checklists and questionnaires aimed at identifying the criteria for Antisocial Personality Disorders as presented in the DSM-IV and the ICD-10.

Eysenck Personality Questionnaire (EPQ-R)

The EPQ-R (Eysenck & Eysenck, 1993) is designed to measure the three traits of Eysenck's personality model: Extraversion (E), Neuroticism (N) and Psychoticism (P). This model links types, traits and behaviour into a hierarchical system. The P trait is the primary trait implicated in the development of antisocial behaviour, with elevations on E and N being secondary. In serious antisocial behaviour, the P trait has a primary role. When E is combined with high P, poor impulse control and a weakened association between behaviour and its consequences will exacerbate the P trait predisposition. Elevated E is more frequent among juvenile delinquents, and elevated N appears in adult criminals. The Eysenck Personality Inventory is also available in a form for adolescents.

Minnesota Multiphasic Personality Inventory – II (MMPI-II)

The MMPI-II (Butcher et al., 1989) is the most frequently used clinical test. It is the revised version of the MMPI. It was originally intended

for use with an adult population. The MMPI-II has 10 clinical scales, 3 validity scales and 15 content scales. The clinical scales are Hypochondriasis, Depression, Hysteria, Psychopathic Deviate, Masculinity–Femininity, Paranoia, Psychasthenia, Schizophrenia, Hypomania, and Social Introversion. The clinical scales do not discriminate clinical groups from normal groups, as the labels might suggest. Subjects who score high on specific scales show particular behaviours and tendencies. For example, subjects scoring high on the Psychopathic Deviate Scale show disregard for social custom, shallow emotions, and an inability to learn from experience. Content scales include internalizing symptoms (somatic disorder, strange beliefs and dysfunctional ways of thinking), aggressive tendencies (dysfunctional control of behaviour, cynicism), low self-esteem, family problems, work interference and negative treatment indicators. The content scales offer behavioural descriptions that are easier to interpret than the clinical scales.

The interpretation of subject profiles must be done by experienced clinicians. Recently, an adolescent version has been developed.

Antisocial Personality Questionnaire (APQ)

The APQ (Blackburn & Fawcett, 1999) is a recently developed, short, multi-trait, self-report inventory aimed at measuring intrapersonal and interpersonal aspects of emotional dysfunction, impulse control, deviant beliefs about the self and others, and interpersonal problem behaviours related to antisocial behaviours. It was derived from another instrument previously developed for mentally disordered offenders. It comprises the following measures: Self-Control, Self-Esteem, Avoidance, Paranoid Suspicion, Resentment, Aggression, Deviance and Extraversion. It is possible to derive two second-order scales: Hostile-Impulsivity and Social Withdrawal. These two scales reflect orientations towards others and the self, respectively.

Hare Psychopathy Checklist – Revised (PCL-R)

PCL-R (Hare, 1991) is a single construct rating scale that uses a semi-structured interview, case-history information and specific diagnostic criteria to provide a reliable and valid estimate of the degree to which an offender or forensic psychiatric patient matches the traditional (prototypical) conception of a psychopath. The PCL-R evaluates emotional and interpersonal characteristics of psychopathy and social deviance.

Millon Clinical Multiaxial Inventory II (MCMI-II)

The MCMI-II (Millon, 1994) is composed of 24 self-administered scales, and is designed to measure 14 personality styles, grouped into (a) Clinical Personality Patterns (schizoid, avoidant [depressive], dependent, histrionic, narcissistic, antisocial [sadistic], compulsive and negativistic [masochistic]) and (b) Severe Personality Pathology (schizotypal, borderline and paranoid). The instrument was developed to match the DSM-IV personality disorder classifications. It also comprises 10 scales measuring other clinical syndromes (such as anxiety, depression, drug-dependence and thought disorders). This instrument also has an adolescent version.

International Personality Disorder Examination (IPDE)

The IPDE (Loranger, Sartorius & Janca, 1996) is a semi-structured interview designed for the assessment of both DSM-IV and ICD-10 Personality Disorders (PD). The IPDE also combines the categorical and dimensional models. Questions are arranged in sections (e.g. background information, work, self, interpersonal relationships).

Other Clinical Interviews for DSM-IV

The most frequently used clinical interviews for the diagnosis of Antisocial Personality Disorder are:

- Structured Clinical Interview for DSM-IV (Scid II; First et al., 1997)

  The SCID II is a semi-structured diagnostic interview organized by disorder which includes all DSM-IV personality disorders. A computerized administration and scoring program is available.

- Structured Interview for DSM-IV (SIDP-IV) Personality Disorder (Pfohl, Blum & Zimmerman, 1995)

  The SIDP-IV consists of 160 questions grouped under 16 thematic sections, such as relationships, emotions and reactions to stressful situations. Questions are asked regarding behaviours in the last five years.

FUTURE PERSPECTIVES AND CONCLUSIONS

The assessment and diagnosis of antisocial disorders should be done by experienced mental health professionals. The assessment process should include multiple methods and informants, and use standardized instruments or structured diagnostic interviews, including complete information related to the ecology of the individual (family and social context) and individual functioning.

Based on the most relevant clinical research in the area of antisociality, we may conclude that in the future the assessment must focus more on both dysfunction and skills and try to integrate the two models, dimensional and categorical, in order to better direct the diagnostic process (screening, identification and placement for intervention).

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RELATED ENTRIES

APPLIED FIELDS: CLINICAL, DANGEROUS/VIOLENCE POTENTIAL BEHAVIOUR, CLASSIFICATION

ANXIETY ASSESSMENT

INTRODUCTION

The first assessment of individual differences is reported in the Bible in the Book of Judges, Chapter 7 on Gideon. God asked Gideon, who was battling the Midianites, to thin out his troops by rejecting individuals who were both fearful and afraid of battle. However, too many men were left, so God instructed Gideon to lead his men down to the water and used the following selection procedure. Out of 10,000 persons, 300 lapped with water from their hands, with their tongues. They were selected. The ones who knelt to drink were not.

This entry will focus on the assessment of anxiety as an individual differences variable; the dimensional conceptualization of anxiety. Dimensionality arises from a personality psychology tradition, in which traits and behaviours are measured psychometrically. Traits are viewed as existing on a continuum, with low levels of a trait (e.g. anxiety) at one end and high levels of the trait at the opposite end of the same continuum. In contrast to the dimensional approach is the typological or categorical conceptualization of anxiety, consistent with the medical model (Endler & Kocovski, 2001). Another entry in this encyclopedia covers the assessment of anxiety disorders.

Definition of Anxiety

Anxiety has been conceptualized as a stimulus, as a trait, as a motive, and as a drive and has been defined 'as an emotional state, with the subjectively experienced quality of fear as a closely related emotion' (Lewis, 1970: 77). Lewis notes that the emotion is unpleasant, future-oriented, disproportional to the threat and includes both subjective and manifest bodily disturbances. There are physiological, cognitive, and behavioural components to anxiety. These give rise to the various methods of the assessment of anxiety. It is important to first distinguish between state anxiety and trait anxiety.

State vs. Trait Anxiety

State anxiety is the momentary experience of anxiety. Trait anxiety is a predisposition or proneness to be anxious. The distinction between state and trait anxiety was first suggested by Cicero (Before the Common Era). Spielberger (1983) suggested that conceptual clarity could be achieved in the anxiety literature by distinguishing between state and trait anxiety. There are various methods to assess state anxiety. The assessment of trait anxiety has been conducted primarily through the use of self-report measures.

Multidimensionality of State and Trait Anxiety

Trait anxiety and state anxiety are both multidimensional constructs (Endler, 1997; Endler, Edwards & Vitelli, 1991). There are at least six facets of trait anxiety: social evaluation, physical danger, ambiguous, self-disclosure, separation and daily routines; and two facets of state anxiety: cognitive-worry and autonomic emotional (Endler & Flett, 2001). These facets of state and trait anxiety are presented in Table 1.

Interaction Model of Anxiety

The distinction between state and trait anxiety has achieved wide recognition in the interaction

Table 1. Anxiety assessment techniques

Anxiety	Assessment Technique
State anxiety	Self-report
	Behavioural
	Cognitive
	Physiological
Trait anxiety	Self-report

model of anxiety, a subset of the interaction model of personality (Endler, 1997). According to the interaction model, increases in state anxiety will result only when a situational stressor is congruent with the facet of trait anxiety under investigation. Over 80% of the tests of the multidimensional interaction model of anxiety have yielded support for the model (Endler, 1997).

Assessment Techniques

The use of questionnaire measures has been the primary assessment technique for trait anxiety. There are multiple techniques that can be used for the assessment of state anxiety. The assessment techniques are shown in Table 1 and include self-report, behavioural, cognitive, and physiological measures. The most comprehensive method of assessing state anxiety is through a combination of the available techniques as there are individual differences in the experience of anxiety.

SELF-REPORT MEASURES

The majority of research in the area of personality is based on self-report measures, despite the fact that personality theory also refers to observable behaviours. Self-report questionnaires have the following advantages: they are easy to administer, results are easy to analyse, results can be compared to normative data, and results can be subjected to factor analytic techniques (as well as other advanced statistical techniques).

Commonly used self-report measures are presented in Table 2. One of the first self-report anxiety measures is the Taylor Manifest Anxiety Scale (Taylor, 1953). Since then, numerous other scales have been developed. One commonly used self-report measure of anxiety is the State–Trait Anxiety Inventory (STAI; Spielberger, 1983). The STAI assesses both state and trait anxiety as unidimensional constructs. The state and the trait scales consist of 20 items each. These scales have been shown to have high internal consistency (approximately 0.90 for both the state and trait scales) and test–retest validity for the trait scale (Spielberger, 1983).

The Endler Multidimensional Anxiety Scales (EMAS) assess both state anxiety and trait anxiety as multidimensional constructs and assess the perception of the situation (Endler, Edwards & Vitelli, 1991). Cognitive-worry and autonomic-emotional are the two components of state anxiety assessed by the EMAS-State

Table 2. Self-report measures of anxiety

Name of scale	Author/year	Psychometric properties
Anxiety Sensitivity Index	Reiss et al. (1986)	Alpha reliability = 0.88; test–retest reliability ranges from 0.75 to 0.85 (2 week interval)
Beck Anxiety Inventory	Beck et al. (1988)	Alpha reliability = 0.92; test–retest reliability = 0.75 (1 week interval)
Endler Multidimensional Anxiety Scales (EMAS)	Endler et al. (1991)	Alpha reliabilities range from 0.89 to 0.95; test–retest reliabilities for the trait scales range from 0.60 to 0.79 (2 week interval)
EMAS–Social Anxiety Scales (EMAS-SAS)	Endler & Flett (2001)	Alpha reliabilities range from 0.92 to 0.93; test–retest reliabilities range from 0.69 to 0.77 (1 week interval)
State–Trait Anxiety Inventory (STAI)	Spielberger (1983)	Alpha reliabilities range from 0.91 to 0.93; test–retest reliabilities range from 0.71 to 0.75 for the trait scale (30 day interval)
Taylor Manifest Anxiety Scale	Taylor (1953)	Test–retest reliability = 0.88 (4 week interval)

measure (20 items in total). The EMAS-Trait measures assess a predisposition to experience anxiety in the following four situational domains (15 items each): social evaluation, physical danger, ambiguous, and daily routines. Recent research has resulted in the addition of the following two situational domains: self-disclosure (to family or to friends) and separation anxiety (Endler & Flett, 2001). The alpha reliabilities of these measures have been found to be highly acceptable (ranging from 0.89 to 0.95; Endler et al., 1991). Numerous studies have been conducted which have found support for the validity of the EMAS-State, Trait, and Perception scales (Endler et al., 1991; see Endler, 1997 for a review).

Another self-report instrument commonly used to assess anxiety is the Beck Anxiety Inventory (BAI; Beck, Epstein, Brown & Steer, 1988). The BAI consists of 21 items representing two factors: somatic symptoms and subjective anxiety symptoms. It has been shown to have a high internal consistency (alpha = 0.92). A weakness is that the BAI does not distinguish between state and trait anxiety. Respondents are asked to report the degree to which they have been bothered by the symptoms assessed over the past week. The BAI is primarily used in clinical settings. Finally, the Anxiety Sensitivity Index consists of 16 items and assesses the fear of experiencing anxiety (Reiss, Peterson, Gursky & McNally, 1986).

BEHAVIOURAL MEASURES

Another anxiety assessment technique is the measurement of various behaviours. The presence and frequency of certain behaviours are rated by others (e.g. clinicians, experimenters). A review of ratings by others for the purposes of clinical evaluation is beyond the scope of this entry. The behaviours used to represent an indication of the level of anxiety an individual is experiencing depend upon the situational domain. For example, behavioural measures of social anxiety include measurement of the maintenance of eye contact, the number of conversations initiated or amount spoken during a social encounter, hand tremors, and fidgeting (Leary, 1986). Not all of these behavioural measures are relevant for other situational domains.

Types of interaction used in behavioural observation can be classified as either artificial (i.e. a role-play situation) or naturalistic (i.e. *in vivo* observation; Glass & Arnkoff, 1989). Behaviours are often recorded in role-play situations due to the impracticality of rating people in naturalistic environments. Even within the naturalistic category, waiting-room type interactions are often used (especially for the assessment of social anxiety).

Behavioural observation techniques are less subjective on the part of the examinee than the use of self-report measures. However, the presence of the examiner in an evaluative role may affect the level of anxiety, and additionally, the examiner is responsible for determining whether the examinee's actual behaviour constitutes the behaviour being assessed. Furthermore, in an interaction type behavioural observation assessment, the behaviour of the partner (or confederate) may represent a confound. The partner may respond differently to different participants depending on variables such as the social skill level of the participant (Glass & Arnkoff, 1989). Despite these criticisms, behavioural assessment techniques for performance situations have been shown to be highly reliable.

COGNITIVE MEASURES

Anxiety also has a cognitive component. Cognitive measures examine the thoughts an individual has. This can be done through thought-listing procedures (Cacioppo & Petty, 1981) or via a questionnaire approach. Thought-listing techniques ask participants to record thoughts in paper and pencil format while they are in an anxious situation (Cacioppo & Petty, 1981). Participants are asked not to concern themselves with spelling or grammar and not to edit the thoughts as they arise. The list of thoughts is then analysed according to such indices as content or frequency. Variations of this technique include: (i) having participants state their thoughts aloud rather than recording them and (ii) having participants watch a video of their performance and state their thoughts during the viewing.

PHYSIOLOGICAL MEASURES

Anxiety has a physiological component, which is largely determined by the septo-hippocampal

system (behavioural inhibition system; Gray & McNaughton, 1996), thus allowing for the assessment of anxiety through physiological means. Among the physiological measures are the measurement of heart rate, electrodermal activity, and respiration. Additionally, blushing, assessed with a photoplethysomograph, has been used to assess social anxiety. The different physiological measures do not, however, correlate well with one another or with self-report measures (Leary, 1986).

Heart Rate

Heart rate is the most commonly used physiological measure of anxiety. It is assessed either via electrodes (which can be attached to the patient's skin to the right and left of the sternum) or via sensors. The unit of measurement typically used is the number of beats per minute. This can be determined by (i) counting the number of beats per minute or, alternatively, (ii) using equipment to determine the length of the interval between heart beats and then calculating beats per minute based on that figure. These two approaches typically yield different results; however, both are used in the assessment of heart rate as an indicator of state anxiety. Heart rate has been found to be strongly correlated with self-report state anxiety in a competitive sports situation and moderately correlated with self-report state anxiety (and one item in particular which assesses heart rate) in a performance anxiety situation (Kantor, Endler, Heslegrave & Kocovski, 2001).

Finger Pulse Volume

Finger pulse volume is a measure of digital vasoconstriction (Bloom & Trautt, 1977). The use of finger pulse volume to assess anxiety is based on the premise that one of the responses of the sympathetic nervous system is decreased blood flow to peripheral areas of the body. Finger pulse volume has been shown to be a valid physiological measure in social-evaluation situations.

Electrodermal Activity

Another physiological measure of anxiety is sweat gland activity. The eccrine sweat glands are innervated by the sympathetic nervous system and are located throughout the surface of the body. The primary concentration of eccrine sweat glands is in the palms of the hands and the soles of the feet. Changes in the degree of sweat gland activity can be a result of state anxiety; however, there are other variables that also play a role. For example, room temperature affects the activity of the eccrine glands, as do person variables (e.g. gender). There are, therefore, numerous variables that can affect the internal validity of a study that uses sweat gland activity as an indication of anxiety as the dependent variable. These need to be considered both in research studies and in the assessment of an individual.

Clements and Turpin (1996) assessed the sweat gland activity of participants while giving a presentation and while being a member of the audience. Sweat gland activity was found to increase prior to and during the presentation and decrease upon completion of the presentation. Levels of state anxiety were also found to be elevated during the presentation. There was, however, no relationship found between the physiological measure (sweat gland activity) and each of state and trait anxiety.

Respiration

Respiration rate can also be used as a tool in the assessment of anxiety. To measure respiration rate, a stretchable device attached to equipment capable of measuring strain is placed around the chest and the abdomen. Respiration rate has been shown to be positively related to self-reported anxiety.

Correlations among the various physiological measures of anxiety are generally found to be low. There are many factors that can account for this difference, including individual differences in the experience of anxiety and temporal factors. For example, Bloom and Trautt (1977) found that, initially, participants were more anxious according to the finger pulse volume measure. However, according to heart rate, participants were more anxious later on. This provides support for the view that any measure of anxiety should be used along with other measures of anxiety. Various psychological, behavioural, and physiological processes are involved in the experience of anxiety and there are individual differences.

FUTURE PERSPECTIVES AND CONCLUSIONS

1 Most of the research has used self-report measures. Additional research can further investigate the reliability and validity of the various techniques in the assessment of anxiety.
2 Considerably more research has been conducted on the assessment of anxiety in the social evaluation situational domain (e.g. presentation situations, interaction situations) compared to other areas. This is especially the case with respect to the use of behavioural observation, cognitive measures, and physiological measures.
3 Future research can focus on the use of these techniques for the assessment of anxiety in situations other than social evaluation situations (i.e. physical danger situations, self-disclosure situations, separation situations, and ambiguous situations).
4 There are various techniques to assess state anxiety, the momentary experience of anxiety. Included among these are self-report instruments, behavioural observation methods, cognitive assessment techniques and physiological measures.
5 Trait anxiety, the predisposition to be anxious in different situations, is assessed through self-report instruments.
6 The reliability and validity of some techniques have been demonstrated to be higher than for other techniques.
7 There are individual differences in the qualitative experience of anxiety. It is therefore important to use diverse sets of assessment techniques that tap at the various facets of anxiety.
8 Self-report measures may be the most convenient method of anxiety assessment in terms of the time required for administration, the cost of administration, and data analyses. However, other factors (i.e. the validity of the assessment) are also important to consider.

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RELATED ENTRIES

Personality Assessment (General), Emotions, Anxiety Disorders Assessment, Test Anxiety, Multimodal Assessment, Applied Fields: Clinical, Applied Fields: Health, Trait–State Models

ANXIETY DISORDERS ASSESSMENT

INTRODUCTION

Anxiety is one of the most common and universal emotions. This emotional reaction to the perception of threatening or dangerous stimuli occurs throughout an individual's lifetime. In fact, anxiety elicited by stimuli or situations such as animals, physical danger and separation is an early biological acquisition, whose function is to protect the child from potential dangers. In this sense, anxiety is undoubtedly of value in relation to the preservation of the human being.

The conceptualization of anxiety has varied considerably over recent decades. On the one hand, critics of the unidimensional view of anxiety have proposed a new multidimensional approach. From this perspective, anxiety is a combination of responses, including cognitive, physiological and behavioural (motor) reactions. These responses are provoked by identifiable cognitive-subjective, physiological or environmental stimuli. In spite of the lack of an accurate explanation of the contents of each system, and there being some discrepancies among authors on what might be understood by the responses of the cognitive system or, to a lesser extent, those of the physiological system (Cone & Hawkins, 1977; Fernández-Ballesteros, 1983), this classification of the different anxiety responses in three systems is widely accepted and used.

In addition, since the seminal works of Cattell or Spielberger in the 1960s, the differentiation between state and trait anxiety has become a classic one. State anxiety is conceptualized as a transitory emotional reaction to the individual's perception of a threatening or dangerous situation, while trait anxiety is defined as a relatively stable tendency to interpret situations as threatening or dangerous, and to react to them with anxiety. Recent works by Endler and his co-workers propose a multidimensional nature for trait anxiety, highlighting the existence of different facets (social evaluation, physical danger, etc.) closely related to specific situational areas.

With the aim of integrating the above-mentioned aspects, anxiety must be considered as an emotional response, or pattern of responses, that includes unpleasant cognitive aspects, physiological aspects characterized by high arousal of the Autonomous Nervous System, and inaccurate and less adaptive motor or behavioural reactions. The anxiety response may be provoked both by situational external and internal stimuli such as thoughts, ideas, images, etc., perceived by the individual as threatening or dangerous. Such anxiety-eliciting stimuli (external or internal) will be mainly determined by the subject's characteristics; thus, there are remarkable individual differences in relation to the tendency to manifest anxiety reactions in different situations (Miguel-Tobal, 1990).

ANXIETY AS DISORDER

Up to now, we have considered anxiety as a normal emotional response of an individual to different situations or circumstances. However, when its frequency, intensity and duration are excessive, producing serious limitations in different facets of individuals' lives and reducing their ability to adapt to the environment, we must talk about pathological anxiety.

Anxiety is closely related to anxiety disorders, depression, disorders traditionally labelled as neurotic, many psychotic disorders, and a wide

variety of psychophysiological problems such as cardiovascular disorders, peptic ulcers, headaches, premenstrual syndrome, asthma, skin disorders, and so on. It is also involved in sexual disorders, addictive behaviour and eating disorders; more recently, there are findings that relate anxiety to weakness of the immune system.

Due to the wide variety of problems in which this emotion plays an important role, anxiety must be considered a central aspect of psychopathology and health psychology. In fact, thousands of persons with anxiety problems seek attention in hospitals, health centres, etc., and this results in an important economic cost to public health services.

Anxiety Disorders

Anxiety disorders constitute the most common psychopathology, followed by affective disorders and drugs and alcohol consumption. The life-prevalence rate accounts for 19.5% of females and 8% of males (Robins, Helzer & Weissman, 1984).

The classifications of anxiety disorders have varied over recent years. The most widely used are the ICD-10 (World Health Organization, 1992), the DSM-IV (American Psychiatric Association, 1994) and the DSM-IV-TR (American Psychiatric Association, 2000). The DSM-IV and DSM-IV-TR will be used as reference sources, and are shown in Table 1.

Table 1. DSM-IV–DSM-IV-TR classification

Codes	Anxiety Disorders
300.01	Panic disorder without agoraphobia
300.21	Panic disorder with agoraphobia
300.22	Agoraphobia without history of panic disorder
300.29	Specific phobia
300.23	Social phobia (Social Anxiety Disorder, added in DSM-IV-TR)
300.3	Obsessive-compulsive disorder
309.81	Post-traumatic stress disorder
308.3	Acute stress disorder
300.02	Generalized anxiety disorder (includes overanxious disorder of childhood in DSM-IV-TR)
293.84	Anxiety due to a medical condition
Variable	Substance-induced anxiety disorder
300.00	Anxiety disorder not otherwise specified

Anxiety Disorders Assessment

Changes in the theoretical frameworks of anxiety research that occurred in the late 1960s have not been accurately reflected in assessment procedures which are instruments, especially for self-report measures, the most widely used. This has impeded the consolidation of a systematic research line focused on different aspects of anxiety in several anxiety disorders.

The works of Lacey (1967) and Lang (1968) proposed the multidimensional nature of anxiety responses and the existence of three relatively independent response systems (cognitive, physiological, and motor responses), while the interactive model (Endler, 1973) stressed the multidimensionality of trait anxiety (Endler & Magnusson, 1974, 1976). Finally, the discovery of individual differences in relation to the tendency to experience anxiety in some situations, but not in others, led to theoretical advances that have not yet been sufficiently applied in research on anxiety disorders.

With the aim of including all of these theoretical advances in an assessment instrument, we developed the *Inventory of Situations and Responses of Anxiety* (ISRA, Miguel-Tobal & Cano Vindel, 1986, 1988, 1994). The ISRA is a self-report instrument for a multidimensional and interactive assessment of anxiety that permits the evaluation of the three response systems (cognitive, physiological and motor responses), trait anxiety, and four situational areas or specific traits (test anxiety, interpersonal anxiety, phobic anxiety and daily life anxiety).

Several studies have explored differential anxiety characteristics, in both anxiety disorders and psychophysiological disorders, through the ISRA. Such studies indicate that there are characteristic profiles in different pathologies that can be relevant in both the research and clinical practice contexts (see Miguel-Tobal & Cano Vindel, 1995).

INSTRUMENTS AND PROCEDURES

A large number of procedures and instruments have been used for the assessment of anxiety,

including self-reports, physiological procedures and behavioural methods. More information on this issue can be found in Endler and Kocovski's entry 'Anxiety Assessment' in this same volume. Here we shall focus especially on the instruments developed for the assessment of different anxiety disorders. It should be noted that procedures for the assessment of general anxiety are also commonly used in clinical practice.

Broad Screening

Several structured interviews have been used in order to determine the onset of an anxiety disorder or to make a more accurate diagnosis. Two good examples are the *Anxiety Disorder Interview Schedule – Revised* (Di Nardo et al., 1985), and the *Structured Clinical Interview for DSM-IV Axis I disorders* (Spitzer, Gibbon & Williams, 1996).

With regard to specific disorders, some widely used instruments and procedures are:

Panic Disorder Assessment

The most widely used self-report instrument for the assessment of panic attacks is the *Panic Attack Questionnaire* (PAQ, Norton, 1988).

Agoraphobia Assessment

In the assessment of agoraphobia, both self-reports and behavioural measures have been used. Among self-reports, the *Agoraphobic Cognitions Questionnaire* (ACQ), along with its companion measure, the *Body Sensations Questionnaire* (BSQ), were devised to assess 'fear of fear' (Chambless, Caputo, Bright & Gallagher, 1984). Among behavioural measures, there are two kinds of devices: one type that measures avoidance behaviours, an example of which is the *Individualized Behavioural Avoidance Test* (IBAT, Agras, Leitenberg & Barlow, 1968), and another type for measuring the time and distance walked away from a 'safe' place as a cue for the intensity of agoraphobic reactions (see Emmelkamp, 1982). It should be noted that assessment instruments designed for phobia, social phobia, and panic attacks are also used in the evaluation of agoraphobia.

Specific Phobia Assessment

The most frequently used instruments are self-reports, such as the *Fear Survey Schedule I* (Lang & Lazovik, 1963) and *Fear Survey Schedule III* (Wolpe & Lang, 1964), for measuring the type and intensity of irrational fears and fear-eliciting stimuli. Also used are behavioural avoidance measures, such as the *Behavioural Avoidance Test* (Lang & Lazovik, 1963) and the *Behavioural Avoidance Slide Test* (Burchardt & Levis, 1977). It should be noted that some of these instruments are also used for the assessment of social phobia and agoraphobia.

Social Phobia Assessment

The *Social Avoidance and Distress Scale* (SADS), the *Fear of Negative Evaluation Scale* (FNE, Watson & Friend, 1969), the *Suinn Test Anxiety Behaviour Scale* (STABS, Suinn, 1969) and the *Social Reaction Inventory – Revised* (SRI-R, Curran, Corriveau, Monti & Hagerman, 1980) are used for assessing social skills, while the *Social Phobia and Anxiety Inventory* (SPAI, Turner, Beidel, Dancu & Stanley, 1989) is also employed. Among behavioural measures, the *Social Interaction Test* (SIT, Trower, Bryant & Argyle, 1978) is designed for measuring social skills in a test anxiety-provoking situation by means of role-play procedures.

Obsessive-Compulsive Disorder Assessment

The most important self-report measures used are the *Leyton Obsessional Inventory* (LOI, Cooper, 1970), the *Compulsive Activity Checklist* (CAC, Philpott, 1975) and the *Maudsley Obsessional-Compulsive Inventory* (MOCI, Hodgson & Rachman, 1977).

Post-Traumatic Stress Disorder Assessment

There are several methods for the assessment of PTSD disorder, including clinical interviews, self-report instruments and psychophysiological measures. For the purpose of this entry we consider general-oriented instruments rather than special populations-oriented ones (combat

survivors, rape victims, etc.), except for psychophysiological measures. Two good examples of clinical interviews are the *Clinical-Administered PTSD Scale* (CAPS-1, Blake, Weathers, Nagy, Kaloupek, Klauminzer, Charney & Keane, 1990), and the *PTSD Symptom Scale Interview* (PSS-I, Foa, Riggs, Dancu & Rothbaum, 1993). Two other good examples of self-report instruments are the *Revised Impact of Events Scale* (RIES, Horowitz, Wilner & Alvarez, 1979), and the *PTSD Diagnostic Scale* (PDS, Foa, 1995). Finally, data from laboratory studies provide evidence that psychophysiological measurement is a valuable tool in the assessment of PTSD. Studies with combat populations reveal that *cardiovascular measures* (heart rate and blood pressure) have generally shown good specificity and sensitivity in PTSD classification (see Lating & Everly, 1995; Miguel-Tobal, González Ordi & López Ortega, 2000).

Generalized Anxiety Disorder (GAD) Assessment

Given the lack of specificity of GAD general anxiety assessment instruments, including the *State–Trait Anxiety Inventory* (STAI, Spielberger, Gorsuch & Lushene, 1970), the *Beck Anxiety Inventory* (BAI, Beck, Epstein, Brown & Steer, 1988), the *Anxiety Sensitivity Index* (ASI, Reiss, Peterson, Gursky & McNally, 1986), the *Endler Multidimensional Anxiety Scales* (EMAS, Endler, Edwards & Vitelli, 1991) and, in Spain, the *Inventory of Situations and Responses of Anxiety* (ISRA, Miguel-Tobal & Cano Vindel, 1986, 1988, 1994), have been used for its evaluation.

As can be seen, there are very few references to physiological measures in this review since, though commonly used in clinical research, they have not generally shown enough specificity to discriminate between different anxiety disorders, except, as mentioned earlier, in the case of PTSD.

Finally, we should stress the appropriateness of using multiple instruments that allow the assessment of general anxiety on the one hand and the evaluation of a specific disorder or disorders on the other. Clinical practice reveals that it is hard to find a pure disorder, since, as Wittchen (1987) points out, the comorbidity rate for anxiety disorders is 68%: in other words, two out of every three patients also present another anxiety disorder.

FUTURE PERSPECTIVES AND CONCLUSIONS

Anxiety disorder assessment has mainly been carried out using self-reports, and to a lesser extent behavioural measures. Physiological measures do not provide sufficient specificity to delimit or evaluate specific disorders; however, there is a promising line of research in relation to PTSD.

In addition to this lack of specificity with regard to anxiety disorders, due to the overlapping of their symptoms, it is also important to consider the problem of their high comorbidity (68% for anxiety disorders and 50% for depression). Taking these aspects into account, it is necessary to carry out a wide-spectrum assessment that includes general anxiety measures, specific disorder measures and measures of depression.

Theoretical advances in the study of anxiety and research on measurement procedures have fostered the multisystem–multimethod assessment, but such advances have been weakly reflected in anxiety disorder assessment research, and have had even less impact on clinical practice. This is one of the challenges for the future, which it is to be hoped will see the development of new multidimensional instruments through the integration of data derived from self-reports, physiological records and behavioural measures.

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RELATED ENTRIES

Applied Fields: Clinical, Anxiety Assessment, Emotions, Test Anxiety, Applied Fields: Health, Classification

APPLIED BEHAVIOURAL ANALYSIS

INTRODUCTION

Applied behaviour analysis is a branch of science in which procedures derived from the principles of behaviour are systematically applied to improve socially meaningful behaviour that could be rigorously defined and objectively detected and measured (Cooper et al., 1987). As pointed out by Moore (1999), behaviour analysis has developed three components, as well as a philosophy of science: (1) the *experimental analysis of behaviour*, the basic science of behaviour, (2) *applied behaviour analysis*, the systematic application of behavioural technology, and (3) the *conceptual analysis of behaviour*, the philosophical analysis of the subject matter of behaviour analysis. The philosophy of science that guides behaviour analysis is called *radical behaviourism*. Even though the link between the experimental and applied component of behaviour analysis is not as united as it should be, bridges are being built between basic and applied work, such as the work being conducted in the areas of establishing fluency and building momentum (Mace, 1996). The impact of bridge studies has been especially pronounced in functional analysis methodologies on aberrant behaviour (Wacker, 2000). This entry will focus on important aspects of functional assessment.

CHARACTERISTICS AND AREAS OF INTEREST

Baer, Wolf, and Risley (1968) list seven defining characteristics of applied behaviour analysis: behaviour or stimuli studied are selected because of their significance to society rather than their importance to theory (*applied*). The behaviour chosen must be the behaviour in need of improvement and it must be measurable (*behavioural*). It requires a demonstration of the events that can be responsible for the occurrence or non-occurrence of that behaviour (*analytic*). The interventions must be completely identified and described (*technological*). The procedure for behaviour change is described in terms of the relevant principles from which they are derived (*conceptual systems*). The behavioural techniques must produce significant effects for practical value (*effective*). The behavioural change must be stable over time, appear consistently across situations, or spread to untrained responses (*generality*).

The writings of B. F. Skinner have inspired behaviour analysts to develop basic concepts of reciprocal behaviour–environment interactions. Over fifty years of research and application have shown the usefulness of these basic concepts in understanding many forms of behaviour, as well as in guiding effective

behaviour-change strategies. The knowledge of *stimulus control* (when the presentation of a stimulus changes some measures of behaviour) and *reinforcement* (the process by which the frequency of an operant [class of responses] is increased) has been useful in the analysis and treatment of human behaviour problems, as well as creating novel behaviour since the inception of applied behaviour analysis. Applied behaviour analysis has played a prominent role in the treatment of individuals with autism and/or developmental disabilities. Though, the areas of interest have been expanding, e.g. school settings, treatment of habit disorders, paediatrics, troubled adolescent runaways, brain-injury rehabilitation, behavioural psychotherapy, organizational management, performance analysis, consultation, sport psychology, college teaching, and behavioural medicine (e.g. Austin and Carr, 2000).

ASSESSMENT

The role of assessment in applied behaviour analysis has been described as the process of identifying a problem and identifying how to alter it for the better. Furthermore, it involves selecting and defining the behaviour (target behaviour) to be changed. Two questions have been essential in behavioural assessment: '(a) What types of assessment methodologies provide reliable and valid data about behavioural function, and how can they be adapted for use in a particular situation? and (b) How might the results of such assessments improve the design and selection of treatment procedures?' (Neef & Iwata, 1994: 211). As we shall examine further, behaviour is assumed to be a function of current environmental conditions – antecedent and consequent stimuli – and it is predicted to be stable as long as the specific environmental conditions remain stable. On the contrary, traditional approaches or non-behavioural therapies assume that the behaviour is a function of enduring, underlying mental states or personal variables. One premise is that the client's verbal behaviour (what people talk about, what they do and why they do it) is considered important because it is believed to be reflective of a person's inner state and the mental processes that govern a person's behaviour (Cooper et al., 1987). This is quite different from a behaviour analytic view where a distinction is made between what people say they do and what they do (Skinner, 1953), and the focus is on behaviour for its own sake.

Function versus Structure

Behaviour could be classified either structurally or functionally. When we talk about a structural approach, behaviour is classified or analysed in terms of its form. For example within developmental psychology, the structural approach is a prominent approach in which researchers investigate what children do at specific stages of development, e.g. the behaviour is studied to draw inferences about cognitive abilities and so-called hypothetical structures, as object permanence or Piagetian schemes. In behaviour analysis, the topography or structure of a response is determined by the contingencies of this behaviour. Instead of inferring such cognitive abilities, the researchers consider the history of reinforcement to be responsible for the child's capability (Pierce & Epling, 1999). Structural approaches to assessment are exemplified by diagnostic, personality and psychodynamic approaches to human behaviour, while functional explanations focus on the relationships between what happens to the organism (i.e. stimuli) and the behaviour of the organism (responses) (Sturmey, 1996). The controversy between functional and structural approach is quite similar to debate in biology on the separation of physiology and anatomy, and also to Skinner's treatment of verbal behaviour (function; without regard to modality [vocal, gestures etc.], the field of verbal behaviour is concerned with the behaviour of individuals and the functional units of their verbal behaviour function) versus language (structure; the consistencies of vocabulary and grammar) (Catania, 1998).

Functional Assessment

Early in the development of behaviour analysis, Skinner (1938) argued that behaviour did not take place in a vacuum and a response must have a function. Empirical demonstrations of 'cause–effect relationships' between environment and behaviour have been rendered possible by functional analysis (Skinner, 1953). Since then comprehensive methods to systematically

assess particular functions of different types of behaviour have been developed, and functional assessment is one of the most intense research areas in our field (see for example Iwata et al., 2000; Repp & Horner, 1999).

Functional assessment is an umbrella term and encompasses: (1) indirect assessments, which are characterized by interviews and questionnaires and behavioural functions. They are based on subjective verbal reports in absence of direct observation. Two recognized indirect methods are the *Motivation Assessment Scale* (Durand & Crimmins, 1988) and the *Motivation Analysis Rating Scale* (Wieseler et al., 1985); (2) descriptive assessments involve no manipulation of relevant variables and are based on direct observation, e.g. the antecedent–behaviour–consequence assessment (ABC) or scatter plot assessment; (3) functional experimental analyses or analogue functional assessment involve manipulation of suspected maintaining variables using experimental methodology to demonstrate control over responding (Desrochers et al., 1997). The first two approaches are approximations compared to the third because they do not elucidate functional relationships, and both are characteristically non-experimental. Furthermore, the functional experimental analysis is most effective in identifying the function of problem behaviour (Carr et al., 1999).

Experimental Functional Analysis or Analogue Functional Assessment

Since the prominent publication by Iwata et al. (1982) there has been a remarkable increase of publications concerning experimental functional analysis (see *Journal of Applied Behaviour Analysis*). Experimental functional analysis represents a simulation of the natural environment and will be the primary tool for demonstrating causal relationships (Carr et al., 1999). Experimental functional analysis methodologies can be used to identify: (1) antecedent conditions (setting events, establishing operations and/or discriminative stimuli) under which behaviour occurs, and these conditions may then be altered so that problem behaviours are less likely, (2) reinforcement contingencies that must be changed, (3) whether the same reinforcer that currently maintains the behaviour problem may be used in establishing and strengthening alternative behaviours, and (4) those reinforcers and/or treatment components that are relevant (Iwata et al., 2000).

Results from the research on functional analysis methodologies have shown that functional analyses are effective in identifying environmental determinants of self-injurious behaviour (SIB), and subsequently, in guiding the process of treatment selection (Iwata et al., 1994). Furthermore, results have shown that the growing use of functional assessment based interventions have increased the number of studies using non-aversive procedures (Carr et al., 2000).

Recording Techniques

In applied behaviour analysis it is important to demonstrate that a particular intervention has been responsible for a particular behaviour change. Therefore, measurement is very important with respect to designing successful interventions and evaluating treatment changes. Automatic recording, permanent products, and direct observational recording are procedures used for measuring and recording behaviour. Direct observational recording include frequency or event, duration, or latency recording, and the recording could either be continuous, time sampling or interval (Cooper et al., 1987). Objectivity, clarity and completeness have been set forth as three criteria of an adequate response definition (Kazdin, 1982).

Experimental Designs

In experimental functional analyses various experimental designs have been used to rule out the possibility that changes in extraneous variable(s) other than in the independent variable could be responsible for the change in dependent variable, e.g. eliminating rival explanations. Thus, these experimental designs have been used to study the functional relationships between environmental changes and changes in target behaviour. Typical experimental design N=1 designs (within-subject manipulation, single-case research design) have been used in applied behaviour analysis, and the designs have been categorized as ABAB designs, multiple baseline designs, multiple treatment designs and changing criterion designs (Kazdin, 1982). The multi-element design (multiple treatment designs) has

typically been used in experimental functional analysis (e.g. Iwata et al., 1982).

In single-case research, replication, either direct or systematic, is crucial for evaluating generality of intervention effects across subjects. The term direct replication has been used when the same procedures have been used across a number of different subjects, while systematic replication indicate that features (e.g. types of subjects, intervention, target behaviour) of the original experiment vary. By replicating in this way, knowledge will be accumulated, and behaviourists will be pyramid builders.

FUTURE PERSPECTIVES AND CONCLUSIONS

Different aspects regarding behavioural assessment as indirect assessment, descriptive assessment and experimental functional analysis have been discussed. Extension and refinement of behavioural assessment and functional analysis technologies will, hopefully, provide for even more effective methods in establishing behaviour and treating maladaptive behaviour. In addition, the advancement of computer technology allows for more simplified assessment techniques. Until now functional assessment technologies have primarily focused on non-compliance and self-injurious and aggressive behaviour in persons with disabilities and autism, but advancements in these procedures will include their applications on other types of behaviour and a larger diversity of problem behaviour in populations other than persons with autism and disabilities.

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RELATED ENTRIES

Behavioural Assessment Techniques, Observational Methods (General), Observational Techniques in Clinical Settings, Theoretical Perspective: Behavioural

Erik Arntzen

APPLIED FIELDS: CLINICAL

INTRODUCTION

Psychological assessment is utilized in clinical psychology primarily for purposes of differential diagnosis, treatment planning, and outcome evaluation. Differential diagnosis involves drawing on assessment information to describe an individual's psychological characteristics and adaptive strengths and weaknesses. These descriptions provide a basis for determining (a) what type of disorder an individual may have, (b) the severity and chronicity of this disorder and the circumstances in which it is likely to be manifest, and (c) the kinds of treatment that are likely to provide the individual relief from this disorder. With respect to further treatment planning, adequate assessment information helps to guide treatment strategies and anticipate possible obstacles to progress in therapy. As for outcome evaluation, pre-treatment assessments establish an objective baseline against which treatment progress can be monitored in subsequent evaluations, and by which the eventual benefits of the treatment can be judged at its conclusion. These clinical contributions of psychological assessment can be implemented during each of four sequential phases in delivering psychological treatment: deciding on therapy, planning therapy, conducting therapy, and evaluating therapy.

DECIDING ON THERAPY

The first step in the clinical utilization of assessment information consists of deciding whether a patient needs treatment and is likely to benefit from it. Accurate differential diagnosis identifies pathological conditions (e.g. depression, paranoia) and maladaptive characteristics (e.g. passivity, low self-esteem) for which treatment is usually indicated, and adequate psychological evaluation helps to distinguish such conditions and characteristics from normal range functioning that does not call for professional mental health intervention. Assessment methods also provide valuable information concerning two factors known to predict whether people are likely to become involved in and profit from psychotherapy: their motivation for treatment and their accessibility to being treated (Garfield, 1994; Greencavage & Norcross, 1990).

Motivation for treatment usually corresponds to the amount of subjectively felt distress that people are experiencing. Accessibility to psychological treatment typically depends on how willing people are to examine themselves, to express their thoughts and feelings openly, and to make changes in their customary beliefs and preferred ways of conducting their lives. Information derived from appropriate assessment procedures can provide clinicians with objective indices of each of these variables, and these assessment data can in turn be used as a basis for determining whether to recommend and proceed with some form of treatment.

PLANNING THERAPY

Planning therapy for patients who need and want to receive psychological treatment involves

(a) deciding on the appropriate setting in which to deliver the treatment, (b) estimating the duration of the treatment, and (c) selecting the particular type of treatment to be given. With respect to deciding on the treatment setting, assessment data provide reliable information concerning the severity of a patient's disturbance, the patient's ability to distinguish reality from fantasy, and his or her likelihood of becoming suicidal or dangerous to others, all of which bear on whether the person requires residential care or can be treated safely and adequately as an outpatient. The more severely disturbed people are, the farther out of touch with reality they are, and the greater their risk potential for violence, the more advisable it becomes to care for them in a protected environment.

Regarding treatment duration, clinical experience and research findings consistently indicate that mild and acute problems of recent onset can usually be treated successfully in a shorter period of time than severe and chronic problems of long-standing duration. A variety of psychodiagnostic measures provide clues to the chronicity as well as the severity of symptomatic and characterological mental and emotional problems, and pretreatment data obtained with these measures can accordingly help clinicians formulate some expectation of how long a treatment is likely to last. Having available such assessment-based information on expected duration in turn assists clinicians in presenting treatment recommendations to prospective patients (Hurt, Reznikoff & Clarkin, 1991).

As for treatment selection, people who are relatively psychologically minded, self-aware, and interested in gaining fuller self-understanding are relatively likely to respond positively to an uncovering, insight-oriented, and conflict-focused treatment approach. Patients whose preference is to feel better without having to examine themselves closely, on the other hand, are more likely to become actively engaged in supportive and symptom-focused approaches to treatment than in exploratory psychotherapy. Psychologically minded people are inclined to feel dissatisfied with supportive treatment, because it does not get at the root of their problems, whereas relief-minded people tend to feel uncomfortable in uncovering treatment, because it makes unwelcome demands on them. Additionally, there is reason to believe that some kinds of conditions and difficulties, especially in people who are problem-oriented, respond relatively well to cognitive-behavioural forms of treatment, whereas other kinds of disorders and maladaptive tendencies, especially in people who are interpersonally oriented, respond better to psychodynamic-interpersonal than cognitive-behavioural therapy (Beutler & Harwood, 1995; Hayes, Nelson & Jarrett, 1987).

Psychological mindedness and preferences for problem-oriented or interpersonally oriented approaches to life situations are among a vast array of personality characteristics that can be measured with assessment methods. Accordingly, adequately conceived pretherapy psychological assessment can facilitate treatment planning by differentiating among psychological states and orientations of the individual that have known implications for successful response to particular treatment approaches.

CONDUCTING THERAPY

Psychological assessment can play a key role in conducting therapy by helping to identify in advance: (a) treatment targets on which the therapy should be focused and (b) possible obstacles to progress towards these treatment goals. Appropriately collected assessment data, and particularly the results of a multimethod test battery, typically contain many normal range findings and often some indications as well of notably good personality strengths and especially admirable personal qualities. At the same time, especially in people who are being evaluated for symptoms or difficulties that have led them to seek professional help, test data are likely to reveal specific adaptive shortcomings and coping limitations. One person may show a penchant for circumstantial reasoning and poor judgement; another person may give evidence of poor social skills and interpersonal withdrawal; a third may exhibit considerable emotional inhibition with restricted capacity to express feelings and feel comfortable in emotionally charged situations. In short, any assessment findings that fall outside of an established normal range and are known to indicate specific types of cognitive dysfunction, affective distress, coping deficit, personal dissatisfaction, or interpersonal inadequacy in turn assist therapists and

their patients in deciding on the objectives of their work together and directing their efforts accordingly.

Some psychological characteristics of patients that constitute targets in their treatment may also pose obstacles to their becoming effectively engaged in therapy and making progress toward their goals. For example, people who are set in their ways and characteristically rigid and inflexible in their views often have difficulty reframing their perspectives or modifying their behaviour in response even to well-conceived and appropriately implemented treatment interventions. People who are interpersonally aversive or withdrawn may be slow or reluctant to form the kind of working alliance with their therapist that facilitates progress in most forms of therapy. People who are relatively satisfied with themselves and not experiencing much subjectively felt distress may have little tolerance for the demands of becoming seriously engaged in a course of psychological treatment (Blatt & Ford, 1994; Horvath & Greenberg, 1994; Shectman & Smith, 1984). Characteristics of these kinds do not preclude effective psychotherapy, but they can result in slow progress, and they may cause patients and therapists to become discouraged and terminate prematurely a treatment that does not appear to be going well. Pretreatment assessment data serve to alert therapists in advance to possible treatment obstacles, which can help them understand and be patient with initially slow progress and also guide them in dealing directly with these obstacles, as by concentrating in the early phases of therapy on encouraging flexibility and open-mindedness, building a comfortable and trusting treatment relationship, or generating some motivation for the patient's involvement in the therapy.

EVALUATING THERAPY

Psychological assessment provides valuable data for monitoring the progress of therapy and measuring its eventual benefit (Maruish, 1999; Weiner & Exner, 1991). For this potential benefit of assessment to be realized, it is vital for assessment data to be collected from patients prior to their beginning treatment. In addition to helping to identify treatment targets and the long-term objectives of therapy, pre-treatment data provide an objective baseline for comparison with the results of subsequent assessments. Periodic re-evaluations can then shed light on whether the treatment is making a difference, how close it has come to meeting its aims, in what way the focus of continued treatment should be adjusted, and whether a termination point has been reached.

For example, if a reliable test index shows abnormally high anxiety, low self-esteem, poor self-control, or excessive anger, and a retest during treatment shows the same or a worse result for any of these treatment targets, there is objective evidence that no progress has been made on this front. Such results can then lead to an informed decision to alter the type or focus of the treatment, change the therapist, or await the next re-assessment before making any change. On the other hand, should retesting show an index closer to an adaptive range than initially, there is reason to conclude that progress is being made on the treatment target related to that index but that further improvement remains to be made in that area. When an initially abnormal test result is found on retesting to be in an adaptive range, then therapists and their patients can conclude with confidence that they have achieved the objective to which this result relates and do not need to address it further. At the point when retesting indicates that most or all of the treatment targets have reached or are approaching as much resolution as could realistically be expected, then the assessment process helps to indicate that an appropriate termination point has been reached.

Assessments conducted at the conclusion of psychotherapy, when compared with initial baseline evaluations, provide an objective basis for evaluating the overall benefit of the treatment that has been provided. Evaluations of treatment benefit made possible by pre-therapy and post-therapy assessments serve important research and practical purposes in clinical psychology. With respect to research issues, assessment data bearing on treatment benefit facilitates comparison studies of the relative effectiveness of different types and modalities of therapy. For practical purposes, retest findings demonstrating treatment benefit bear witness to the value of psychological interventions, particularly as weighed against the financial cost of these services (Kubiszyn et al., 2000).

WIDELY USED INSTRUMENTS

Surveys of clinical psychologists and the contents of standard handbooks concerning psychological assessment identify several instruments as being among those most widely used by clinicians in the United States for purposes of differential diagnosis, treatment planning, and outcome evaluation. Four of these measures are relatively structured self-report inventories on which conclusions are derived from what respondents are able and willing to say about themselves: the *Minnesota Multiphasic Personality Inventory*, the *Millon Clinical Multiaxial Inventory*, the *Sixteen Personality Factors Questionnaire*, and the *Personality Assessment Inventory*. Four of them are relatively unstructured performance-based measures in which the key data consist not of what respondents say about themselves but how they deal with various kinds of somewhat ambiguous tasks that are assigned to them: the Rorschach Inkblot Method, the Thematic Apperception Test, several types of figure drawing tasks, and some alternative sentence completion methods (Camara, Nathau & Puente, 2000; Maruish, 1999).

FUTURE PERSPECTIVES AND CONCLUSIONS

Psychological assessment has been an integral part of clinical psychology since its inception and continues to the present day to provide practitioners with valuable information to guide their evaluation and treatment of persons who seek their help. At times, failure to appreciate the benefits of preceding treatment with thorough assessment has led to insufficient teaching and learning of psychodiagnostic methods by clinical psychologists, as has the regrettable and shortsighted devaluing of diagnostic procedures by health insurance providers. However, the future application of psychodiagnostic methods in clinical psychology appears to rest safely in the hands of practitioners and researchers who know from their experience and data how useful assessment can be in facilitating good clinical decisions.

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RELATED ENTRIES

Applied Behavioural Analysis, Child and Adolescent Assessment in Clinical Settings, Clinical Judgement, Couple Assessment in Clinical Settings, Interview in Behavioural and Health Settings, Observational Techniques in Clinical Settings, Goal Attainment Scaling (GAS), Psychophysiological Equipment and Measurements, Outcome Assessment/Treatment Assessment, Prediction: Clinical vs. Statistical

APPLIED FIELDS: EDUCATION

INTRODUCTION

The role of assessment and evaluation in education has been crucial, probably since the earliest approaches to formal education. However, change in this role has been dramatic in the last few decades, largely due to wider developments in society. The most dramatic change in our views of assessment is represented by the notion of assessment as a tool for learning. Whereas in the past, we have seen assessment only as a means to determine measures and thus certification, there is now a realization that the potential benefits of assessing are much wider and impinge on in all stages of the learning process. In this entry, we will outline some of the major developments in educational assessment, and we will reflect on the future of education within powerful learning environments, where learning, instruction and assessment are more fully integrated.

Consequences of the Developments in Society

Economic and technological change, which brings significant changes in the requirements of the labour market, poses increasing demands on education and training. For many years, the main goal of education has been to make students knowledgeable within a certain domain. Building a basic knowledge store was the core issue. Students taking up positions in modern organizations nowadays need to be able to analyse information, to improve their problem-solving skills and communication and to reflect on their own role in the learning process. People increasingly have to be able to acquire knowledge independently and use this body of organized knowledge in order to solve unforeseen problems. As a consequence, education should contribute to the education of students as lifelong learners.

Paradigm Change: From Testing towards Assessment

Many authors (Mayer, 1992; De Corte, 1990) have pointed to the importance of instruction to promote students' abilities as thinkers, problem-solvers and inquirers. Underlying this goal is the view that meaningful understanding is based on the active construction of knowledge and often involves shared learning. It is argued that a new form of education requires reconsideration about assessment (Dochy, Segers & Sluijsmans, 1999). Changing towards new forms of learning, with a status quo for evaluation, undermines the value of innovation. Students do not invest in learning that will not be honoured. Assessment is the most determining factor in education for the learning behaviour of students. Traditional didactic instruction and traditional assessment of achievement are not suited to the modern educational demands. Such tests were generally designed to be administered following instruction, rather than to be integrated with learning. As a consequence, due to their static and product-oriented nature, these tests not only lack diagnostic power but also fail to provide relevant information to assist in adapting instruction appropriately to the needs of the learner (Campione & Brown, 1990; Dochy, 1994). Furthermore, standard test theory characterizes performance in terms of the difficulty level of response choice items and focuses primarily on measuring the amount of declarative knowledge that students have acquired.

This view of performance is at odds with current theories of cognition. Achievement assessment must be an integral part of instruction, in that they should reflect, shape, and improve student learning. Assessment procedures should not only serve as a tool for crediting students with recognized certificates, but should also be used to monitor progress and, if needed, to direct students to remedial learning activities. The view that the evaluation of students' achievements is

something which happens at the end of the process of learning is no longer widespread; assessment is now represented as a tool for learning (Dochy & McDowell, 1997).

The changing learning society has generated the so-called assessment culture as an alternative to the testing culture. The assessment culture strongly emphasizes the integration of instruction and assessment. Students play far more active roles in the evaluation of their achievement. The construction of tasks, the development of criteria for the evaluation of performance, and the scoring of the performance may be shared or negotiated among teachers and students. The assessment takes all kinds of forms such as observations, text- and curriculum-embedded questions and tests, interviews, performance assessments, writing samples, exhibitions, portfolio assessment, and project and product assessments. Several labels have been used to describe subsets of these alternatives, with the most common being 'direct assessment', 'authentic assessment', 'performance assessment' and 'alternative assessment'.

New Methods of Assessment

Investigations of new approaches (e.g. Birenbaum & Dochy, 1996; Nitko, 1995; Shavelson et al., 1996) illustrate the development of more 'in context' and 'authentic' assessment (Archbald & Newmann, 1992; Hill, 1993). Nisbet (1993) defines the term authentic assessment as 'methods of assessment which influence teaching and learning positively in ways which contribute to realizing educational objectives, requiring realistic (or "authentic") tasks to be performed and focusing on relevant content and skills, essentially similar to the tasks involved in the regular learning processes in the classroom' (p. 35).

Assessment of such 'authentic' tasks is highly individual and contextualized. The student gets feedback about the way he or she solved the task and about the quality of the result. Evaluation is given, on the basis of different 'performance tasks', performed and (reviewed) assessed at different moments. The evaluation criteria have to be known in advance. When students know the criteria and know how to reach them, they will be more motivated and achieve better results. This form of evaluation gives a more complete and realistic picture of the student's ability (achievement). It evaluates not only the product, but also the process of learning. Students get feedback about their incorrect thinking strategies.

Within the new forms of 'new assessment', much attention is paid to authentic problem-solving, case-based exams, portfolios and the use of co-, peer-, and self-assessment (Birenbaum, 1996).

In traditional education, the question 'Who takes up the exam and who defines the criteria?' is seldom asked. Most of the time, it is the teacher. New forms of education do pose this question. Students themselves, other students or the teacher and students together are responsible for assessment. The type of student self-assessment referred to most frequently in the literature is a process, which involves teacher-set criteria and where students themselves carry out the assessment and marking. Another form of student self-assessment is the case where a student assesses herself or himself, on the basis of criteria which she or he has selected, the assessment being either for the student's personal guidance or for communication to the teacher or others. According to Hall (1995) there are two critical factors for genuine self-assessment: the student not only carries out the assessment, but also selects the criteria on which the assessment is based. Similarly, peer-assessment can indicate that fellow students both select the criteria and carry out the assessment. Any situation where the tutor and students share in the selection of criteria and/or the carrying-out of the assessment is more accurately termed co-assessment (Hall, 1995). However, it is still frequently the case that teachers control the assessment process, sometimes assisted by professional bodies or assessment experts, whereas students' assessments and criteria are taken seriously but considered to be additional to the assessment undertaken by the teacher or professor rather than replacing it (Rogers, 1995). Implementing forms of self-, peer- and co-assessment may decrease the time-investment professors would otherwise need to make in more frequent assessment. In addition to that advantage, using these assessment forms assists the development of certain skills for the students, e.g. communication skills, self-evaluation skills, observation skills, self-criticism.

ASSESSING NEW ASSESSMENT FORMS: DEVELOPMENTS IN EDUMETRICS

Judgements regarding the cognitive significance of an assessment begin with an analysis of the cognitive requirements of tasks as well as the ways in which students try to solve them (Glaser, 1990). Two criteria by which educational and psychological assessment measures are commonly evaluated are validity and reliability. One can say that based on these criteria, the results above are not yet consistent and depending upon the assessment form there is a larger or smaller basis to state that the evaluation is acceptable.

It is however important to note that Birenbaum (1996) mentions that the meaning of validity and reliability has recently expanded. Dissatisfaction with the available criteria, which were originally developed to evaluate indirect measures of performance, is attributed to their insensitivity to the characteristics of a direct assessment of performance.

The most important element of new assessment models is the reflection of the competencies required in real-life practice. The goal is to ensure that the success criteria of education or training processes are the same as those used in the practice setting. Hence, as notions of fitness of purpose change, and as assessment of more qualitative areas are developed, the concepts of validity and reliability encompassed within the instruments of assessment must also change accordingly. This means that we should widen up our view and search for other and more appropriate criteria. It should not be surprising that a new learning society and consequently a new instructional approach and a new assessment culture cannot be evaluated on the basis of the pre-era criteria solely.

Validity Related Issues

Although performance assessment appears to be a valid form of assessment, in that it resembles meaningful learning tasks, this measure may be no more valid than scores derived from response choice items (Linn et al., 1991). Evidence is needed to assure that assessment requires the high-level thought and reasoning processes that they were intended to evoke.

The authors of the 1985 Standards define *test validity* as 'a unitary concept, requiring multiple lines of evidence, to support the appropriateness, meaningfulness, and usefulness of the specific inferences made from test scores' (AERA, APA, NCME, 1985: 9). All validity research should be guided by the principles of scientific inquiry reflected in *construct validity*.

Within the construct validity framework, almost any information, gathered in the process of developing and using an assessment, is relevant, when it is evaluated against the theoretical rationale underlying the proposed interpretation and inferences, made from test scores (Moss, 1995). Thus, validation embraces all the experimental statistical and philosophical means by which hypotheses are evaluated. Validity conclusions, then, are best presented in the form of an *evaluative argument*, which integrates evidence to justify the proposed interpretation against plausible alternative interpretations.

Kane's *argument-based approach* is in line with Cronbach's view on validity. According to Kane (1992), to validate a test-score interpretation is to support the plausibility of the corresponding interpretative argument with appropriate evidence: (1) for the inferences and assumptions, made in the proposed interpretative argument, and (2) for refuting potential counter arguments. The core issue is not that we must collect data to underpin validity, but that we should formulate transparent, coherent, and plausible arguments to underpin validity.

Authors like Kane and Cronbach use validity principles from interpretative research traditions, instead of psychometric traditions, to assist in evaluating less-standardized assessment practices.

Other criteria suggested for measuring validity of new assessment forms are the transparency of the assessment procedure, the impact of assessment on education, directness, effectiveness, fairness, completeness of the domain description, practical value and meaningfulness of the tasks for candidates, and authenticity of the tasks (Haertel, 1991). According to Messick (1994), these validation criteria are, in a more sophisticated form, already part of the unifying concept of validity, which he expressed in 1989. He asserted that validity is an evaluative summary of both evidence for and the actual as well as potential consequences of score interpretation and use. The more traditional conception of

validity as 'evidence for score interpretation and use' fails to take into account both evidence of the value implications of score interpretation and the social consequences of score use.

Messick's unifying concept of validity encompasses six distinguishable parts – content, substantive, structural, external, generalizability, and consequential aspects of construct validity – that conjointly function as general criteria for all educational and psychological assessment. The *content* aspect of validity means that range and type of tasks, used in assessment, must be an appropriate reflection (*content* relevance, representativeness) of the construct-domain. Increasing achievement levels in assessment tasks should reflect increases in expertise of the construct-domain. The *substantive* aspect emphasizes the consistency between the processes required for solving the tasks in assessment, and the processes used by domain-experts in solving tasks (problems). Further, the internal *structure* of assessment – reflected in the criteria, used in assessment tasks, the interrelations between these criteria and the relative weight placed on scoring these criteria – should be consistent with the internal structure of the construct-domain. If the content aspect (relevance, representativeness of content and performance standards) and the substantial aspect of validity is guaranteed, score interpretation, based on one assessment task, should be *generalizable* to other tasks, assessing the same construct. The *external* aspect of validity refers to the extent that the assessment scores' relationship with other measures and non-assessment behaviours reflect the expected high, low, and interactive relations. The *consequential* aspect of validity includes evidence and rationales for evaluating the intended and unintended consequences of score interpretation and use (Messick, 1994).

In line with Messick's conceptualization of consequential validity, Frederiksen and Collins (1989) proposed that assessment has 'systematic validity' if it encourages behaviours on the part of teachers and students that promote the learning of valuable skills and knowledge, and allows for issues of transparency and openness, that is to access the criteria for evaluating performance. Encouraging deep approaches to learning is one aspect, which can be explored in considering the consequences. Another is the impact which assessment has on teaching. Dochy and McDowell (1997) argue that assessing high-order skills by means of authentic assessment will lead to the teaching of such high-order knowledge and skills.

With today's emphasis on high-stakes assessment, two threats to test validity are worth mentioning: construct under-representation and construct-irrelevance variance. In the case of *construct-irrelevance variation*, the assessment is too broad, containing systematic variance that is irrelevant to the construct being measured. The threat of *construct-underrepresentation* means that the assessment is too narrow and fails to include important dimensions of the construct being measured.

Special Points of Attention for New Assessment Forms

The above implies in our view that other criteria suggested for measuring validity of new assessment forms will need to be taken into account, i.e. the transparency of the assessment procedure, the impact of assessment on education, directness, effectiveness, fairness, completeness of the domain description, practical value and meaningfulness of the tasks for candidates, and authenticity of the tasks.

In addition, predictable difficulties will have to be taken into account, such as those outlined in the following paragraphs.

Authentic assessment tasks are more sensitive to construct-underrepresentation and construct-irrelevance variation, because they are often loosely structured, so that it is not always clear to which construct-domain inferences are drawn. Birenbaum (1996) argues that it is important to specify accurately the domain and to design the assessment rubrics so they clearly cover the construct-domain. Messick (1994) advises to adopt a construct-driven approach to the selection of relevant tasks and the development of scoring criteria and rubrics, because it makes salient the issue of construct-underrepresentation and construct-irrelevance variation.

Another difficulty with authentic tasks, with regard to validity, is concerning rating authentic problems. Literature reveals that there is much variability between raters in scoring the quality of a solution. Construct-underrepresentation in rating is manifested as omission of assessment

criteria or idiosyncratic weighting of criteria such that some aspects of performance do not receive sufficient attention. Construct-irrelevance variance can be introduced by the rater's application of extraneous, irrelevant or idiosyncratic criteria (Heller et al., 1998). Suggestions for dealing with these problems in literature include constructing guidelines, using multiple raters and selecting and training raters.

Reliability Related Issues

Reliability in classical tests is concerned with the degree in which the same results would be obtained on a different occasion, in a different context or by a different assessor. Inter- and intrarater agreement is used to monitor the technical soundness of performance assessment rating. However, when these conventional criteria are employed for new assessments (for example using authentic tasks), results tend to compare unfavourably to traditional assessment, because of a lack of standardization of these tasks.

The unique nature of new forms of assessment has affected the traditional conception of reliability, resulting in the expansion of its scope and a change in weights attached to its various components (Birenbaum, 1996). In new assessment forms, it is not about achieving a normally distributed set of results. The most important question is to what extent the decision 'whether or not individuals are competent' is dependable (Martin, 1997). Differences between ratings sometimes represent more accurate and meaningful measurement than would absolute agreement. Measures of interrater reliability in authentic assessment, then, do not necessarily indicate whether raters are making sound judgement and do not provide bases for improving technical quality. Measuring the reliability of new forms of assessment stresses the need for more evidence in a doubtful case, rather than to rely on making inferences from a fixed and predetermined set of data (Martin, 1997).

In line with these views on reliability is Moss' idea (1992) about reliability. She asserts that a hermeneutic approach of 'integrative interpretations based on all relevant evidence' is more appropriate for new assessment, because it includes the value and contextualized knowledge of the reader, than the psychometric approach that limits human judgement 'to single performances', results of which are then aggregated and compared with performance standards.

FUTURE PERSPECTIVES AND CONCLUSIONS

The assessment culture leads to a change in our instructional system from a system that transfers knowledge into students' heads to one that tries to develop students who are capable of learning how to learn. The current societal and technological context requires education to make such a change. The explicit objective is to interweave assessment and instruction in order to improve education. A number of lessons can be learned from the early applications of new assessment programmes.

First, one should not throw the baby out with the bath water. Objective tests are very useful for certain purposes, such as high-stake summative assessment of an individual's achievement, although they should not dominate an assessment programme. Increasingly, measurement specialists recommend the so-called balanced or pluralistic assessment programmes, where multiple assessment formats are used. There are several motives for these pluralistic assessment programmes (Birenbaum, 1996; Messick, 1984): a single assessment format cannot serve several different purposes and decision-makers; and each assessment format has its own method variance, which interacts with persons.

There is a need to establish a system of assessing the quality of new assessment and implement quality control. Various authors have recently proposed ways to extend the criteria, techniques and methods used in traditional psychometrics. Others, like Messick (1995), oppose the idea that there should be specific criteria, and claim that the concept of construct validity applies to all educational and psychological measurements, including performance assessment.

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Filip Dochy

RELATED ENTRIES

DIAGNOSTIC TESTING IN EDUCATIONAL SETTINGS, EVALUATION IN HIGHER EDUCATION, INSTRUCTIONAL STRATEGIES, LEARNING DISABILITIES, LEARNING STRATEGIES, PSYCHOEDUCATIONAL TEST BATTERIES, REPORTING TEST RESULTS IN EDUCATION, STANDARD FOR EDUCATIONAL AND PSYCHOLOGICAL TESTING

APPLIED FIELDS: FORENSIC

INTRODUCTION

Psychological forensic assessment aims to contribute to rational problem-solving in a forensic context when judgements have to be made about conditions or consequences of human behaviour brought to (criminal or civil) court. We describe a decision-oriented model of the process of psychological assessment that can serve as a general framework for psychological assessment concerning forensic questions. Frequently asked forensic questions relate to (1) psychological problems of parental custody and contact with children after divorce, (2) credibility of witness statements, and (3) prognosis of offence recidivism.

GENERAL CONCEPT

Modern psychological forensic assessment is conceived as an aid for optimizing forensic problem solving in a scientific process of hypotheses-testing. The assessment process can be regarded as a sequence of decisions. Decisions during planning have a crucial impact on assessment results: mistakes in planning may cause invalid results. Additionally, many decisions must be made while realizing the assessment plan and combining the data into results. Explicit rules to aid these decisions are explained and compiled in checklists by Westhoff and Kluck (1998).

This approach is in contrast to the – outdated – trait-oriented comprehensive 'portraying' of the personality. According to this general concept, it is not the personality that has to be evaluated, but the conditions and the course of a person's actions, or the relations between individuals, in the past, present and in the future. There are six sets of conditions influencing human behaviour: (1) environment; (2) organism; (3) cognition; (4) emotion; (5) motivation; and (6) social variables; and their interactions.

In a single case, all empirically relevant conditions and behavioural variables are checked for their contributions to the forensic question put to the psychological expert. In order to test the resulting hypotheses, different sources of information have to be selected, e.g. according to their psychometric properties. Data can be gathered from systematically planned interviews, observation of behaviour, biographical files and standardized procedures (e.g. tests or questionnaires). Assessors balance the costs of a special assessment procedure, e.g. a test, and its benefits. Of course, they take into consideration not only material, but also immaterial costs and benefits for each participant in the assessment process. A competent realization of the assessment plan requires the up-to-date knowledge and skills of a well-trained psychologist. This expert will use the most objective methods of documentation, e.g. tape recording of interviews.

Data from all relevant sources of information are weighted according to the single case and combined in order to reach a decision about each of the initial hypotheses. In a second step the outcomes of these decisions are integrated, in order to answer the forensic question(s) posed by the judicial system. The conclusions are always stated as probabilistic 'if–then'-statements.

The structure of a psychological report according to this assessment process corresponds to the international scientific publication standards and the Guidelines for the Assessment Process (GAP) of the European Association of Psychological Assessment (Fernández-Ballesteros et al., 2001):

1 Client's question (and client)
2 Psychological questions (= hypotheses)
3 Plan and sequence of the investigation (including the names of all investigators, all appointments, duration and locations of meetings)
4 Data

5 Results
6 Recommendations and suggestions (if asked for in the client's question)
7 References
8 Appendix (including psychometric calculations)
9 Signature (of the responsible psychologist)

JUDICIAL SYSTEM AND FORENSIC QUESTIONS PUT TO THE PSYCHOLOGICAL EXPERT

The roles and the tasks of all the participants in legal proceedings differ according to the different judicial systems in Western societies. Consequently, the questions put to forensic psychological experts, and their working conditions, differ as well. Nevertheless, there are common basic forensic-psychological concepts and methods. The following sections will deal with them. They will be illustrated by sketches of the forensic questions most frequently put to psychological experts.

Psychological Reports in Family Law

Writing a psychological report on questions of parental custody and contact of parents with their children after divorce is a very complex task which, primarily, needs thorough planning. Preparation of such a report aims to support the parents' readiness of communication with each other and their educational competence. The results of the psychological expert's work help the judge at the family court to decide in the 'best interest of the child'. Psychological experts optimize this assessment process by using explicit rules. Westhoff, Terlinden-Arzt, and Klueber (2000) explain every single decision that has to be made in this process. Additionally they give checklists containing rules to help avoid errors and mistakes and to minimize judgement biases.

To enable the parents and/or the judge to decide in the 'best interest of the child' requires the operationalization of this hypothetical construct. The psychological expert has to test the following sets of (psychological) variables:

1 the personal attachments of the child;
2 the continuity of personal care and the continuity environment of the child;
3 fostering the development of the child;
4 the attitudes of the child to possible solutions;
5 parents' readiness for communication with each other regarding the child;
6 their readiness to support the personal attachments of the child;
7 strategies of the family to cope with their divorce-related problems.

The psychological expert has to select the most useful, objective, reliable, and valid instruments for gathering the necessary data. There are only very few standardized procedures that match the questions asked by the family court. Most of the relevant data for psychological assessment in family court problems are obtained from systematic, partly standardized interviews and from the systematic observation of relevant behaviour (e.g. 'the strange situation' designed by Ainsworth et al. [1978] for the assessment of attachment quality). The Family Relations Test by Bene and Anthony (1985) can be very useful as a supporting instrument for the systematic interviewing of even young children: it helps the children to verbalize their incoming and outgoing emotions about each member of their family. The still widely used projective techniques as well as trait-oriented personality questionnaires are not validated for answering family court questions: the constitutional right to have or to rear children is not limited by a particular degree of any personality trait. Therefore, personality trait scores cannot be meaningful criteria in deciding with which of the parents the children should live or whether they should have contact with the other party.

Statement Credibility

In criminal investigation, psychological experts may be asked to assess the credibility of statements by witnesses of a crime. Expert knowledge is mainly required in cases of sexual abuse and maltreatment or other violent crimes, especially when children are victims and/or witnesses of such offences and where there is no other evidence than the victim's/witness's statement. Nevertheless, the principal logic and the basic procedure of conducting an expert assessment is not limited to minors or to particular kinds of crime.

The assessment process here is again a hypothesis-testing procedure: starting with the assumption that the statement is not based on a real-life experience of the witness, the expert has to look out for data that rule out this hypothesis. Only if there is strong evidence for the alternative hypothesis, 'the statement is based on an experienced real-life event', can this alternative hypothesis be accepted. In contrast to this, the presupposition that the alleged event has actually occurred would only need very weak supporting evidence to be accepted and would therefore lead to an extremely false-positive bias.

Assessing the credibility of a witness's statement does not rely on 'general trustworthiness' as a kind of personality construct, but refers only to the assessment of the veracity of the specific testimony in a particular case. The general question of credibility assessment can, therefore, be stated as follows: 'Is this individual witness, under the given conditions of the investigation and the possible influences of other people, capable of making this particular statement even if it is not based on real-life experience?' (translated from Steller & Volbert, 1999).

The basic working hypothesis for analysing the content of a witness's statement was developed by Undeutsch (1967); it says that a statement that is based on real-life experience differs systematically from one that lacks this experience. For credibility assessment, this means that the witness's statement has to be analysed according to quality criteria applied to its content, which differentiate between reality-based statements and others. Reality criteria have been described since the beginning of the 20th century in German psychological and juridical literature. Undeutsch (1967) was the first to describe a comprehensive set of reality criteria. Steller and Koehnken (1989) refer to former approaches proposed by several authors and describe a system of five categories of reality criteria (p. 221); these are:

1 general characteristics: logical structure, unstructured production, quantity of details;
2 specific contents: contextual embedding; descriptions of interactions; reproduction of conversation, unexpected complications during the incident;
3 peculiarities of content: unusual details, superfluous details, accurately reported details misunderstood, related external associations, accounts of subjective mental state; attribution of perpetrator's mental state;
4 motivation-related contents: spontaneous corrections, admitting lack of memory, raising doubts about one's own testimony, self-deprecation; pardoning the perpetrator;
5 elements specific to the offence: details characteristic of the offence.

This integrative expert system has experienced-enhanced theoretical foundation (Ceci & Bruck, 1995). During the last fifteen years many studies of empirical validation of the system have been conducted in field studies and as well as in experimental studies. The criteria system has turned out to be a useful assessment instrument for scientific research and for practical use in assessing the credibility of a witness's statement.

Criteria Based Content Analysis (CBCA) can only lead to a valid credibility assessment if it takes into account certain characteristics of the witness as preconditions for a reliable and valid testimony. These are perception parameters, memory conditions and verbalization. In addition, there are motivational aspects to be considered like readiness to testify, goals, expectations, desires and fears connected with giving true or false testimony.

Furthermore there must be a test of whether there are or ever have been situational conditions that influence the statements so that they can even be made without that particular experience in real life. Statements by very young children in particular are susceptible to inductive and suggestive influences and questions, whether these are intentional or unintentional. Therefore, the 'history' of the statement and its development has to be explored, as well as the cognitive, emotional, and social developmental status of a young child witness.

The complete process of credibility assessment described here is called Statement Validity Assessment (SVA). In 1999, the Federal Supreme Court of Germany decided that expert opinions on the credibility of (child) witnesses are not acceptable in forensic contest unless they meet the standards of an SVA (Bundesgerichtshof, 1999).

Appropriate data for testing the above hypotheses for SVA are mainly obtained from biographical interviews; psychometric tests would have

to be selected with regard to their ecological validity for the special aspects of the abilities in the forensic context mentioned above. While severe limitations of sensory perception and developmental delays can be easily observed or assessed by psychometric or otherwise standardized methods, an appropriate test of 'memory' for SVA would have to test 'episodic' memory; a test of 'logical thinking' would have to refer to 'understanding social context'. Special tests of this kind are not yet available.

Consequently, the most important procedure for gathering data to run an SVA is therefore a non-suggestive, systematic interview of the witness (for interviewing strategies, see Milne & Bull, 1999). Observation of overt behaviour can be helpful in certain aspects, but most non-verbal cues (e.g. facial expression or illustrators during speaking) are ambiguous with regard to the veracity of a witness's statement (Koehnken, 1990).

Prognosis of Offender Recidivism

Predicting the risk of recidivism of criminal offenders can very much influence the sentence and – in the case of mentally disordered offenders – the kind and duration of correctional treatment. This prediction task has to balance the severe consequences of false positive and of false negative judgements, both from the viewpoint of the individual offender and of the community.

Prognoses of offender recidivism are fraught with many specific and difficult problems: absolute certainty cannot be achieved by logical reason; the available data for prediction are incomplete; the only data about recidivism risks are those obtained about the individual offender; the important situational conditions can only be vaguely rated.

The process of psychological (and/or psychiatric) prognosis requires four steps of assessment (Rasch, 1999; Dahle, 1999): (1) analysis of the former criminal offences of the individual; (2) assessment of his present mental state (including possible mental disorders or illnesses); (3) analysis of the psychological development of the offender since the latest offence; (4) the general framework (situations, persons, chances) of his prospective living conditions. All these criteria are assessed according to the base rate of individuals, where a similar constellation of conditions is observed.

Data for this prognosis task come from prison, hospital or therapy records, from some standardized psychodiagnostic questionnaires which have proven themselves as being reliable and valid predictors for criminal recidivism (such as the HCR-20 by Webster et al., 1994 and the Level of Service Inventory [LSI-R] by Andrews et al., 1995). Nevertheless, the most important method is the systematic interview with the offender based on the topics of the prognosis criteria.

CONCLUSIONS

The three topics of forensic assessment described here are only examples. In different countries there are many other forensic questions that are put to the psychological expert. These concern for example: (1) assessment of criminal responsibility, (2) 'lie detection' by psychophysiologial methods, (3) assessment of the effects of victimization (4) and (other) special problems in civil law. The structure of the assessment process described above does not differ, however, for any forensic question whatsoever put to the forensic psychological expert.

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RELATED ENTRIES

Assessment Process, Child Custody, Antisocial Disorders Assessment

APPLIED FIELDS: GERONTOLOGY

INTRODUCTION

Older adults and particularly those frequently described as the 'oldest old' (85+) represent the fastest growing population subgroup in most (industrialized) countries around the world. Although high competence characterizes the majority of today's elders (Lehr & Thomae, 2000), a whole gamut of critical situations related to ageing, and particularly to very old age, underscores the need for psychological assessment in older adults. Psychological assessment provides a rational, scientific means for making decisions in these situations, prototypical examples of which are residential decisions (e.g. relocation to an institution or within institutions), treatment decisions (e.g. early diagnosis of dementia coupled with a promising cognitive training intervention), or rehabilitation decisions (e.g. the estimation of an individual's rehabilitation potential and remaining plasticity).

In order to define the content of this article, we first draw from Lawton and Storandt (1984), who suggested a broad conception of assessment: 'An attempt to evaluate the most important aspects of the behaviour, the objective, and the subjective worlds of the person [...]' (p. 258). Second, we argue for a theoretical framework to organize the different types of assessment and numerous instruments found in this rapidly evolving field of gerontology. Our suggestion is to roughly distinguish between three assessment approaches: (1) Person-oriented (P) assessment is aimed to address the older person's cognitive and behavioural competence, personality, and psychological aspects of health. (2) Environment-oriented (E) assessment addresses the social and the physical environment of the ageing person. (3) Finally, the assessment of P×E outcomes evaluates the impact of person–environment transactions on major domains of life quality such as subjective well-being, affect, and mental health. Below, we use this line of thinking to review psychological assessment in gerontology. The challenges of assessing older persons in terms of application and theoretical-methodological issues are discussed shortly thereafter. We end this entry with some general conclusions and the consideration of future perspectives.

MAIN APPROACHES IN THE ASSESSMENT OF OLDER PERSONS AND THEIR ENVIRONMENTS

The following overview draws from both old and new treatments of the assessment of older adults (e.g. Kane & Kane, 2000; Lawton & Storandt, 1984; Lawton & Teresi, 1994). Due to space limitations, each theoretical domain is illustrated using a small number of prototypical instruments that essentially reflect the construct or family of constructs in question (see also Table 1).

Person-Oriented Assessment

Cognitive and Behavioural Competence

Cognition is a major aspect of behavioural competence which undergoes particular decline in the later years. However, two reservations are warranted: first, this is true only for speed-dependent cognitive abilities ('fluid intelligence' in contrast to 'crystallized' intelligence); second, pronounced interindividual variability in performance is characteristic for old age. To test an individual's intellectual ability against the norm, the well-known *Wechsler Adult Intelligence Scale* (WAIS) is a classic in the field of ageing (Wechsler, 1981). Also, while there is a high correlation between cognitive functioning and the so-called 'Activities of Daily Living' (ADL; basic activities such as eating, washing, or dressing) as well as the 'Instrumental Activities of Daily Living' (IADL; more complex activities such as preparing meals, using the phone, or shopping), a separate assessment of ADL and IADL is nevertheless recommended to afford a comprehensive picture of the everyday competence of the older person. Respective assessment procedures (e.g. the classic scale proposed by Lawton & Brody, 1969) have proven to be powerful predictors of institutionalization and mortality. To further complement the evaluation of everyday competence, an additional assessment of leisure activities using an activity list or diary is helpful (Mannell & Dupuis, 1994).

Personality

There has been some debate in psychological gerontology regarding the question of whether personality traits such as the 'Big Five' (neuroticism, extraversion, openness to experience, agreeableness, conscientiousness; Costa & McCrae, 1985) remain stable across the adult lifespan. Moderate stability has been widely confirmed, with a tendency toward lower stability over correspondingly longer observation periods. From a practical perspective, a recurring question is whether so-called 'problem behaviours' (such as antisocial behaviour, health-related risk behaviours, or the non-use of existing competencies) may be better explained by individual differences in personality. In this regard, the *NEO Personality Inventory* (Costa & McCrae, 1985) is a classic assessment device that has been used intensively with elders. Reservations have to be made regarding the practical utility of these and other personality instruments with respect to the very old and those suffering from mild cognitive impairments; short scales with easily understood items are still rare. Besides standardized testing, a careful semi-structured exploration of the biography and major (and often critical) turning points therein is essential for an in-depth understanding of an older person's current strengths and weaknesses (Lehr & Thomae, 2000).

In a process-oriented perspective of personality, two constructs are particularly useful to explain situation-specific outcomes such as subjective well-being: coping and control. A classic coping instrument is the *Ways of Coping Checklist*, which has also been proved as useful in a shortened version, helpful for assessing the very old (Folkman, Lazarus, Pimley & Novacek, 1987). For measurement of perceived control, we recommend a short instrument newly developed within the context of the Berlin Aging Study (Smith & Baltes, 1999; Smith, Marsiske & Maier, 1996).

Health

Gaining clarity on the influences of health impairments is important for psychological assessment in any age group. However, this is particularly true for older persons. Chronic conditions and multimorbidity occur frequently in later life and are among the most influential explanations of subjective well-being, depression, and the loss of independence. From a psychological perspective, the subjective evaluation of health based on a single-item assessment ('How would you rate your overall health at the present

Table 1. Recommendation of assessment instruments for use with older adults[a]

Assessment domain	Prototypical instrument	Application issues and selected psychometric information[b]
Person-oriented assessment		
Cognitive and behavioural competence	Wechsler Adult Intelligence Scale (WAIS) (Wechsler, 1981)	Very widely used; takes about 1.5 hours to administer;[c] Cronbach's alpha of all subscales >0.70; broad evidence underlining validity.
	Activities/Instrumental Activities of Daily Living Scale (ADL/IADL) (Lawton & Brody, 1969)	Very widely used; takes about 5 minutes to administer; Cronbach's alpha of both scales >0.80; inter-rater *r* 0.61 (ADL) and 0.91 (IADL); broad evidence underlining validity.
Personality	NEO Personality Inventory (Costa & McCrae, 1985)	Very widely used; takes about 20 minutes to administer; Cronbach's alpha of all subscales >0.70; broad evidence underlining validity.
	Ways of Coping Checklist (Short) (Folkman et al., 1987)	Frequently used; takes about 10 minutes to administer; Cronbach's alpha of subscales 0.47–0.74; some evidence underlining validity.
	Perceived Control (Smith et al., 1996)[d]	Instrument introduced in the Berlin Aging Study; takes about 10 minutes to administer; some evidence underlining reliability and validity.
Health (psychological aspects)	SF-36 (Ware & Sherbourne, 1992)	Frequently used; takes about 10 minutes to administer; Cronbach's alpha of subscales 0.57–0.94; some evidence underlining validity.
Environment-oriented assessment		
Social environment	Social Networks in Adult Life Survey (Kahn & Antonucci, 1980)	Frequently used; administration time depends on persons nominated as social network members; on an average about 30 minutes; reasonable degree of convergence between respondents' and significant others' report; some evidence underlining validity.
	UCLA Loneliness Scale (Russell et al., 1980)	Frequently used; takes about 10 minutes to administer; Cronbach's alpha >0.90; some evidence underlining validity.
	Burden Interview (Zarit et al., 1980)	Frequently used; takes about 10 minutes to administer; Cronbach's alpha >0.70; some evidence underlining validity.
Physical environment	The Housing Enabler (Iwarsson, 1999)	Recently developed instrument; takes about 1.5 hours to administer; inter-rater reliability mean kappas for the different domains assessed 0.68–0.87; some evidence underlining validity.
	Multiphasic Environmental Assessment Procedure (Moos & Lemke, 1996)	Frequently used; data-collection time depends on the size of the institution to be assessed; can take up to about 1 week; Cronbach's alpha of subscales 0.44–0.96; some evidence underlining validity.

(*continued*)

Table 1. Continued

Assessment domain	Prototypical instrument	Application issues and selected psychometric information[b]
Assessment of person×environment outcomes		
Subjective well-being and affect	Philadelphia Geriatric Center Morale Scale (PGCMS) (Lawton, 1975)	Very widely used; takes about 10 minutes to administer; Cronbach's alpha >0.80 (total score); broad evidence underlining validity.
	Scales of Psychological Well-Being (Ryff, 1989)	Frequently used; takes about 20 minutes to administer; Cronbach's alpha of all subscales >0.70; some evidence underlining validity.
	Positive and Negative Affect Schedule (PANAS) (Watson et al., 1988)	Frequently used; takes about 5 minutes to administer; Cronbach's alpha >0.70; some evidence underlining validity.
Mental health	Center of Epidemiological Studies of the Elderly Depression Scale (CES-D) (Radloff, 1977)	Very widely used; takes about 10 minutes to administer; Cronbach's alpha >0.80; broad evidence underlining validity.
	Mini-Mental State Examination (MMSE) (Folstein et al., 1975)	Very widely used; takes about 10 minutes to administer; inter-rater r >0.80; broad evidence underlining validity.

[a]See also additional description of these instruments in the text.
[b]The psychometric information given here is based on additional published evidence, which is not explicitly cited in this article due to space limitation.
[c]The estimation of duration always refers to the administration with old and very old persons.
[d]We recommend direct contact with the authors of this instrument for more information.

time: excellent, good, fair, or poor?') has proven to be a powerful predictor of subjective well-being in many studies. A multi-item assessment of this construct as well as other health-related aspects is provided by the now classic *SF-36* (Ware & Sherbourne, 1992). Frequently overlooked in its impact on everyday life and well-being, the assessment of pain and its psychosocial impact is recommended as a must for any comprehensive health evaluation of older adults (Parmelee, 1994).

Environment-Oriented Assessment

Social Environment

Aspects of the social environment include the objective size of the social network, the amount of real and perceived social support, interpersonal conflicts, and overall social network evaluations, such as loneliness. Caregivers are a significant part of elders' social environments. A classic instrument to measure social network size as well as some of its major qualitative characteristics is the *Social Networks in Adult Life Survey* (Kahn & Antonucci, 1980). This instrument defines social network membership using concentric circles, an approach that has proven to be very helpful in differentiating members of the social network in terms of closeness and importance. Another well-established tool to assess the existing network is the *UCLA Loneliness Scale* (Russell, Peplau & Cutrona, 1980) addressing how often the respondent feels isolated and misunderstood and wishes to be involved in more social relationships. Caregiver persons deserve the attention of psychologists as well, given the extensive strain associated with this task and the increased risk of becoming physically and mentally ill. An instrument for assessing the stress of caregivers is the *Burden Interview* suggested by Zarit and colleagues in the early 1980s (Zarit, Reever & Bach-Peterson, 1980).

Physical Environment

Physical environments optimally adapted to the needs of frail elders can take on powerful supportive and stimulating functions in old age (for a review of the according empirical literature,

see Wahl, 2001). Gitlin (1998) concluded in her review of checklists providing a comprehensive assessment of the home environment that the psychometric properties of most of these devices are at best unclear. Among the rare strictly tested instruments, we would recommend the 'Housing Enabler' as a promising tool that carefully considers the physical home environment as well as the functional profile of older persons acting within these environments (Iwarsson, 1999). Although many different suggestions have been tossed around, there is no single device with well-proven psychometric properties currently available. In contrast, the assessment of institutional environments serving the elderly has found much attention and more canalized research efforts. A comprehensive measurement device is the *Multiphasic Environmental Assessment Procedure* (MEAP), which is based on a wide-ranging research programme conducted by Moos and associates (Moos & Lemke, 1996) and has also been transferred to other countries (e.g. Fernandez-Ballesteros et al., 1991).

Assessment of Person × Environment Outcomes

Subjective Well-Being and Affect

Subjective well-being, or the cognitive and affective evaluation of the past and present life, has been regarded as a major indicator of successful ageing. The most highly renowned instrument probably is the *Philadelphia Geriatric Center Morale Scale* (PGCMS) (Lawton, 1975). This relatively easy-to-use 17-item scale covers three dimensions of subjective well-being, i.e. agitation, satisfaction with the ageing process, and general life-satisfaction. Due to the clinical nature of this instrument with many items addressing negative thoughts and emotions, it is particularly useful in the clinical, psychological evaluation of an older person, while other instruments more thoroughly address the positive facets of subjective well-being (e.g. Ryff, 1989).

Compared to subjective well-being, the measurement of affect has not yet found very much empirical attention (Labouvie-Vief, 1999). The term 'affect' includes emotions, moods, and feeling states, all of which can be assessed in terms of intensity, frequency, and duration. A promising assessment tool for use with elders is the *Positive and Negative Affect Schedule* (PANAS) suggested by Watson, Clark, and Tellegen (1988).

Mental Health

Within the spectrum of mental health threats in later life, depression is, besides dementia, the major disease, whose optimal detection requires a combination of expertise from clinical psychology and psychiatry. The *Center of Epidemiological Studies of the Elderly Depression Scale* (CES-D) introduced by Radloff (1977) is widely used, has proven psychometric properties, and works well in elderly populations. Although a score of 17 is widely accepted as an indication of a depressive illness, it is wise to always include at least one other source of information (such as a clinical expert rating) before a final diagnostic decision is made. In addition, because severe cognitive impairments substantially increase as people age – with estimated dementia rates of about 25% beyond the age of 85 years – dementia assessment should be included as a routine part of every older person's clinical evaluation. A classic screening test in this regard is the *Mini-Mental State Examination* (MMSE), originally suggested by Folstein, Folstein, and McHugh (1975). A major advantage of this widely used device is its scoring system, which is well known among clinicians and thus significantly facilitates communication (a score of 23 is generally recommended as indicative of cognitive dysfunction).

SPECIFIC CHALLENGES OF ASSESSING OLDER ADULTS

A number of factors can threaten the internal and external validity of assessing older persons. In the following, only a selective overview of these issues can be provided.

Two messages are important in terms of practical test application: on the one hand, old age is associated with a slowing in fine motor functioning and reaction time, the loss of sensory functioning, and cognitive impairment. One consequence of this is that performance tests that require motor behaviour may not be adequate, at least in some elderly subpopulations (such as geriatric patients).

Furthermore, scales which are normally self-administered (e.g. personality tests) must frequently be administered by a third person, which means, as compared to other age groups, a substantial change in the social psychology of the test situation, for instance in terms of self-disclosure. The length of the instrument is particularly critical in case of very old persons. Furthermore, the response format should remain stable within testing sessions and should be as simple as possible (not more differentiated than a 5-point Likert-type scale). Also, motivational issues, including fatigue, must be considered when creating optimal test circumstances. On the other hand, test strategies found to be very effective and economic in younger persons, such as phone and computer-based assessment, can, in many cases, be transferred to older people as well. With respect to demented elders, the use of observational methods is frequently the only well-functioning assessment procedure for evaluating behaviour and inner states.

A major theoretical-methodological challenge of assessing older persons is the issue of construct invariance. For instance, constructs such as depression or pain might have a fundamentally different semantic at the age of twenty than at the age of ninety years. Moreover, measures might have age-related characteristics with respect to response bias, response format, or the production of missing data. These and other issues as well as tentative solutions have intensively been addressed by Teresi and Holmes (1994).

To conclude, we urge researchers and practitioners to adopt an attitude of 'constructive caution' in interpreting and using test results gathered in elderly populations.

FUTURE PERSPECTIVES AND CONCLUSIONS

The assessment of older persons is an important field of gerontology in terms of research and application. Due to the multitude of measurement instruments suggested in the gerontological literature, it is essential to carefully check the proven psychometric properties *and* practical usefulness of these devices for making adequate instrument selections. Standardized tests, semi-structured assessments, and observational methods should serve as complementary tools in any comprehensive clinical evaluation. An important task of future research is, as is so often the case, replicative research including different subgroups of elders and the revision of existing devices in order to improve the critical mass of good instruments. The assessment procedures so developed should provide a broad, reliable, and valid description of both the positive and negative sides of the ageing individual.

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RELATED ENTRIES

Dementia, Quality of Life, Health, Dynamic Assessment (Learning Potential Theory, Testing the Limits), Cognitive Plasticity, Cognitive Decline/Impairment, Fluid and Crystallized Intelligence, Autobiography, Intelligence Assessment Through Cohort and Time, Caregiver Burden, Burnout Assessment

APPLIED FIELDS: HEALTH

INTRODUCTION

Health psychology is a field within psychology that is devoted to understanding psychological influences on health-related processes, such as why people become ill, how they respond to illness, how they recover from a disease or adjust to chronic illness, and how they stay healthy in the first place (Schwarzer & Gutiérrez-Doña, 2000). Health psychologists conduct research on the origins and correlates of diseases. They identify personality or behavioural antecedents that influence the pathogenesis of certain illnesses. Health psychologists analyse the adoption and maintenance of health behaviours (e.g. physical exercise, nutrition, condom use, or dental hygiene) and explore the reasons why people adhere to risk behaviours (e.g. why they continue to smoke or drink alcohol). Health promotion and the prevention of illness are, therefore, agendas for research and practice, as is the improvement of the health care system in general.

In health psychology, a multitude of variables are assessed, such as physical conditions, health behaviours, quality of life, coping with stress or illness, coping resources, and premorbid personality. Since health behaviours dominate the discipline, the following contribution will focus on this particular subarea.

HEALTH BEHAVIOURS

Many health conditions are caused by such behaviours as problem drinking, substance use, smoking, reckless driving, overeating, or unprotected sexual intercourse. Health behaviours are often defined as behaviours that people engage in to maintain or improve their current health and to avoid illness. They include any behaviour a person performs in order to protect, promote, or maintain his or her health, whether or not such behaviours are objectively effective towards that end (Conner & Norman, 1996; Schwarzer & Renner, 2000).

People are inconsistent in the way they practise multiple health behaviours. For example, a person who exercises regularly does not necessarily adhere to a healthy diet. One reason people's current health habits are not more consistent is that they differ on a number of dimensions (see Table 1).

For a valid and reliable measurement of health behaviours, it is essential to distinguish between these dimensions and to define clearly the subject matter under investigation.

ASSESSMENT OF HEALTH BEHAVIOURS

There are various methods of assessing health behaviours (Renner, 2001). *Questionnaires* that assess the frequency of past behaviour are the most commonly used methods. There are numerous questionnaires that ask for the average or typical quantity and frequency of alcohol consumption (for an overview, see Sobell & Sobell, 1995), dietary habits, or physical activity. However, the information provided by quantity and frequency measures (QF estimates) is limited because respondents must base their estimates on a large variety of experiences. QF estimates often reflect less drinking and tend to misclassify drinkers compared to daily diary or timeline reports. They also provide lower absolute food intake estimates than a longer, interviewer-administered diet history.

In rare occasions, *physiological methods* can be used, which are most accurate for measuring alcohol consumption (via blood or urine sampling), drug consumption (via immunoassay, hair or sweat bioassay procedures), habitual dietary intakes (via biochemical markers), or physical activity (via doubly labelled water). However, such bioassay methods are only required when a high level of accuracy about recent health behaviour is needed (e.g. for workplace drug testing). They can also be used in addition to self-report data in order to confirm or falsify self-report information (e.g. about recent drug use). However, in some circumstances it may only be necessary to lead respondents to believe that there is an objective way to identify their behaviours via physiological measures, which is done to reduce misreporting. Another direct method is *behavioural observation*, used to assess physical activity among children or a driver's speed, for example.

Unstructured or semistructured *interviews* are qualitative techniques for research on understanding individuals' cognitive and conceptual models of health behaviours and the frames of reference used to organize these behaviours. Therefore, qualitative methods are mainly concerned with exploration and analysis of health behaviour because they

Table 1. Dimensions of health behaviours

• Voluntary; consciously undertaken by the individual	• Involuntary; unconsciously undertaken by the individual
• Avoidance of harmful activities	• Engagement in protective activities
• Undertaken without medical assistance	• Needs professional medical assistance
• Vital	• Non-vital
• Occasional; unstable	• Habitual; stable
• Simple	• Complex, multifaceted

allow the interviewee to address the issues that are relevant to the topics raised by the investigator. One major disadvantage of qualitative methods is that generality is, by definition, not quantifiable. Furthermore, since anonymity is not given, self-reports may be affected by social desirability biases, which lead to overreporting of socially desirable behaviours as well as underreporting of socially undesirable behaviours.

Stone and Shiffman (1994) have labelled strategies for collecting self-reports of respondents' momentary or current state as *Ecological Momentary Assessment* (EMA). EMA studies usually consist of repeated assessment of participants' momentary state as they go about the tasks of daily living in their natural environment. Interval-contingent assessments require assessment at regular intervals. One example is the method of interactive voice response where alcoholics are asked to call in on a regular basis to report their drinking status to the interviewers. Another way is asking respondents to record every episode of smoking, eating, or another behaviour of interest. This event-contingent approach may not lead to a representative sample of the participant's general state, and it requires a clear definition of the triggering event. In contrast, signal-contingent sampling supplies participants with an external signal cue that is usually timed to be emitted at random to prompt them to complete a written assessment or an electronic diary. Signal device beepers, electronic watches, and palmtop computers can be used. EMA is a method that precisely assesses recent health behaviours. Its major advantage is that it minimizes deviations due to recall from memory by relying on respondents' reports of their experience at the very moment of inquiry.

A diary log is a data collection strategy that gathers information as time passes. The distinctive feature of this method is that it yields information that is temporally ordered. It shows the sequence of events and the profile of actions across time. Diary techniques can be particularly useful when data from the same person are required over a considerable period of time and/or very frequently, such as assessing smoking behaviour, alcohol consumption, or dietary habits, in order to provide a general estimate of the amounts consumed. For example, alcohol consumption diaries often include questions about the frequency of drinking, the type of drink, and the typical quantity consumed on each occasion. In comparison to questionnaires, the diary log format minimizes recall biases associated with retrospective reporting, but daily reporting may be more reactive. In addition, diaries could be valuable for getting access to so-called 'intimate' information (e.g. sexual behaviour).

Timeline Followback Method Reports (TLFB), developed by Sobell and Sobell (1995), provide a detailed insight into health behaviours (smoking, taking drugs, or drinking, etc.) over a designated time period. Participants are asked to provide retrospective estimates of their daily behaviour by using a calendar over a certain time period, ranging up to 12 months prior to the interview. With this method, the pattern, variability, and level of drinking or smoking can be profiled, which is especially useful when precise estimates are needed or when researchers wish to evaluate specific changes in health behaviours before, during, and after interventions. However, this is a rather time-consuming method.

BIASES IN SELF-REPORTS

Some problems shared by all surveys relying on self-reports could seriously decrease internal and external validity (Schwarz & Strack, 1991). Short-term fluctuations, such as in substance use, produced by environmental (e.g. social settings) and psychological (e.g. mood or stress) variables, may affect the psychometric properties of usage measures. For example, there is a tendency for students to become increasingly exuberant as their high school graduation approaches. Increased party activity during the spring months contributes significantly to the actual level of drug use. Therefore, seasonal effects and short-term fluctuations may lead to superficial behavioural changes that could be misinterpreted by researchers as being genuine changes.

Questions about past behaviours assume accurate memory of events as well as willingness to report them to a researcher. However, respondents might not recall the actual events, employing instead various cognitive heuristics (rules of thumb) to estimate frequencies. This could result in certain

biases. Individuals use different strategies to answer frequency questions over different time spans. Episodic enumeration (recalling and counting individual incidents) is more likely to be used with shorter time spans in frequency reports, whereas rate-based estimation (projecting the typical rate over the length of the recall period) is more likely to be used when longer time spans are involved. Reported behavioural frequencies for a year are generally lower than 12 times the equivalent frequencies for a month. People probably forget more behavioural instances over the time span of a year than over a month. Therefore, behavioural reports over a month are the more accurate of the two. The use of different time spans across or within studies may lead to inconsistent or even misleading results.

Accurate and reliable measurements of health behaviours, especially drug use and sexual activity, have proven to be difficult because of social desirability influences. People underreport smoking and underestimate alcohol consumption. Self-reports of alcohol consumption can account for as little as half the amount obtained from sales figures. Likewise, the total number of cigarettes sold or otherwise estimated to be consumed is substantially higher than the estimate calculated from smokers' self-reports. In addition, studies that focus on behavioural frequencies consistently yield illusory superiority: respondents report a lower frequency of unhealthy behaviours and higher frequency of healthy behaviours for themselves than for an average peer. Illicit problem behaviours, such as drug or alcohol use, may elicit stronger self-serving biases than more mundane health-threatening behaviours in adolescents (for details, see Renner, 2001).

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RELATED ENTRIES

Health, Quality of Life, Interview in Behavioural and Health Settings, Brain Activity Measurement, Goal Attainment Scaling (GAS), Psychophysiological Equipment and Measurements, Outcome Assessment/Treatment Assessment, Self-Reports (General), Self-Report Distortions, Self-Presentation Measurement

APPLIED FIELDS: NEUROPSYCHOLOGY

INTRODUCTION

Neuropsychological assessment as a formal procedure is a relatively recent development. Its evolution has paralleled advances, in the past fifty years, in the areas of neuroscience in general, and cognitive neuroscience in particular. It has also been influenced by developments in applied clinical disciplines such as neurology, neuroradiology, rehabilitation medicine, special

education, geriatrics, developmental psychology, etc. In this section, we review the historical trajectory of this aspect of clinical neuropsychology, and present the current state of the field.

HISTORICAL ANTECEDENTS

Neuropsychological assessment did not come of age until after the Second World War. In the second half of the 19th century, there had been a flurry of clinical studies that correlated brain structures and cognitive activity. The work of Broca, Déjerine, Jastrowitz, Korsakoff, Lichteim, Liepmann, Oppenheimer, Ribot, Wernicke, and many others in the latter part of the 19th century described the neurological substrates of disorders such as the aphasias, apraxias, amnesia, and frontal disinhibition (Walsh, 1978; Benton, 2000). However, these advances in localization of function lay dormant (except in the USSR) for over half a century. This approach regained its popularity in the 1950s and 1960s, in part as a result of the work of Brenda Milner and her colleagues in Montreal, who described the pivotal role of the hippocampus in memory (Scoville & Milner, 1957), and in part due to the work of Benton, Zangwill, Hécaen, Ajurriaguera, and Goodglass. Sperry's work and the seminal case study of a human deconnection syndrome (Geschwind & Kaplan, 1962) lent further impetus to the belief that higher cognitive functions could be componentialized and subjected to analysis via objective techniques. Interest in the pioneering 19th century studies and their potential contribution to the study of brain–behaviour relationships was revived by Norman Geschwind in Boston at approximately the same time (Geschwind, 1997).

PARADIGMS IN NEUROPSYCHOLOGICAL ASSESSMENT

Global Measures of Brain Damage

At the outset, the primary goal of the neuropsychological evaluation in the United States was to assist in differentiating behavioural disorders of 'organic' (i.e. structural) nature, from those of 'functional' (i.e. psychological) origin. This focus can be attributed to the influence of psychoanalytic thinking, which postulated that psychiatric disturbance could result from intrapsychic (moral and psychological) and disturbed inter-personal relationships (Hill, 1978: vii). Further, clinicians in the USA and Britain were formed in a positivist, psychometric culture, which has more readily trusted an actuarial, mechanistic approach to data gathering, and statistically driven decision-making algorithms (Meehl, 1954), while being less comfortable with the methodology of single-case studies. Thus Ward Halstead's purpose in designing tests was to determine whether a person had sustained brain damage or not, asking, 'more practically, can convenient indices be found which, like blood pressure, accurately reflect the normal and pathological range of variance for the individual? Is there a pathology of biological intelligence which is of significance to psychiatry and to our understanding of normal behaviour?' (Halstead, 1947: 7). He noted accurately that the tests developed by Binet and standardized by Terman (for the purpose of identifying 'subnormal' children who required remediation in school) were completely insensitive to the effects of brain damage. Citing the work of Hebb and Penfield (1940) he wrote, 'Evidence is now on record to the effect that surgical removal of one or both prefrontal lobes – that is, a mass of brain substance constituting about one-fourth of the total cerebrum – may not significantly alter the I.Q.' (Halstead, 1947: 7).

Fixed and Flexible Batteries

The Halstead–Reitan Battery (Reitan & Davison, 1974; Reitan & Wolfson, 1993) and extensions of it (e.g. Heaton, Grant & Mathews, 1991) gained widespread recognition in the USA from the 1950s as the best practice in neuropsychological assessment, since it provided a means of summarizing an array of observations into numerical values that can be compared across patients and situations, and which provide reliable predictions (Boll, 1981; Russell, 1986). This battery (the Halstead–Reitan Battery; Reitan & Davison, 1974) began as a selection of seven tests chosen for their ability to best discriminate patients with frontal versus non-frontal or non-injured controls. Currently,

five of the original seven tests are typically administered to derive an Impairment Index (the proportion of scores in the impaired range), together with the Wechsler Intelligence scales, memory tests, and other tests of specific functions (Lezak, 1995: 709). The five tests include the Categories Test, the Tactile Perceptual Test, the Seashore Rhythm Test, the Finger Oscillation Test, and the Speech-Sounds Perception Test.

Halstead was fully aware of the view that prevailed in the 1930s (and well into the 1960s) that brain dysfunction is unitary (i.e. the notion of equipotentiality). Other tests sensitive to 'brain damage' were also available at that time. A well-known example is the Visual Motor Gestalt Test (Bender, 1938), now commonly referred to as the Bender–Gestalt test. Piotrowski might be credited with developing the first 'impairment index' when he stated (in reference to interpretation of responses to the Rorschach ink blot test) that, 'No single sign alone points to abnormality in the psychiatric sense, to say nothing of organic involvement of the brain. It is the accumulation of abnormal signs in the record that points to abnormality' (Piotrowski, 1937, cited in Lezak, 1995: 773). He considered five signs (out of the ten that he proposed) to be the minimal number needed to support an inference of brain damage, and noted that the number of signs increased with age. Halstead insisted on 'blind' administration of tests by trained technicians to ensure objectivity of results, although his qualitative observations were based on an impressive variety of sources. The use of cut-off scores (usually one and a half or two standard deviations from the mean, indicating impairment) and an Impairment Index (the number or proportion of tests on which the patient's score equals or exceeds the cut-off) as applied to the Halstead–Reitan battery (Reitan & Davison, 1974) attests to the influence of then prevalent theories of brain function on neuropsychological test interpretation. Nonetheless, both Halstead and later Reitan rejected the notion that brain function is unitary, based on the fact that patients with lesions in different areas produced different patterns of performance on the tests (Halstead, 1947; Reitan & Davison, 1974). Over time, there was recognition that identifiable neurological syndromes exist, and rather than apply a fixed battery of tests to everyone, regardless of the diagnosis, a flexible battery approach, espoused by Benton, in which standardized tests are selected to assess the functions most likely to be affected by the presenting conditions, has come to be preferred by the majority of clinicians in the United States.

Alternatives to the Psychometric Approach

The psychometric approach has not gone unchallenged. One of the pillars in the area of assessment in the USA, Anne Anastasi, expressed early concerns about the indiscriminate use of standardized assessment with diverse populations (Anastasi & Cordova, 1953). Further, the essential tenet of this approach is that 'the final solution to a problem, arrived at within a given time, is an objective measure of an underlying cognitive mechanism' (Kaplan, 1988: 129). A number of people have taken issue with such a premise, pointing to the multifactorial nature of the tasks used for assessment, and the various routes that an individual can take to reach a solution (e.g. Luria, 1966; Walsh, 1978; Kaplan, 1988). The score-based approach to assessment is quite different from an attempt to understand brain–behaviour relationships in terms of the way in which the organism or person interacts with the environment to attain a goal, regardless of the integrity of the nervous system. As early as the mid-1920s, Luria and his mentor Vygotsky in the USSR had decided that the best approach to understanding higher cognitive functions was two-pronged: to study their normal development on the one hand, and their 'decomposition' in brain-damaged individuals on the other. Vygotsky felt that the earlier work of the 19th century neurologists was limited by the absence of an adequate theory of psychology (Luria, 1979). Luria and his followers emphasized an analysis of performance based on the belief that behaviours are the result of functional brain systems that interact with each other. Thus, a function could be subserved by various subsystems, and difficulty in performing a task could be the result of a breakdown in any of those mechanisms. Conversely, compensatory routes engaging alternate subsystems can sometimes be utilized to achieve the same goal. This approach was particularly relevant to the rehabilitation of individuals who sustained

brain damage during World War II. Analysis of the compensatory strategies that are or can be brought into play to reach a goal (that is, an analysis of the different circumstances that elicit or inhibit a given behaviour) provides a basis for intervention that can enhance the individual's success. Largely for this reason, Luria's approach to neuropsychological assessment has been widely adopted in rehabilitation centres throughout the world (e.g. Caetano & Christensen, 1997). His work has had a wide-ranging impact in neuropsychological practices and assessment in many countries.

Evolving Procedures and Roles for the Neuropsychologist

Christensen (1978) attempted to systematize Luria's approach to testing in order to make his procedures more accessible to a wider audience and to present stimuli in a format and sequence consistent with Luria's conceptualization of cortical functions. In the United States, this approach was assimilated within a quantitative scoring framework by Golden and his colleagues, and is now known as the Luria–Nebraska Neuropsychological Battery (Golden, Purisch & Hammeke, 1985). This battery is rarely in use today, as it has been widely criticized on a number of both conceptual and methodological grounds (Lezak, 1995). The publication in 1976 of Lezak's *Neuropsychological Assessment* (now in its 3rd edition), which describes and reviews many tests, as well as syndromes, provided an important resource to the field. One of the legacies of Luria's conceptualization of a hierarchy of cognitive abilities has been the need to separate the impact of primary on secondary functions (e.g. the need to assess activation and attention as they relate to memory and other higher mental processes). An important distinction must be made, especially in clinical practice, between psychometric testing (which in many clinics is performed by technicians) and neuropsychological assessment (which involves the interpretation and integration of information regarding the patient). A comprehensive neuropsychological evaluation will, at a minimum, address basic attentional, linguistic, visuoperceptual and visuoconstructional, motor, learning and memory, calculations, sequencing, executive and emotional functions, social interactions, and problem-solving abilities. The importance of reviewing the records, obtaining a comprehensive history, family interviews, and an analysis of the person's goals and behaviour across different settings and over time, provide a more contextualized understanding of the individual as a whole, and better insights into how recommendations can be realistically formulated (Armengol, Kaplan & Moes, 2001). Attention to the role and possible impact on testing of medication, pain, physical limitations, and mental status (including neurovegetative functions such as sleep, appetite, sensorimotor changes, and mood) is essential.

Technological breakthroughs in the field of neuroimaging, specifically the advent of the CT scan in the early 1970s, and more recently with technologies that allow visualization of areas of brain activation (such as funtional Magnetic Resonance Imaging (fMRI) and PET/SPECT scanning), along with the availability of more sophisticated neuropsychological evaluation procedures in clinical settings, has gradually changed the focus and role of neuropsychological assessments. No longer is lesion localization the primary aim; rather, it has shifted in the direction of describing and understanding the functional consequences and rehabilitation implications of brain dysfunction. An important exception to this in the USA has been the area of forensic neuropsychology, where the focus continues to be on establishing the presence of structural brain damage following injury, with its functional and prognostic implications. This is particularly a concern in cases of minor head injury, where neuroimaging is likely to be unhelpful and where the potential for malingering is inevitably raised. This has led to interest in measures designed to detect deception (if only to be able to preemptively refute the assertion of malingering in the majority of cases), as well as an appreciation for the need to take into account the baseline incidence in the normal population of symptoms and patterns of test scores, in order to be able to establish the presence or absence of pathology.

In light of relatively new standards for presenting evidence in courtrooms (i.e. the Daubert rule of 1993), clinical neuropsychologists have had to rely on standardized instruments (rather than clinical experimental techniques) to document changes in functioning.

Over the years, within the experimental tradition of cognitive psychology, investigations of selective deficits in individuals with brain lesions led to the identification of discrete components of complex functions, as well as the development of ingenious and elegant laboratory procedures to demonstrate disconnections, levels of processing, and double dissociation of functions (e.g. Warrington, 1982; Shallice, 1988; McCarthy & Warrington, 1990; Gazzaniga, 1995). Experimental paradigms that have been used with lesioned non-human animals have also been applied in research and clinical settings to see if brain–behaviour relationships established for other species can be successfully applied to the study of humans. A good example is the use of delayed object alternation tasks with individuals who have sustained prefrontal damage (e.g. Oscar-Berman, McNamara & Freedman, 1991).

Current Trends

Edith Kaplan, who was trained by the developmental psychologist Heinz Werner, has formulated and championed a process approach to neuropsychological assessment. 'For Werner (1956) every cognitive act involves "microgenesis" (i.e. an "unfolding process over time"). Thus close observation and careful monitoring of behaviour en route to a solution (process) is more likely to provide more useful information than can be obtained from right or wrong scoring of final products (achievement)' (Kaplan, 1988). The Boston Process Approach, as it is known, attempts to bridge the case study method (grounded in an understanding of neuropsychological syndromes) developed by Luria on the one hand, and the focus on the need for replicable, empirical, and normatively standardized data on the other. This has been pursued in several ways. Following up on developments in cognitive neuroscience, new tests such as the California Verbal Learning Test (Delis et al., 1987) and the Delis–Kaplan Executive Function System (Delis, Kaplan & Kramer, 2001) were developed to better assess aspects of learning and executive function which are found to differ among patients with different neuropsychological disorders. This approach has also included (a) the addition of standardized procedures to existing tests to assist in clarifying the process underlying a patient's response (e.g. the Weschler Adult Intelligence Scale as a Neuropsychological Instrument or WAIS-RNI, and the Wechsler Intelligence Scale for Children as a Process Instrument or WISC-III PI); (b) the addition of new indices to score existing data that allow for better capture of relevant process variables (e.g. new methods to score the Rey–Osterrieth Complex Figure drawings, as developed by Stern et al., 1995); and (c) a conceptual reanalysis of performance on existing tests based on alternative theoretical models (see Poreh, 2000 for examples of this last approach). Poreh (2000) refers to this new trend as the 'Quantified Process Approach'. One of the potential advantages of computerized approaches to assessment is the ability to capture sequential qualitative aspects of performance, although this potential remains largely unfulfilled at this time.

FUTURE PERSPECTIVES AND CONCLUSIONS

Neuropsychological assessment is central to attempts to understand the biological bases of behaviour. Even as our technology becomes more sophisticated and we unravel genetic codes, behavioural functions must be mapped, and behavioural and cognitive markers for particular syndromes and disorders become more relevant. Structural and functional in vivo neuroimaging techniques provide exciting opportunities to examine patterns of brain activation during the performance of tests and induced psychological states. Neuropsychological assessment must keep pace with the new demands imposed by technological advances and limitations. Tests adapted for presentation during fMRI are good examples of the latter (e.g. Whalen et al., 1998). In the immediate future, the greater use of computerized technologies will open possibilities for more naturalistic assessment, the evaluation of more complex behaviours, and the ability to collect a wide sample of measures, including the incorporation of physiological measures, concomitantly with performance of various activities. One area with particular promise for assessment and rehabilitation is the developing field of virtual reality (Riva, 1997). Neuroimaging has also permitted an analysis of brain functioning in individuals who differ in terms of the ecological

demands placed upon them, such as illiterates and bilingual subjects (e.g. Castro-Caldas et al., 1998). The finding that structural and functional differences emerge under different environmental circumstances reinforces the need to take into account issues relating to ecological validity. That is, tests that have been developed for one population may have limited validity when administered to a different population (this certainly applies to populations in different stages or trajectories of development). Similarly, results that are obtained under one set of circumstances (e.g. the clinic or research laboratory) may not generalize to other, more typical daily tasks and situations. Clearly there is much work to be done in this area.

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RELATED ENTRIES

MEMORY DISORDERS, VISUO-PERCEPTUAL IMPAIRMENTS, EXECUTIVE FUNCTIONS DISORDERS, VOLUNTARY MOVEMENT, EQUIPMENT FOR ASSESSING BASIC PROCESSES, NEUROPSYCHOLOGICAL TEST BATTERIES, OUTCOME EVALUATION IN NEUROPSYCHOLOGICAL REHABILITATION

APPLIED FIELDS: ORGANIZATIONS

INTRODUCTION

Psychologists interested in describing, diagnosing or changing organizational behaviour are compelled to assess psychological properties of organizations at some stage of their work. It is for this reason that, as in other applied fields, multiple approaches and techniques concerning psychological assessment have been developed and used in organizations. This entry aims to describe a multilevel psychological assessment, adopting a social systems perspective. To this end, we define psychological assessment of organizations, analyse how it is implemented at different levels, and present future perspectives.

CONCEPT AND OBJECTIVES OF ORGANIZATIONAL ASSESSMENT

Psychological assessment of organizations refers to the measure of human behaviour in organizations using scientific instruments. The primary objective of this assessment is to describe the organization as an individual and collective behaviour system accurately. However, psychological measures should be also relevant in terms of practical implications, serving the purpose of helping managers and other members of the organizations to make decisions.

Traditionally, psychological assessment in organizations has been restricted to the measure of individual differences, implicitly assuming that organizational effectiveness is the result of the aggregation of the psychological characteristics of individuals. This individual level of analyses, however, is limited and the measurement of the work group and the organization as a whole offer a complementary and more comprehensive assessment. Psychological properties exist at different levels of analyses and all of them contribute to the effectiveness. Thus, a multilevel assessment is needed in obtaining a deeper description of the organizations.

MAIN TOPICS IN PSYCHOLOGICAL ASSESSMENT AT DIFFERENT LEVELS OF ANALYSES

The Individual Level

There is a persistent interest in the study of individual experiences in organizations and continuously there are emerging topics and controversies (Nord & Fox, 1996). Personality, cognitive, affective, and behavioural variables have been assessed during decades. With this in mind, the most relevant issues currently associated with the measurement of individuals in organizations are summarized in this section.

Personality

Individuals can be characterized by a number of enduring dispositional properties, which help to understand people's behaviours in organizations. One of the most popular methods of assessing personality is derived from the big five theory. Through self-report inventories, five dimensions of personality are measured: (1) extraversion; (2) emotional stability; (3) agreeableness; (4) conscientiousness; and (5) openness to experience. Several authors prefer the use of a composite of several big five constructs, labelled integrity test, because this broader measure can be more reliable in predicting overall job performance. However, narrower trait constructs can show better prediction of specific job performance criteria within specific occupations (Gatewood, Perloff & Perloff, 2000).

Knowledge, Abilities and Skills (KASs)

KASs are defined, respectively, as the amount of factual information known by an individual, his/her conduct of job specific activities, and his/her conduct of generalized job activities. With respect to the abilities, different goals are associated with the measure of general mental ability or 'g' versus specific abilities. Although there is some consensus about the predictive efficiency of the 'g' factor, measures of specific abilities tend to be more useful when the goals are understanding people's behaviours or their classification. Given that abilities, as they are measured by aptitude tests, refer to a wide and general range of human experiences, more circumscribed measures of skills and knowledge have been developed in order to improve the validity of measures. This is the case of interpersonal skills, which are especially critical in customer service jobs, work groups, and leadership. Also, job knowledge and tacit-knowledge measures are closely related to specific job performance criteria. For instance, subjects can be exposed to a job-related situation, and their capabilities to solve problem situations can be measured through assessment centre procedures.

Individual Performance

Production (e.g. quantity) and other employee behaviour records (e.g. absenteeism) are used as objective direct or indirect measures of individual performance. Also, subjective evaluations from individuals familiar with the work of the focal person are considered (e.g. 360° feedback). These performance indicators are the result of task and contextual performance. The first is defined as the proficiency with which subjects perform core technical activities of well-defined jobs. Thus, cognitive abilities are relevant for predicting task performance. In contrast, contextual performance is defined as extra-task proficiency that contributes more to the organizational goals, including aspects such as enthusiasm and volunteering to make duties not formally part of one's job. It is assumed that personality variables are critical for predicting contextual performance criteria (Arvey & Murphy, 1998).

Work Attitudes

Work attitudes are defined as positive or negative evaluations about aspects of one's work environment (O'Reilly, 1991). The most common constructs measured by attitude instruments are job satisfaction, commitment, involvement, and stress. Satisfaction refers to a emotional state resulting from job experiences. The questionnaires used to measure job satisfaction can be classified in two groups: measures of overall satisfaction and measures of satisfaction with specific aspects of the job (Peiró & Prieto, 1996). The most frequently measured facets are satisfaction with pay, promotion, supervision, and job content (Gatewood et al., 2000). With regard to commitment, there is no generally accepted definition and measurement. While affective commitment measures include aspects such as loyalty towards the organization,

the effort to achieve organizational goals, and the acceptance of organization's values, continuance commitment measures are related to the personal sacrifice associated with leaving the organization and the perceived employment alternatives. Finally, another measure of work attitudes refers to the degree to which the job experiences are perceived as stressful. However, caution is needed because self-report measures of stress may be easily inflated by the person's disposition toward negative affectivity (O'Reilly, 1991).

The Group Level

The work group consists of individuals who see themselves and who are seen by others as a social entity, who are interdependent because of the tasks they perform as members of a group, who are embedded in one or more larger social systems (e.g. organization), and who perform tasks that affect others (Guzzo & Dickson, 1996). Psychological assessment at group level is primarily focused on three aspects: design, processes, and performance.

Group Design

Although a good group design cannot guarantee a satisfactory group functioning, it is necessary to facilitate competent group behaviours. It is for this reason that group design should be measured and controlled. Of the different facets of group design (structure of task, group composition, and establishment of norms), composition of group has received increasing attention, especially heterogeneity (Guzzo & Dickson, 1996). Group heterogeneity refers to the mix of abilities, personalities, gender, attitudes, background, and demographic characteristics. In order to work effectively, a 'right mix' of group members is needed. Efforts have been devoted to assess the right mix of members in terms of abilities and personality (West & Allen, 1997). It is the case of 'skill mix', particularly popular within teams in health service settings, which refers to the efficient balance between trained and untrained, qualified and unqualified, and supervisory and operative staff. Also, personality compatibility can be measured. For instance, according to Schutz's theory of fundamental interpersonal relations orientations (FIRO) there are three basic needs expressed in group interaction: needs for inclusion, control, and affection. A compatible balance of initiators and receivers of control, inclusion, and affection characterize effective groups.

Group Process

It is generally assumed that, in addition to group design, the process of interaction among group members affects the effectiveness of the group as a whole. As Hackman (1987) pointed out, assessing group process can pursue different goals. A trained observer can focus on the interpersonal transactions that reflect conscious and unconscious social and emotional forces (e.g. who is talking with whom). Group process assessment can also be focused on the issues of interaction directly related to work of group on its task (e.g. the degree to which knowledge and skill members are used). Group interaction can result in 'synergy'; that is, outcomes that are different from those that would be obtained by simply adding up the contributions of individuals (Hackman, 1987). Synergy can be positive (e.g. a very creative solution of a job-related problem) or negative (e.g. a severe failure of coordination). In general, different methods can be used to assess group process. It is the case of some assessment centre techniques (e.g. simulation), where real job tasks are represented and a group of individuals is assessed by a group of judges.

Group Performance

Three criteria are typically used to measure group performance: (1) group-produced outputs, (2) the influences of group for its members, and (3) the state of the group as a performing unit (see Guzzo & Dickson, 1996; Hackman, 1987). Although some objective indicators of group outputs can be measured (e.g. quantity), objective criteria are only available for a restricted number of work groups in organizations. In general, the assessment from others (e.g. a manager) is more critically associated with the consequences for a group and its members than objective measures. It is for this reason that there is a tendency to assess outputs in terms of satisfaction of the standards of the people ('clients') who receive and/or review the output. The second measure is related to the impact of group on individuals. It is assumed that the cost of generating group outputs is high if its members are dissatisfied. Accordingly, the degree to which the group

experiences satisfy the needs of group members should be also assessed. The third measure reflects the probability that a group performs effectively in the future. Although the present outputs of a group can be satisfactory, it is possible that the social processes by which these outputs are obtained hamper the group as a performing unit, and its members are not willing anymore to work together on future tasks.

The Organization Level

Individuals and work groups are embedded in a more general organizational system that can be measured itself. Psychological properties of organizations as a whole, such as culture, climate, and performance, can also be assessed.

Culture and Climate

Although culture and climate have been sometimes used as synonyms, they refer to different concepts. As Schneider (1985) pointed out, culture is a deeper construct than climate has been. While organizational climate is defined as the shared perceptions of employees related to the practices, procedures, and behaviours that are rewarded and supported in an organization, culture refers to the beliefs, norms, and values underlying the policies and activities, as well as the manner in which the norms and values systems are communicated and transmitted. Consequently, the modes by which culture and climate are assessed are also different. Culture is usually measured by using qualitative and case study methodologies. In contrast, the survey approach is the dominant method in measuring climate (Schneider, 1985).

Organizational Performance

Financial performance and productivity are considered as the typical measures of organizational performance as a whole. In addition, other measures associated with customer responses of satisfaction and perceived quality have received increasing attention. While economic measures of performance reflect quantity of outputs, psychological measures of customer evaluations refer to quality of outputs as they are perceived by the customer (Fornell, 1992). Psychological measures offer information that is not included in current-term financial measures (Aaker & Jacobson, 1994). In the absence of alternatives, short-term financial gains are usually used as indicators of long-term prospects. However, the strategies devoted to increase long-term performance often diminish short-term earnings. The myopic management style, focused on short-term gains, can be corrected by considering non-financial measures. In fact, the measurement of customer perceptions of product quality is able to predict information concerning long-term competitiveness that is not captured by short-term financial measures (see Aaker & Jacobson, 1994).

FUTURE PERSPECTIVES

An Integrated Assessment of Organizations

In the preceding discussion, we have analysed how the psychological assessment is implemented at different levels of organizations. However, a more integrated perspective can be considered where the different levels of analyses are interrelated showing complex interactions. Herriot and Anderson (1997) proposed that the relationships between measures at individual, group, and organizational levels of analyses could show three kinds of patterns: complementary, neutral, and contradictory. The complementary interaction is observed when a high score at one level of analysis is desirable in combination with a high score at another level (e.g. when high interpersonal skills are required for both individual work and group working). The neutral interaction occurs when a high score on a construct is desired at one level and, simultaneously, it is not applicable at another level of analysis (e.g. when interpersonal skills are required for group working, but they are not related to individual performance). Finally, the contradictory interaction is observed when a high score at one level of analysis is desirable in combination with a low score at another level (e.g. when extraversion is desirable for team working, but introversion is positively related to individual performance). Because of its relevance to research and management, future efforts are needed in developing and testing these kinds of approaches. An integrated assessment is able to describe an organization more accurately, given that it serves to diagnose their complex and contradictory character.

Links between the Context of Organizations and Psychological Assessment

It is generally assumed by managerial orientations that organizations are free in order to design and implement practices and policies (see Morishima, 1995). However, the external context of organization impacts on the organizational choices, including the type of procedures and techniques used in the psychological assessment. For instance, Rousseau and Tinsley (1997) suggested that the culture of a country (e.g. in terms of individualism vs. collectivism) can be related to the appropriateness of individual versus group measures of performance, as well as to the emphasis on individual-job versus individual-organization or work-group fit measures. Also, Herriot and Anderson (1997) indicated that organizations are now subjected to an environment that changes with an increasing speed and unpredictability. In this context, organizations emphasize the psychological assessment related to employee flexibility, personality, and potential to innovate. Additionally, it is also likely to expect that, in some circumstances, organizations impact on their external context. For instance, organizations can demand an education system in which certifications are highly job-related, given that this type of education can facilitate the measurement and the managerial decisions (e.g. in a selection process). Thus, reciprocal influences between organizations and their contexts can be studied in the future. A contingency approach can be proposed where the psychological assessment depends on the characteristics of external contexts and the nature of the relations between these contexts and organizations.

The Political Face of Psychological Assessment in Organizations

Research and practice in organizations espouses a rational perspective in understanding psychological assessment. Organizations are often defined as rational and efficiency-seeking systems, and managers use psychological assessment in order to achieve valued organizational outcomes. However, their political 'face' should also be considered. Following this perspective, the organization is seen as a political system with competing groups and interests, each with its own perceptions of organizational realities. The political face is not everything, but it serves to understand some events related to psychological assessment. Additionally, the ignorance of power in organizations can result in managerial failures and incomplete assessment at different levels of analyses. For instance, there is not only a dominant culture in organizations but also 'countercultures' that reflect alternative values. Usually, individuals and work groups that have values and perceptions congruent with those of organizations, especially with the top-management group, also have more power and influence (Friedlander, 1987). Accordingly, it is reasonable to expect that divergent thinking will not be reflected in the measurement of culture. Also, psychological assessment is likely to be used to reinforce and justify the values and perceived tasks of the dominant coalition. Powerful coalitions act within their own reality, which is not necessarily better than other realities constructed within the organization as a whole. Alternative cultures can reflect adaptive values in terms of initiative and creativity. The ignorance of these cultures has contributed to long-term disasters in many companies (see Dachler, 1989). Thus, more effort is needed in order to include the diversity of organizational 'cultures' in psychological assessment, as well as in studying the impact of power forces and power games on measurement decisions at different levels of analyses.

CONCLUSIONS

A multilevel psychological assessment has important potential benefits. Using this perspective, the great complexity of organizations is diagnosed, given that the organization is considered as an open social system with different measurable subsystems. Psychologists can focus their psychological assessment at different levels of analyses. Thus, this perspective serves to consider both the micro domain's focus on individuals and groups and the macro domain's focus on the organization as a whole.

Additionally, the multilevel psychological assessment is enriched if three complementary perspectives are also incorporated in the future. First, a more integrated assessment can be considered, assuming that constructs measured at different levels of analyses can show complex, even contradictory, relationships. Secondly, there is a need to

study the reciprocal influences, in terms of psychological assessment, between organizations and their external contexts. Finally, the political face of organizations should be measured and analysed in order to obtain a richer portrait of psychological assessment in organizations.

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José Maria Peiró and Vicente Martínez-Tur

RELATED ENTRIES

Organizational Culture, Leadership in Organizational Settings, Observational Techniques in Work and Organizational Settings, Risk and Prevention in Work and Organizational Settings, Self-Reports in Work and Organizational Settings, Centres (Assessment Centres), Applied Fields: Work and Industry

APPLIED FIELDS: PSYCHOPHYSIOLOGY

INTRODUCTION

The major focus of this entry will be to provide a clear rationale for the application of psychophysiological approaches and methods to areas of applied psychology. We will examine the reasons for their application, the psychological constructs and processes to be assessed, the methods employed, and specific issues concerning applied uses of these techniques. Specific guidance on psychophysiological recording has been dealt with elsewhere, together with entries on brain

activity and ambulatory monitoring. For background reading and a general reference source, Cacioppo, Tassinary and Berntson's *Handbook of Psychophysiology*, 2nd Edition (2000) is recommended. Other useful introductory texts include Caccioppo and Tassinary (1990), Hugdahl (1995) and Stern, Ray and Davis (1980).

DEFINITIONS AND CONSTRUCTS

Psychophysiology can be loosely defined as the study of psychological constructs and processes using non-invasive physiological measures (see Cacioppo, Tassinary & Berntson, 2000; Turpin, 1989). Traditionally it is distinguished from physiological psychology by emphasizing the importance of studying the intact and conscious organism, usually in the absence of invasive techniques, which might disrupt and limit consciousness or behaviour. As such, the usual domain of psychophysiology has been the measurement of peripheral autonomic and central cortical measures within human participants studied whilst engaged in psychologically relevant tasks or natural situations. In contrast, physiological psychology has tended to use animal subjects and to measure invasively, usually directly from the nervous system, using implanted electrodes, and frequently employing invasive manipulations such as lesioning, infusion of pharmacological agents, direct stimulation etc. More recently, these boundaries have become less distinct since physiological psychology has been incorporated within the greater multidisciplinary arena of neuroscience, and psychophysiology has been extended by more direct but still non-invasive measures of brain activity and structure such as functional imaging, dense array electroencephalography and magnetography (see Cacioppo et al., 2000). Nevertheless the cardinal features of psychophysiology as being the study of psychological processes, largely from human participants and using non-invasive physiological measures, are central to the successful application of the discipline to more applied areas of study.

APPLIED PSYCHOPHYSIOLOGY

Psychophysiology has always been essentially an applied discipline since its identity has been very much to do with the measures employed and their various applications. Recently, Cacioppo et al. (2000) described this as systemic psychophysiology, which refers to the study of the various physiological systems (i.e. electrodermal, cardiovascular, cortical etc.) with respect to measurement, quantification and their relationships to psychological processes and paradigms. Much psychophysiological research has been methodologically focused in validating either specific physiological measures or their use as indices of psychological constructs. Subsequently, these measures have then been applied to theoretical questions derived from other branches of psychology including both fundamental and applied research. Traditional areas of application have included psychopathology research and the search for physiological markers of psychological disorder, as well as the development of clinical assessment and outcome measures (Keller, Hicks & Miller, 2000; Stoney & Lentino, 2000; Turpin, 1989). The measurement of stress and cognitive performance using psychophysiological parameters has also meant that these techniques have been used extensively within human factors and ergonomic research (Kramer & Weber, 2000). Other applied areas where psychophysiological approaches have been adopted have included attitude measurement, applied developmental psychology, environmental and specific polygraphy (i.e. lie detection) applications (Cacioppo et al., 2000).

What are the benefits of using psychophysiological approaches? The answer lies in the range of psychological constructs and paradigms for which psychophysiological indices or measures have been derived. Cacioppo et al. (2000), in addition to describing 'systemic psychophysiology', also identified 'thematic psychophysiology' which describes topical areas of psychophysiological research. They cited the following examples: cognitive psychophysiology (human information processing and physiological events); social psychophysiology (reciprocal relationships between social systems and physiology); developmental psychophysiology (developmental and ageing processes); clinical psychophysiology (study of disorders); environmental psychophysiology (person–space interactions); and applied psychophysiology (psychophysiological technologies such as biofeedback, lie detection, man–machine instruction etc.). These topics are

exhaustively covered within their handbook. Similarly, we can identify at a more detailed level a myriad of psychological processes and constructs (e.g. attention, attitudes, emotion, memory consolidation) for which there are claimed to be psychophysiological indices or correlates (see Hugdahl, 1995). For example, a class of evoked potential measures of brain activity called the 'P300' is said to be associated with a variety of psychological processes surrounding stimulus evaluation, categorization and context updating (Donchin & Coles, 1988). Similarly, evoked potential Mis-Match-Negativity (Näätänen, 1992), cardiac deceleration (Graham, 1979) and the electrodermal response (Siddle, 1983) have all been associated with the detection of mismatches due to changes in stimulus novelty or significance.

It is apparent that psychophysiological correlates exist for a wide range of psychological constructs. The question, therefore, arises as to what advantages psychophysiological assessments present with respect to performance or self-report measures. It is claimed that psychophysiological measures have the following advantages: they are objective and free of either subjective or observer bias, they are continuous and unobtrusive measures, they can accurately indicate the timing of psychological events, and they may indicate the nature of mechanisms underlying the brain–behaviour relationships under study. Within an applied setting, many of these advantages become even more important. The ability to obtain objective and continuous measures which do not require either self-report or observation means that physiological measures indicating psychological changes in either state or processes may be studied in difficult or inaccessible environments. These could range from space flight to studying arousal processes in married couples during naturalistic social interaction (Gottman & Levenson, 1992). The emphasis on objective versus subjective report also means that data may be obtained from individuals with communication difficulties either due to cognitive impairment or age and temperament. Indeed, with respect to many psychological processes, it is argued that a comprehensive understanding is not possible without recourse to physiological measurement. Lang's classical work (Lang, 1968; Turpin, 1991) on the measurement of anxiety and the three systems approach which utilized behavioural, cognitive and physiological approaches is a prime example of this argument. Moreover, there may be situations where systematic biases might be introduced with respect to self-report (i.e. forensic settings) where the assessment of 'truth and honesty' (i.e. lie detection) or the presentation of certain disorders (e.g. Post-Traumatic Stress Disorder) are claimed to be more accurately assessed using psychophysiological techniques. This raises the interesting question as to how objective psychophysiological indices truly are and whether they themselves can be subject to conscious manipulation and bias (Iocano, 2000).

Doubts concerning objectivity are not the only disadvantages to be considered when adopting psychophysiological techniques. Whether claimed psychophysiological indices of putative psychological constructs are either reliable or valid may also be subject to challenge. With respect to reliability, psychophysiological measures might be heavily influenced by the setting and situation in which they are obtained. This may give rise to problems of generalizability, if care is not taken to carefully standardize methods, settings, paradigms and materials. Reported test–retest reliabilities vary considerably across different psychophysiological indices (Strube, 2000). Similarly, due to the practical constraints of assessing large numbers of individuals, standardized norms for psychophysiological measures are few and far between. This provides very definite psychometric limits to the application of psychophysiology to the single case.

Specific psychophysiological theories are also limited and measures are usually interpreted within the context of other theoretical frameworks from cognitive psychology and elsewhere. Sometimes this results in psychophysiological measures having particular interpretations, which are assumed rather than empirically based. An example being whether cardiac deceleration, a common psychophysiological response, should be interpreted as an index of the orienting response, the detection of stimulus novelty or merely just stimulus registration (Ohman, Hamm & Hugdahl, 2000). Similarly, psychophysiological constructs can persist even though their empirical basis may be either insubstantial or even contradictory. Perhaps the best example, and one which is commonly used within applied settings, is the notion of arousal.

Arousal is still used as a major explanatory concept in many applied social and clinical settings despite much psychophysiological research, which has been deeply critical of the construct (Gardener, Gabriel & Diekman, 2000; Turpin & Heap, 1998). This can lead to major problems regarding interpretation and construct validity.

Finally there are issues to do with practical utility. Psychophysiological measures usually require complex electronic machinery for physiological measurement, sophisticated computer software for data acquisition and analysis, laboratory environments and trained technicians. These resources are expensive and may not be widely available. Furthermore, the reliance on laboratory settings may also preclude many applied settings. Consequently, many recent applications have relied on the development of ambulatory methods.

Applied Constructs and Uses

As discussed above, there are a wide range of potential applications for psychophysiological measures and approaches. Within the space limitations of this entry it is impossible to present even an overview of different types of applications. However, we will describe some recent examples. Before doing so, a distinction perhaps needs to be made between applied research and research in applied settings. Much psychophysiological research is geared to applied questions relating to psychological understanding of important issues such as health and disease. However, this tends to be laboratory-based experimental research and is directed at using psychophysiological measures to seek answers to fundamentally theoretically relevant questions but with consequences for applied areas. For example, there has been an impressive growth in studies employing the potentiated startle paradigm as a method of assessing emotional valence, and anxiety in particular (Lang, Bradley & Cuthbert, 1990). At a theoretical level, this research has increased understanding of how fear cues are processed at both conscious and pre-attentive levels, and the possible neural substrates underlying some of these mechanisms (Lang, Davis & Ohman, 2000). The question arises, therefore, whether these techniques can be transferred into an applied setting and used for more practical purposes. Could measures of potentiated startle be used to discriminate between different diagnostic groups of anxiety disorders, could they accurately track response to treatment and indicate therapeutic outcomes and gains? Unfortunately, there are in reality few areas of psychophysiology which are used routinely in professional psychology practice. Perhaps the only real examples are biofeedback treatments and polygraphy. Nevertheless, major areas of psychophysiological endeavour such as evoked potential research influence practical applications in other areas such as clinical neurology or audiometry.

Common clinical research applications of psychophysiological measures have been as measures of attention within schizophrenia: these have included electrodermal measures of orienting, P300 type event-related potentials (EP) and early sensory gating EPs (see Chapter by Miller et al., in Cacioppo et al., 2000). Recent applications of dense array EEG have looked at lateral distribution of brain activity, especially over prefrontal cortex and its relationship to affective processing and depression (Davidson, 1992). Anxiety disorders research has focused on the potentiated startle paradigm (Lang et al., 1990), as described above, together with studies of autonomic balance within Generalized Anxiety Disorders (Thayer & Lane, 2000). Therapeutic applications of psychophysiology continue in the form of studies of relaxation and meditation (Turpin & Heap, 1998) and biofeedback (Schwartz, 1995).

Psychophysiological studies within the discipline of health psychology continue to examine mechanisms underlying cardiovascular disease (Stoney & Lentino, 2000). Studies aimed at assessing cardiovascular reactivity to psychologically challenging events continue to be performed (e.g. Fredrickson & Matthews, 1990). A particular focus is the relationship between laboratory-based studies and ambulatory-monitoring based studies of reactivity. Psychophysiological measures have been particularly adopted to assess the role of stress in contributing to the aetiology and maintenance of common physical conditions. In addition to the usual autonomic measures such as heart rate and blood pressure reactivity, many studies examining 'stress' exploit techniques from psycho-immunology and endocrinology: using biochemical assays of immune or hormonal status (Uchino, Kiecolt-Glaser & Glaser, 2000).

Human factors psychophysiology has traditionally examined problems such as assessing alertness and sleep quality, mental workload and performance, and man–machine interactions. A full range of measures have been employed including endocrinological assays (Lovallo & Thomas, 2000) to evoked potential applications to man–machine interactions. Spectral analysis of physiological parameters over extended periods of time or different activities is a technique frequently employed in ergonomic applications. Mulder (1992), in particular, has exploited measures of heart rate variability to assess attentional and workload factors.

CONCLUSIONS

Psychophysiology has a long tradition as being used within applied settings. Advances in technology have broadened the range of settings in which psychophysiological measures can be obtained. Developments in neuro-imaging (e.g. Reiman, Lane, Van Petten & Bandettini, 2000) also mean that psychophysiological techniques can now address exciting questions of functional brain–behaviour relationships. Hopefully, these techniques will be extended so as to include more applied questions and applications.

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Graham Turpin

RELATED ENTRIES

Ambulatory Assessment, Anxiety Assessment, Anxiety Disorders Assessment, Psychophysiological Equipment and Measurements, Brain Activity Measurement, Equipment for Assessing Basic Processes, Applied Fields: Health, Applied Fields: Clinical

APPLIED FIELDS: WORK AND INDUSTRY

INTRODUCTION

Very broadly, one might say that wherever people are busy there is a chance and a need for psychological assessment. However, it is impossible to name all fields in work and industry which are open for psychological assessment. The psychological assessor just has to look at the world of work and industry around him in order to find out what he might contribute. This may be done in terms of theories and constructs which allow evaluations of work and industriousness, by instruments which operationalize constructs and measures that are reliable and valid or in terms of methods, designs, and results to present to a customer or a team of experts.

One approach to systematize assessment in applied fields in general, and of work and organization in particular, is to take an Individual, Group, or Organizational perspective.

INDIVIDUAL PERSPECTIVE

Starting with assessing the individual within a company or an organization one might question 'what, when, what for': of course, psychological assessment is of interest in order to learn more about the individual's strengths and weaknesses, about his attitudes and beliefs, and about his competencies and potentials. Here, methods used in mental tests, reaction time studies, occupational personality scales (Ones & Viswesvaran, 2001), motivation scales, and opinion questionnaires are called for. The aim is to describe a person as fully as is needed to evaluate on how she or he will do (well)

on a prospective job. Thus data at job entry are used to forecast the 'zone of proximal development' of an applicant. One has to recognize (see Furnham, 2001) that an individual:

- *chooses* a job based on pay, location, job security, and training based on his personality traits, attitudes, and values
- *adapts* to a job out of necessity, insight, motivation
- *changes* a job by altering the physical and social environments
- *evolves* with new technology, markets and global requirements according to what he understands are necessary requirements in the future.

All this is open for assessment. But assessment of an individual does not stop at job entry. Any job confronts incumbents with a variety of minor and major challenges. One of these is to learn to function well at a certain position. Thus learning gains or developing several competencies are of interest to assessors. Assessment results lead to improvement of the interaction with the individual and the work place by considering human factors for improved functioning, by motivating the individual, by designing up to date remuneration schedules, by considering aptitude treatment interactions in designing effective training programmes, by monitoring communication and coordination with others, by communication and coordination programmes, to name but a few.

A new aspect for assessment emphasizes licensing professionals as an aspect of overall quality assurance in production and service. Companies may want coworkers who have knowledge, skills, and competencies to deal with their products within the company itself but, even more important, they want this at all customer sites. The service person for a database product of a regional bank may create quite a loss if a new programme release is not handled with care. This is part of the liability movement in modern societies which assures that products and services do not do any harm to others. Here, with each new product and each new service, there has to be a model of proper use and a contingent assessment of its components. So assessment takes place in regard to accreditation and licensing.

During a person's professional life there are numerous occasions to assess what an incumbent's profile of competencies is like, or to find out about the set of strengths and weaknesses in order to assign someone to a proper position for the sake of himself and the benefit of the organization. Placement decisions should be based on sound assessment data.

Even at the end of a career, assessment may help to find a new position outside the organization by means of outplacement or early retirement plans. One might also have to look at the loss or weakening of competencies and skills over time and find means and measures to decide about rehabilitation programmes. Here, it is of interest what residual competencies are available, to which degree, and how they should be built upon in a rehabilitation training.

Seen as such, psychological assessment is a work-life-long companion activity which serves the individual and the organization in order to fruitfully monitor the interaction between both of them. The psychological well being of the individual is a target as is the reasonable use of his forces at work. Assessment emphasizes prerequisites to job demands, trainings, and personality developments (Roberts & Hogan, 2001). However, it also emphasizes effects of all the aforementioned after a new job was assigned, a training was accomplished, and a personal challenge was taken. Assessment data are vital to human resource management and thus have to be valid, reliable, and objective in the first place to sustain all personnel decisions that are taken.

GROUP PERSPECTIVE

Assessment at the group level is mainly oriented towards productivity, conflict resolution, good communication, and coordination. One may want to look at the social functioning of a team by means of a sociogram (Moreno, 1951; see entry on Sociometric Methods), by means of interaction analysis (Bales, 1950, SYMLOG), by means of a questionnaire about role ambiguity (Rizzo et al., 1970), or by observation studies in an obtrusive or non-obtrusive manner (Putnam and Jones, 1982).

Some assessments are status oriented and should allow judgement on what are the prevailing attitudes or obstacles in group life in order to go from there to improve it. Actions may involve changes in group memberships, group trainings, or re-groupings at large.

More of a process-oriented approach is called for if monitoring of actions is of interest. Longitudinal assessment data are needed to describe what changes take place in a group and explain why these changes occur. Cross-sectional data reveal how different groups develop independently from each other. Harrison and Shirom (1998: 161) present some key group factors: (1) Group Composition, Structure and Technology like nationality mix, divergence of professions, decision procedures, control procedures like evaluation, comprehensiveness of controls, and (2) Group Behaviour, Processes, and Culture like relations among members, reward types, direction of information flows, openness, decision making, supervisory behaviour (supportiveness, participation, goal setting, performance expectation, conflict management).

Topics may range from modern shift systems, remuneration schedules, new production techniques, new forms of cooperation and coordination, integrating minorities, client centredness of work, quality assurance at each production step, self-organization of the team, group cohesion, role conflicts/clarity, mobbing propensity, coworker–supervisor relationship, learning needs. This list is by far not complete but it displays minor and major topics which may be subject to an in-depth assessment. Practical problems are closely linked to some kind of sometimes political action on behalf of the management and the labour union representatives.

ORGANIZATIONAL PERSPECTIVE

Organizational assessment is by far more macroscopic than the foregoing two approaches (see Harrison & Shirom, 1998). First, it has to be defined: what is the organization under scrutiny? Some of them are small shops in a small region and others are global players operating on quite diverse markets. Second, the perspective may change if one considers an organization from within, its inner dynamics, its members, in contrast to considering clients, suppliers, and organization members at the same time.

In order to assess, i.e. describe, an organization's climate, for example, quite different actions have to be taken. One has to look at what attracts people to an organization, what keeps them within, and what are the typical characteristics of those who are there for a given time (Schneider, 1987). So even for personnel marketing and in recruitment campaigns one may want to use self-assessment instruments. Pritchard and Karasick (1973) provide a scale with eleven dimensions like Autonomy, Conflict vs. Cooperation, Social Relations, and Structure, to name but a few. Based on this and other research, James and James (1989) provided a model which emphasizes (1) role stress and lack of harmony, (2) challenge at work and autonomy, (3) facilitation by leadership and support, (4) cooperation, friendliness, and warmth in a team. As Weinert (1998) points out these factors are related to roles, leadership, and teams.

Organizational culture (Schein, 1985; see entry on Organizational Culture), an adjacent construct, emphasizes common shared values, norms, goals, beliefs, and perspectives. Thus here the scope is on meaning, intentions, purpose of work and tasks, as well as on methods to achieve organizational essentials and underlying norms and values in all what members do. Artefacts and behaviour patterns are far more visible than beliefs, cognitions, and basic assumptions within a company. Sackman (1992) referred to cognitive orientations as part of organizational culture and identified four forms:

- dictionary knowledge – definitions of labels and definitions
- directory knowledge – assumptions of how common practices work and what are presumably causal relations
- recipe knowledge – prescriptions for improving remedy processes or urgencies
- axiomatic knowledge – about nature of things and why events occur.

The reasons for an assessment are manifold, too. There may be a constant interest in changes of the organization, a need to assess the organization prior or as a consequence of a re-organization, an in-depth view of what

merging with another company had as an effect, to assure that new products and production techniques are adopted by the workforce, to find out how new markets would affect the members, and what challenges are perceived in the light of new clients. The scope is always to find out something about the organization as a whole. Most of this will be assessed by means of questionnaires, but some is discernible by interviews, observation, or unobtrusively browsing through documents, self-reports, marketing material, and guidelines. More qualitative than quantitative results are likely with the latter.

An investigation may be launched at the beginning of a change in organizational behaviour or the end of a campaign. In particular, many questionnaire-based actions are meant to shed light on aspects the management wants to emphasize. So the questions are one means to convey to the workforce what is considered essential to the organization. The questions altogether convey a message as such, and subsequent results tell everyone the degrees to which essentials are shared. If, for example, there are several questions about cooperation formats then the responders are geared to particularly perceive this construct and evaluate his momentary reflections on this. Thus the questionnaire is highlighting a concept which may be on the organization's agenda.

Scaffoldings of how to organize an assessment are given by the Open-Systems Analysis (Harrison & Shirom, 1998), Six Box Model (Weisbord, 1976), Stream Analysis (Porras, 1987), just to name a few.

ASSESSMENT INSTRUMENTS

There are published instruments which allow even standardized interpretation. But their drawback may be that they do not address the present problem and thus do not answer the question raised fully. In the case of assessment of an individual's behaviour there are numerous instruments from Differential Psychology. But if one addresses group and organizational problems one finds less and less formalized and standardized instruments. One help may be 'instruments' shared among psychological assessors who worked out a scale, evaluated it at one site or within one company, but made it available to others. At least some kind of documentation about intended scope, design, and small scale results and evaluations are available (Drasgow & Schmitt, 2001).

So ad hoc instruments are created by internal staff or outside consultants. Often a sound explication and elaboration of constructs is missing. Some instruments lack a theory-based pre-evaluation of questions to be asked. This is sacrificed to immediate results because market forces drive the management to deciding. One may definitely wish that even a 'simple' questionnaire is considered and valued as a measuring instrument in itself. It provides sound data only if it has been designed and developed according to goals, established theory, constructs, and empirical results. In 'rapid practice' questions are ambiguous and so are results. Often the questionnaire falls short of a sound coverage of facets and so data are incomplete or highly one-sided.

There are, of course, good guidelines (Fleishman & Quaintance, 1984) as to how to construct a good measure. Many instruments ought be based on sound job descriptions to pre-define relevant target behaviours, task-related competencies, and job-related social skills (see entry on Job Characteristics). Also (item and/or person) sampling techniques (Shoemaker, 1973) allow cost saving at the expense of not asking everyone that should be invested in instrument design and evaluation.

As was mentioned above, apart from questionnaires, interviews, observations, survey-feedback approaches, simulations, grid-techniques (Jenkins, 1998), and scenario techniques may be used, for example. However, the less standardized they are, the more assessment errors that may be committed. In general, any instrument should be closely designed for the purpose it has to serve. Ad hoc instruments should be avoided, but instruments with some empirical underpinning should be preferred. The former only allow an assessment per fiat and the latter an assessment per fact.

ASSESSMENT DESIGNS

Designs of how to conduct an evaluation study (Cook & Campbell, 1979; Sanders, 1994) have been available for a long time. But in regard to sound assessment of effects of introduced changes

at the person, group, or organizational level there ought to be more than one measure of an effect, and even a pre-measure should be available as a standard against which one may judge any changes. Restructuring of an organizational unit is quite an investment, and it is desirable to trace back to a prior measure what and how much has changed. Often enough an effect is ascertained but vanishes over time. So more than one post measure is advocated. Designs may be borrowed from Educational Psychology (Campbell & Stanley, 1963) to assure that assessed changes are true changes and not just valid for a short time.

Not only is it possible to sample individuals, but content areas can be sampled as well (Shoemaker, 1973; Hornke, 1978) in order to have a sound picture. It is not necessary to ask everyone the same questions, and have many duplicated answer patterns. Good design of individuals and content samples yield sufficient reliable and valid data and will help to save costs quite a bit. It just demands a bit of prior construct knowledge, some speculation about possible effects, and a kind of intelligent logistic in regard to data collection. An all-embracing survey is not always worth its efforts and investments. Sometimes, less is much more!

FUTURE PERSPECTIVES AND CONCLUSIONS

The initial and implicit question, of what the fields of psychological assessment are in regard to work and organization, can only be answered at a surface level. It is left to the ingenious assessor and his efforts, interests, and creativity to sense what the fields of assessment activities are. No one assigns them to him and even a contract allows for sound science-based assessments the contractor himself might not have had in mind. Applied fields in this sense are all those fields which help to improve an individual's, a group's, and an organization's life. The latter is for the benefit for all of them.

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RELATED ENTRIES

Cognitive/Mental Abilities in Work and Organizational Settings, Interview in Work and Organizational Settings, Motor Skills in Work Settings, Observational Techniques in Work and Organizational Settings, Work Performance, Physical Abilities in Work Settings, Risk and Prevention in Work and Organizational Settings, Self-Reports in Work and Organizational Settings, Centres (Assessment Centres), Achievement Motivation, Leadership in Organizational Settings

ASSESSMENT PROCESS

INTRODUCTION

In solving daily life problems, we automatically execute a lot of judgement and decision making. We also gather information or consult others in order to make well-informed decisions and judgements. The assessment process in the field of psychology is about the gathering and processing of information by a professional in order to get well-informed judgements and decisions concerning a specific request made by a person or an organization. The client is either a person or an organization that made the request; the subject is the person or organization who is the target of the assessment. Psychological assessment refers to the judgements and decisions made by the professional psychologist. Assessment process refers to how these judgements and decisions came about and how these judgements and decisions are communicated to the client.

Contrary to the layperson, the professional has the obligation to process his judgements and decisions according to three sets of standards: ethical standards, social standards, and methodological standards. Ethical and social standards apply to all fields of professional psychology. It is with respect to the methodological standards that the professional gets his or her identity as an academically educated expert in a particular field. Most methodological standards in the field of assessment published in the standards of the professional organizations are related to the methods and procedures the psychologist uses in collecting information. Standards or guidelines with respect to the assessment process are not so well articulated. Actually, it is only recently that the European Association of Psychological Assessment installed a Task Force to formulate Guidelines for the Assessment Process (GAP) (Fernández-Ballesteros, 1998).

This entry contains five sections. The first section highlights the distinction between assessment and testing. The second section analyses the assessment process. The third section mentions some of the biases that may disturb the intrinsic validity of the process and mentions some remedies proposed in the literature. The fourth section points to developments in the field that try to model the assessment process. The last section pays attention to the most recent contribution to the field, which is the production of professional guidelines for the assessment process.

ASSESSMENT AND TESTING

The relatively late attention to the quality of the assessment process might partly be explained by the dominant position of the psychometric approach in assessment. Psychometrics is the discipline that deals with formal statistical foundations of measuring and validating individual differences. In the field of applied psychometrics this tradition focuses on two issues: the development of psychometrically sound tests and the validation of these tests with respect to external criteria. A test is psychometrically sound when it proves to be an objective, quantitative, and reliable measure of individual differences. It is psychometrically valid when its scores predict the position of the examinee on some other criterion or characteristic. In order to be accepted as a test, the instrument must be constructed and validated according to the prescriptions of the existing psychometric theories (Allen & Yen, 1979, and Nunnally, 1978, for further documentation). The psychometric tradition has proven very valuable and both test theory and testing are integrated in the academic education of assessors. Moreover, the tradition has witnessed distinguished scholars who published fine books on testing and test use (Anastasi & Urbina, 1997; Cronbach, 1990).

Assessment is a summary term which refers to all the activities the assessor performs in producing an answer to the client's request. These activities may include testing among other activities, such as analysing the client's problem, generating hypotheses about its causes and searching for the appropriate intervention. It is the analytical and constructive quality of the assessment process that distinguishes assessment from mere testing.

THE PROCESS

The assessor has to analyse the request and to integrate his or her results in a case formulation, which takes into account the available knowledge in the field. In doing so he or she has to follow the same kind of logic any scientific researcher follows in deductively inferring hypotheses, in testing these hypotheses, and in formulating conclusions in the framework of the available knowledge. However, although the assessment process follows the same kind of logic as in any scientific search process the context differs basically from that of the scientific process (De Groot, 1969; Sloves et al., 1979).

For the scientific researcher in psychology the context of his or her work is the body of knowledge at a particular domain and the researcher is focused upon phenomena not yet explained within that particular domain. The goal of the scientific researcher is to find descriptions and explanations that generalize across persons and situations. It is not the concrete person who is the subject, but general phenomena such as perception, motivation, or personality dimensions. The assessor, however, focuses on the person with his or her particular problems in his or her past as well as present situation. The primary goal of the process is to contribute to the solution of a person's problems. The more the person's problems can be described and understood as representative for problems shared by other persons, the more the assessor can rely on a common body of knowledge and apply procedures and protocols developed for specific groups of clients. However, in many cases the assessor cannot just apply already established knowledge. Instead, he or she has to rely on his or her methodological and professional experience in using the state of the art in the field to design a client-tailored procedure and to make an educated interpretation of the outcome.

When talking about the client's problem, it is important to make a distinction between adjustment problems and clinical problems. By problem is meant a psychological state of uncertainty for which neither the client nor his or her social network sees a preferred course of action. Adjustment problems are problems all people encounter in their daily life, and for which they may want to seek professional advice. Examples of such problems are marital conflict, study choice, and career planning. Clinical problems are problems that have dysfunctional effects on the psychological and social well being of the client. In assessing adjustment problems, the assessor uses instruments and applies knowledge that belongs to the domain of general psychology. In assessing clinical problems, the assessor uses tools and knowledge that pertain to the domain of clinical psychology.

An important part of the assessment process is the explanation to the client of why and how the assessment tools are applied and how strong the evidence is, which may be the outcome of the process. The kind of assessment tools and

knowledge involved are triggered by the requests the assessor has to answer. The simplest format to describe such requests is that of a question as if phrased by the client. Examples of such questions within the non-clinical domain are: 'Am I suited for this type of job?', 'Which qualities do I have to develop in order to be eligible for this particular education programme?', 'What conditions at the workplace are responsible for getting the high rate of job turnover?' Examples of questions in the clinical domain are: 'How serious are my anxieties?' 'Why does it happen to a person like me to have burn out', 'Do I need psychological treatment to master my feelings of self-worthlessness?'

Concrete requests and related questions automatically specify the kind of assessment activities the assessor should perform in order to answer the questions. For instance, in order to answer the question 'How serious are my anxieties?', the assessor first has to describe the anxieties and, secondly, he or she has to evaluate the anxieties against some standard or norm of severity. In answering the question 'What conditions are responsible for the labour turnover', the assessor first has to check whether the turnover is unusually high (again evaluation against a standard). Secondly – when the latter is the case – he or she has to hypothesize about conditions and, thirdly, to test these hypotheses by collecting data and evaluating the outcome.

Whatever the steps taken in the process, the process ends in an advice to the client. The oral and written report of the course and outcome of the assessment process must give the client a fair and evidence-based account of the given advice. The assessor should be careful in conveying the probabilistic and conditional nature of his or her statements.

FLAWS AND BIASES

The assessment process contains many instances in which the assessor, alone or in dialogue with the client, determines the course of action. The assessor should be aware of and protect him- or herself against the flaws and biases of clinical judgement. Clinical judgement refers to informal and subjective thinking and decision making. There is ample evidence that the professional psychologist who is not armed by proper decision aids is as weak a decision maker as the less-trained professional or layperson.

The studies which demonstrate the fallibility of the clinical judgement and decision making belong to three different research streams which can be labelled as the psychometric, cognitive and social-psychological tradition. The *psychometric* tradition offers evidence for the fact that clinical prediction is nearly always less accurate than a prediction made by standardized formal predictions. Meehl already drew this conclusion in 1954, and ever since he was supported by many other reviews, the most recent one was presented by Grove et al. (2000). If one wants to predict a person's state of mind or behaviour in the future, the best thing to do is to base the prediction on the outcomes of empirical studies of the relationship between predictor (present state) and criterion (future state).

The *cognitive* research tradition presents evidence that cognitive heuristics which allow people to operate rather well in their daily lives nevertheless may have distorting effects in dealing with restricted and probabilistic information. Since the seminal work of Tversky and Kahneman (1974) the distorting effect of cognitive heuristics have been demonstrated in all kinds of choice and decision situations and with all kinds of people, professionals as well as laypersons (see Baron, 1994, and Goldstein & Hogarth, 1997, for a review). Of special critical interest for the assessment process are the heuristics people use in the generation and testing of hypotheses. One of the most famous heuristics in this respect has been called the confirmatory test strategy. People have the strong tendency to test hypotheses by searching the information that confirms the hypothesis and to neglect searching information that would disconfirm the hypothesis.

The *social-psychological* tradition presents evidence that in meeting the client the clinician is inclined to select and interpret information from the perspective of his causal attributions, stereotypes and characteristics. Of specific interest to the assessment process is the actor–observer bias hypothesized by Jones and Nisbett (1971) and empirically demonstrated in several studies (see Turk & Salovey, 1988, for a review). In explaining their behaviour actors tend to attribute it to situational factors while observers tend to attribute this behaviour to internal causes like traits and motives.

Studies of flaws and biases have automatically led to the question how these flaws and biases could be avoided or at least restricted. Several proposals have been made, ranging from further standardization of data-collection and empirical validation of prediction procedures involved up to debiasing reasoning techniques and computerized decision aids. Lists of such proposals are given in Garb (1998), Haynes and O'Brien (2000), and Turk and Salovey (1988).

MODELLING THE PROCESS

In many fields of professional psychology, one always has been well aware of the intricacies and fallacies of an assessment process that is not protected somehow against the flaws and biases of clinical judgement. Considerable progress has been made in standardizing the way in which information can be gathered by using reliable and valid tests by which a client's response can be compared with that of others. However, not only the data collection and statistical interpretation should proceed properly, the same should apply to the comprehensive assessment process, which starts with the client's requests and ends in the assessor's advice to the client.

In non-clinical domains, such as job and curriculum selection, the client's requests relate to the client's strengths and weaknesses with respect to a certain job or study curriculum. Here the relevant empirical body of knowledge is the relationship between the client's characteristics and the success or satisfaction in the job or curriculum at hand. What emanates from this empirical approach is – technically speaking – a multiple regression equation in which the scores on a standardized battery of tests are weighted according to their relationship with the criterion, and combined in such a way that the prediction of the criterion is as accurate as possible. The assessment process is modelled after a *statistical prediction model*. The assessment process reaches a level of standardization that equals the level of standardization of each of its components.

Uncertainty about which job or study to engage in most often presents a problem of choice. Not only the probability of success in each of the choice options is at stake, but also the value each of these options have for the client. The value of having success in a particular career is not restricted to financial profits, but also depends upon more personal values such as social recognition, social identity, and emotional and intellectual satisfaction. The assessment process should result in advice in which probability of success is weighted by the value of that success. In the *utility model* the assessment process is formalized as the combination of probability and values that apply to each of the choice options (Baron, 1994; Von Winterfeld & Edwards, 1986).

Neither the statistical model nor the utility model are developed to model the full assessment process which starts with the client's request and results in an advice to the client. Nor do these models formalize the specific decision rules the diagnostician should follow in going through the main phases of the process. Westmeyer (1975) proposed an *algorithmic model*. In this formal model decision algorithms are supposed to work on an adequate empirical knowledge base which contains complete sets of conditional probabilities for a specified type of both problem and client.

All three models presented so far are *normative* in the sense that they process information according to statistical or decision rules. Strict normative models set formal conditions that usually cannot be met in psychological practice nor in the knowledge base this practice is supposed to work with (see Westmeyer & Hageböck, 1992, for a discussion). Therefore, many students of the assessment process have tried to model the process according to more heuristic principles that could guide the process. Most of these *heuristic models* have been restricted to a diagrammatic presentation of the assessment process (Maloney & Ward, 1976) while some others (De Bruyn, 1992; Haynes & O'Brien, 2000) have led to elaborations which show how the assessor can proceed if he or she wants to follow the logical decision flow depicted in the model.

FUTURE PERSPECTIVES AND CONCLUSIONS

Despite the growing interest in the quality of the assessment process, a comprehensive set of *heuristic guidelines* that could support the assessor in executing the process is still lacking. This is in contrast to the related fields of testing (American Psychological Association, 1999) and programme evaluation (Joint Committee on Standards for Educational Evaluation, 1994) which eventually

have succeeded in the formulation of standards that monitor professional work. It is only recently (Fernández-Ballesteros, 1998) that a task force consisting of psychologists from different fields in psychology started to think of formulating guidelines to cover all phases of the assessment process. The task force formulated a set of guidelines to cover the phases of analysing the case, organizing and reporting results, planning the intervention, and evaluation and follow-up (Fernández-Ballesteros et al., 2001). Instead of being rigid rules, fixed forever, these guidelines represent recommendations for professional behaviour.

As already demonstrated in the fields of testing and evaluation, such guidelines highly contribute to the development of the profession. Therefore, as stated by Fernández-Ballesteros et al., 'We hope that the efforts made in developing and disseminating these Guidelines stimulate the discussion among interested scientific and professional audiences and, in the long run, will contribute to improve the practice of psychological assessment as well as the education and training of psychological assessors' (2001: 185).

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RELATED ENTRIES

Assessor's Bias, Clinical Judgement, Case Formulation, Ethics, Prediction (General), Prediction: Clinical vs. Statistical, Report (General)

ASSESSOR'S BIAS

INTRODUCTION

Psychological assessment is subject to various errors of measurement. While some are random, as assumed in classical test theory, others are systematic and lead to consistent distortions of the true value of a characteristic. These latter errors may be partially due to assessor's biases. This term does not refer to elementary professional mistakes such as implementing test instructions incorrectly, but to systematic tendencies in case-related information processing that reduce the validity of data. Although these biases normally impair objectivity and reliability, they remain undetected when they are consistent across individuals and time. In addition, a low interrater agreement is not necessarily a sign of assessor's bias but may be due to valid differences between settings and informants (Lösel, 2002).

Not all types of assessment information are equally susceptible to assessor's biases. Whereas standardized tests or biographical inventories are less affected, their impact may be strong in unstructured interviews, behaviour observations, or trait ratings. For example, some studies on the judgement of job performance have shown that more than half of the variance is due to differences in the assessors (Scullen et al., 2000). In a meta-analysis, approximately 37% of the variance in ratings was attributed to them (Hyot & Kerns, 1999).

This entry concentrates on biases in assessments by other persons (e.g. psychologists, psychiatrists, teachers, or lay informants). Although these biases are similar to the numerous response sets and distortions in self-reports, some seem less important (e.g. lying, simulation, dissimulation, social desirability, or positive self-presentation) and others more relevant (e.g. halo, leniency, stringency, or contrast effects). In the following, we will first describe several of these errors and afterwards address factors that differentiate and moderate these distortions. Finally, we will take a brief look at approaches for detecting and reducing assessor's biases.

EXAMPLES OF ASSESSOR'S BIASES

Halo and Logical Error

In psychological assessment, a *halo effect* refers to an overgeneralization from one prominent characteristic of a person to other judgements on this individual. Most typically, it is an overestimation derived from a general impression. For example, if a person is judged to be good in general, he or she will be judged more positively on any specific dimension. Halo errors may arise particularly when there is insufficient information for a detailed assessment or when traits are not well defined. In these cases, the general impression is used to fill information gaps (Saal et al., 1980). A related bias is the *logical error*. Here, assessors are likely to give similar ratings to traits that seem logically related in their minds (Guilford, 1954). Whereas the halo effect derives from a perceived coherence of characteristics in an individual, the logical error refers to a more explicit and abstract coherence of variables or traits. The latter is often anchored in the assessor's subjective personality theory.

Both biases produce the same outcome, namely spurious and inflated correlations (Murphy et al., 1993). The underlying mechanisms are also related. Occasionally, a halo effect can have some advantage because it accentuates differences between individuals (Murphy et al., 1993). This is the case when a quick decision has to be made and the core determinants of the halo effect are empirically valid. Then, one can simply follow the useful decision rule 'take the best, ignore the rest' (Gigerenzer & Selten, 2001).

Position Effects

Whereas halo effects result from the psychological or logical closeness of the rated characteristics, their sequence or position may have a similar effect. One such distortion is the *proximity error*. Judgements that are close to each other in time or space contain a higher risk of mutual influence. A related error is the *primacy effect* in which the first impression of a person overshadows the assessment of their further behaviour. Its opposite is the *recency effect*: the last information on a person influences the evaluation of previous data. Early stereotyping (primacy) or easy remembering (recency) are among the mechanisms that underlie these modes of information processing. Although some experiments suggest that recency is more influential than primacy (e.g. Betz et al., 1992), it is questionable whether such findings can be generalized to real-life assessments.

Leniency and Stringency

These errors refer to the tendency to make relatively positive (leniency) or negative (stringency, severity) assessments. For example, somebody who is rather intelligent would be judged to be even more intelligent by a lenient rater but less intelligent by a stringent one. Leniency seems to be more frequent than stringency (Guilford, 1954). It may partially reflect tendencies toward social desirability, harmony, or other dispositions. Assessors who score high in self-monitoring tend to deliver more lenient ratings. Similarly, leniency correlates negatively with conscientiousness and positively with agreeableness (Bernardin et al., 2000). Nonetheless, other studies question the view that leniency is primarily due to personality dispositions. Situational and relational factors must also be taken into account.

Central Tendency

Leniency and stringency go along with polarizations between extreme judgements. In contrast, other assessors tend to produce scores in the middle range. Sometimes, this may express a lack of differentiated information on a person. In other cases, it involves indifferent perceptions or a general ambivalency or insecurity in the assessor.

Contrast and Projection Effects

Biases may also result from comparisons between a person's behaviour and the assessor's own dispositions. A *contrast error* is when the assessor attributes characteristics at the opposite pole to his self-perception; a *projection effect* when he evaluates a person as being similar to himself. Both tendencies relate to self-awareness and self-presentation processes in the assessor. For example, persons with behavioural problems may rate others higher on the same dimensions. Whereas projection errors can contribute to self-worth by reinforcing social comparability, contrast effects can serve a similar function by protecting the assessor's individuality.

Interactional Biases

Assessors' biases not only influence their own information processing but also how persons behave in the assessment situation. Although the assessor's age, gender, ethnicity, role, status, or institutional affiliation may have such effects (Hagenaars & Heinen, 1982), these should not be viewed as biases. Interactional biases refer to influences that derive from the assessor's information processing. One example is the self-fulfilling prophecy of positive expectations, although the typical Rosenthal effect has not been replicated sufficiently (Elashoff & Snow, 1971). In the practice of psychological assessment, even minor biases can have an effect (e.g. slightly nodding the head or providing other non-verbal reinforcements based on halo or leniency effects). Unstructured interviews are particularly vulnerable to biases derived from assessor's attitudes and expectations. Hyman et al. (1975) distinguish three forms: (a) *Attitude-structure expectations* refer to the belief that the attitudes of the respondent are unified. They resemble the halo effect and may reinforce uniform reactions. (b) *Role expectations* relate to the respondent's membership of a certain group. These stereotypes can result in assessor behaviour that triggers prototypical reactions in the respondent. (c) *Probability expectations* refer to the base rates of diagnostic characteristics in the respective population. They can lead to assessor behaviour that tries to confirm these specific assumptions. Other interactive biases contribute to *missing data*. For example, projection or contrast effects may lead an interviewer to evaluate a question as being

extremely difficult or intimate. This can reduce emphasis and thus lead to more incomplete or 'don't know' answers. On the other hand, a very stringent assessor may elicit similar effects through behaviour that reduces the respondent's willingness to cooperate.

Overall, the impact of such interviewer biases seems to be small or not well-investigated (Hagenaars & Heinen, 1982). Probably, the more an assessor complies with professional standards and is not socially involved, the fewer biases will occur (Hyman et al., 1975).

DIFFERENTIAL ISSUES

Rater- versus Dyad-Specific Biases

Assessor's biases contain both rater-specific and dyad-specific components (Hyot & Kerns, 1999). In the former, the error variance is attributable to the assessor alone (e.g. a rater who generally tends to leniency when judging coworkers). In the latter, it is due to a specific relation between the assessor and the assessee (e.g. a teacher who judges a difficult student more negatively than he should). Rater-specific biases are a minor problem when only one assessor compares individuals on one dimension, because the error is the same across all judgements. It becomes more problematic when there are several assessors with different biases. The same holds for complex assessments by a single assessor who confounds specific information due to a halo effect.

Dyad-specific biases seem to be more powerful. Because they are less general, they are also more difficult to detect and correct. Neither rater-specific nor dyad-specific biases need to be stable. They may fluctuate over time and situations according to current influences such as emotional state, task involvement, or organizational factors.

Moderating Factors

The magnitude of biases also depends on what information is gathered. Their impact is relatively small (4% of variance) when ratings are based on explicit and objective criteria such as behaviour frequencies (Hyot & Kerns, 1999). However, it is much stronger (47% of variance) when assessors rate global trait characteristics. Training of assessors is another important moderator. When they are well-trained, less than 10% of variance is attributable to assessor's biases, but with minimal training, these sources may account for over 50% (Hyot & Kerns, 1999). Furthermore, rater agreement varies according to the observed behaviour samples. If assessors refer to different samples, they will agree less. However, as mentioned before, such interrater differences may indicate true variance rather than biases (reliability–validity trade-off; Scullen et al., 2000). For example, employees behave differently with their bosses than with their colleagues.

DETECTING AND REDUCING ASSESSOR'S BIASES

The valid assessment of an assessor's biases is a prerequisite for intervention. Unfortunately, there is little systematic and practice-oriented research on this issue.

One strategy is to reconstruct the errors from the assessor's judgements. If he rated specific dimensions in various persons and other assessors did the same, inter- and intrarater comparisons are possible. Different frequency distributions, means, variances, and correlations between variables may indicate halo, leniency, extremity, or other errors. However, as mentioned above, this is only possible when assessors work on the same samples of data. Another strategy is to compare the individual judgements with objective data structures. Brunswik's lense model can be used to compare regression weights between the respective data and both the assessor's judgement and an objective criterion. For example, a teacher may place too much weight on verbal intelligence in predicting student achievement. Similarly, configurational analyses can be used to detect biases in non-linear data structures.

Such reconstructions require a great deal of analogue data and judgements. If these are not available, one can try to assess directly what goes on in the assessor's mind (e.g. by the method of thinking aloud or analysing subjective theories by using structure-placing or repertory grid techniques). However, it is questionable how far these approaches can detect automatized and unconscious mental processes. Verbal ambiguities and social desirability effects must also be expected.

Assessor's biases may further be reduced through supervision by neutral experts or team feedback

sessions. These approaches are most common in clinical contexts but can also be applied in other fields of psychological assessment.

Last, but not least, assessor's biases can be reduced by a systematic organization and quality management of the whole assessment process. This includes, for example, standardized procedures, detailed behavioural indicators of categories, intensive training of assessors, random-routine check of assessment quality, re-analysable data registration (e.g. video recordings), adequate time-spacing of judgements, techniques that enhance systematic comparisons (e.g. in pairs vs. ratings), the clear distinction between data description and interpretation, and explicit rules for data integration.

FUTURE PERSPECTIVES AND CONCLUSIONS

Assessor's biases are important sources of error variance. Although these biases cannot be eliminated completely in the human process of assessment, they can be reduced substantially. For example, this is possible by following the Guidelines for the Assessment Process recently proposed by a Task Force of the European Association of Psychological Assessment (Fernández-Ballesteros et al., 2001).

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RELATED ENTRIES

Item Bias, Clinical Judgement, Assessment Process

ATTACHMENT

INTRODUCTION

Children are attached, if they tend to seek proximity to and contact with a specific caregiver in times of stress arising from factors such as distress, illness, or tiredness (Bowlby, 1984). Attachment is a major developmental milestone in the child's life, and it remains an important issue throughout the lifespan. In adulthood, attachment representations shape the way adults

feel about the strains and stresses of intimate relationships, including parent–child relationships, and the way in which the self in relation to important others is evaluated. Attachment theory is a special branch of Darwinian evolution theory, and the need to become attached to a protective conspecific is considered one of the primary needs in the human species. Attachment theory is built upon the assumption that children come to this world with an inborn inclination to show attachment behaviour – and this inclination would have had survival value, or better: would increase 'inclusive fitness' – in the environment in which human evolution originally took place. Because of its ethological basis, assessment of attachment implies careful and systematic observations of verbal and non-verbal behaviour.

ASSESSMENT OF ATTACHMENT IN INFANTS

Attachment to a protective caregiver helps the infant to regulate his or her negative emotions in times of stress and distress, and to be able to explore the environment even if it is somewhat frightening. The idea that children seek a balance between the need for proximity to an attachment figure and the need to explore the wider environment is fundamental to the various attachment measures, such as the *Strange Situation* procedure (SSP; Ainsworth et al., 1978) and the *Attachment Q-Sort* (AQS; Vaughn & Waters, 1990) (see Table 1). Ainsworth and her colleagues observed one-year-old infants with their mothers in a standardized stressful separation procedure, and used the reactions of the infants to their reunion with the caregiver after a brief separation to assess the amount of trust the children had in the accessibility of their attachment figure.

The SSP consists of eight episodes, of which the last seven ideally take three minutes. Each episode can however be curtailed when the infant starts crying. *Episode One* begins when the experimenter leads caregiver and child into an unfamiliar playroom. *Episode Two* is spent by the caregiver together with the child in the playroom. In *Episode Three* an unfamiliar adult (the 'stranger') enters the room and after a while starts to play with the infant. *Episode Four* starts when the caregiver departs, and the infant is left with the stranger. In *Episode Five* the caregiver returns, and the stranger unobtrusively leaves the room immediately after reunion. *Episode Six* starts when the caregiver leaves again: the infant is alone in the room. In *Episode Seven* the stranger returns. In *Episode Eight* the caregiver and the infant are reunited once again, and the stranger leaves unobtrusively immediately after reunion.

Table 1. Attachment measures

Attachment measure	12–24 months	24–48 months	12 years and older
Strange Situation	X		
Attachment Q Sort	X	X	
Adult Attachment Interview			X

The Strange Situation procedure has been used with mothers, fathers, and other caregivers. Infants usually are between 12 and 24 months of age. For pre-schoolers, the same SSP is used, but the rating system for classifying the children is different and still is in the process of validation (Cassidy et al., 1992). On the basis of infants' reactions to the reunion with the caregiver, three patterns of attachment can be distinguished. Infants who actively seek proximity to their caregivers upon reunion, communicate their feelings of stress and distress openly, and then readily return to exploration are classified as secure (B) in their attachment to that caregiver. Infants who seem not distressed, and ignore or avoid the caregiver following reunion are classified as insecure-avoidant (A). Infants who combine strong proximity seeking and contact maintaining with contact resistance, or remain inconsolable, without being able to return to play and explore the environment, are classified insecure-ambivalent (C).

An overview of all American studies with non-clinical samples (21 samples with a total of 1584 infants, studies conducted in the years 1977–1990) shows that about 67% of the infants are classified secure, 21% are classified as insecure-avoidant, and 12% are classified insecure-ambivalent (Van Ijzendoorn, Goldberg, Kroonenberg & Frenkel, 1992). The Strange Situation classifications have been demonstrated to be valid. For example, secure infants have more sensitive parents than insecure infants (in 66 studies with more than 4000 infants,

DeWolff & Van Ijzendoorn, 1997). Furthermore, secure infants have more satisfactory peer relations, and they develop better language skills (Cassidy & Shaver, 1999). The SSP also shows discriminant validity in comparison with temperament. One of the most powerful demonstrations of the absence of a causal link between attachment and temperament is the lack of correspondence between a child's attachment relationship to his or her mother, and the same child's relationship to his or her father.

The concept of 'disorganized' attachment emerged from the systematic inspection of about 200 cases from various samples that were difficult to classify in one of the three organized attachment categories (Main & Solomon, 1986). In particular in studies on maltreated infants, the limits of the traditional Ainsworth et al. (1978) coding system became apparent because many children with an established background of abuse or neglect nevertheless had to be forced into the secure category. A common denominator of the anomalous cases appeared to be the (sometimes momentary) absence of an organized strategy to deal with the stress of the SSP. Disorganized attachment can be described as the breakdown of an otherwise consistent and organized strategy of emotion regulation. Whether secure or insecure, every child may show disorganization of attachment depending on the earlier child-rearing experiences. Maltreating parents are supposed to create disorganized attachment in their infants because they confront their infants with a pervasive paradox: they are potentially the only source of comfort for their children, whereas at the same time they frighten their children through their unpredictable abusive behaviour. Disorganization of attachment occurs in about 15% of non-clinical cases, where associations with parental unresolved loss have been found, and it is considered a major risk factor in the development of child psychopathology.

ATTACHMENT IN TODDLERS AND PRESCHOOLERS

Although the SSP has become remarkably popular and successful, it has been a drawback that attachment research was almost exclusively dependent on a single procedure for the measurement of attachment. Waters and his co-workers introduced another method for assessing attachment security in infants and toddlers, i.e. the *Attachment Q-Sort* (AQS). The AQS consists of 90 cards. On each card a specific behavioural characteristic of children between 12 and 48 months of age is described. The cards can be used as a standard vocabulary to describe the behaviour of a child in the natural home-setting, with special emphasis on secure-base behaviour (Vaughn & Waters, 1990). After several hours of observation the observer ranks the cards into nine piles from 'most descriptive of the subject' to 'least descriptive of the subject'. The number of cards that can be put in each pile is fixed, i.e. 10 cards in each pile. By comparing the resulting Q-sort with the behavioural profile of a 'prototypically secure' child as provided by several experts in the field of attachment theory, a score for attachment security can be derived.

The AQS has some advantages over the SSP. First, it can be used for a broader age range (12–48 months) than the SSP. Moreover, AQS scores for attachment security are based on observation of the child's secure-base behaviour in the home and may therefore have higher ecological validity. Furthermore, because the application of the AQS does not require the artificial induction of stress used in the SSP, the method can be applied in cultures and populations in which standard application of the SSP has proved to be somewhat complicated. Because the AQS is less intrusive than the SSP, it may be used more frequently with the same child, for example in repeated measures designs, in interventions studies, and in studies on children's attachment networks. Lastly, the application of the AQS in divergent cultures or populations may be attuned to the specific prototypical secure-base behaviour of the children from those backgrounds.

When the AQS is sorted by a trained observer it shows an impressive predictive validity. In particular, the observer AQS is strongly correlated with sensitive responsiveness. At the same time, it should be noted that the association between observer AQS security and SSP security is rather modest (Van Ijzendoorn, Vereijken & Risken-Walvaren, in press). The AQS and the SSP may therefore not measure the same construct, or they may be indexing different dimensions of the same construct. Support for the validity of the AQS as sorted by the mother is less convincing.

The association between the mother AQS and the SSP is disappointingly weak, and the instrument surprisingly shows a stronger association with temperament (Van Ijzendoorn et al., in press). Mothers of insecure children may lack the observational skills that are necessary for an unbiased registration of secure-base behaviours in their children.

In this contribution three assessment procedures are discussed that play a central role in attachment theory and research. The *Strange Situation Procedure* (SSP; Ainsworth et al., 1978) has been developed to assess attachment security of infants with their parents or other caregivers in a laboratory playroom. The *Attachment Q Sort* (AQS; Vaughn & Waters, 1990) is an instrument to observe secure-base behaviour and attachment security in children from 12–48 months at home. The *Adult Attachment Interview* (AAI; Main, Kaplan & Cassidy, 1985) is a semi-structured interview with a coding system (Main & Goldwyn, 1994) to assess adolescent and adult mental representations of attachment. We start with a brief discussion of the theoretical background of these assessment tools.

ASSESSMENT OF ATTACHMENT IN ADOLESCENCE AND ADULTHOOD

Attachment experiences are supposed to become crystallized into an internal working model or representation of attachment (Bowlby, 1984), which Main, Kaplan, and Cassidy defined as 'a set of rules for the organisation of information relevant to attachment and for obtaining or limiting access to that information' (1985, pp. 66–67). They developed an interview-based method of classifying a parent's mental representation of attachment, the *Adult Attachment Interview* (AAI). The AAI is a semi-structured interview that probes alternately for general descriptions of attachment relationships, specific supportive or contradicting memories, and descriptions of the current relationship with one's parents. The interview can be administered to parents, professional caregivers, and older adolescents, and stimulates respondents to both retrieve attachment-related autobiographical memories and evaluate these memories from their current perspective. For example, subjects are asked which five adjectives describe their childhood relationship with each parent, and what concrete memories or experiences led them to choose each adjective.

The AAI lasts about an hour and is transcribed verbatim. Interview transcripts are rated for security of attachment as derived from the subjects' present discussion of their attachment biographies (Hesse, 1999). The coding of the interviews is not based primarily on reported events in childhood, but rather on the coherency with which the adult is able to describe and evaluate these childhood experiences and their effects. The interview, therefore, does not assess the actual quality of childhood attachment relationships, and a secure representation of attachment is not incompatible with an insecure attachment history throughout childhood. This is a major difference with questionnaires that ask for descriptions of the relationship with parents or parents' parenting, in which descriptions of childhood experiences are decisive and taken for granted. Instead, the AAI takes into account that retrospection is not necessarily reliable, and that repression and idealization do take place. Hesse (1999) has suggested that the central task presented to the subject is that of producing and reflecting upon attachment-related memories while *simultaneously* maintaining coherent discourse with the interviewer.

The coding system of the AAI (Main & Goldwyn, 1994) includes scales for inferred childhood experiences with parents (e.g. loving, rejecting, role-reversing) and scales for state of mind with respect to attachment (e.g. anger, idealization, insistence on lack of recall, coherency). The scale scores for state of mind are of overriding importance when it comes to classification of an interview, in one out of three main categories. *Autonomous* or *secure* adults are able to describe their attachment-related experiences coherently, whether these experiences were negative (e.g. parental rejection or overinvolvement) or positive. They tend to value attachment relationships and to consider them important for their own personality. *Dismissing* adults tend to devalue the importance of attachment experiences for their own lives or to idealize their parents without being able to illustrate their positive evaluations with concrete events demonstrating secure interaction. They often appeal to lack of memory of childhood experiences. *Preoccupied* adults are still very much involved and preoccupied with their past attach-

ment experiences and are therefore not able to describe them coherently. They may express anger or passivity when discussing current relationships with their parents. Dismissing and preoccupied adults are both considered insecure. Some adults indicate through their incoherent discussion of experiences of trauma (such as maltreatment, or the loss of an attachment figure) that they have not yet completed the process of mourning. They receive the additional classification *Unresolved*, which is superimposed on their main classification. In a meta-analysis on 33 studies, the distribution of non-clinical mothers was as follows: 24% dismissing, 58% autonomous, and 18% preoccupied mothers (Van Ijzendoorn & Bakermans-Kranenburg, 1996). About 19% of the mothers were additionally classified as unresolved. Fathers and adolescents showed about the same distribution of AAI classifications. Clinical respondents, however, showed highly deviating distributions, with a strong overrepresentation of insecure attachment representations. Systematic relations between clinical diagnosis and type of insecurity could not be established.

The test–retest reliability of the AAI has been established in several studies, and the same is true of the AAI's discriminant validity. AAI classifications turned out to be independent of respondents' IQ, social desirability, temperament, and general autobiographical memory abilities (for a review, see Hesse, 1999). The predictive validity of the AAI has been thoroughly tested in a large number of studies in different countries, and the results can best be described by meta-analytic findings. First, the AAI appears to be predictive of parents' sensitive responsiveness. Autonomous parents are more responsive to their child's attachment signals and needs than insecure parents (Van Ijzendoorn, 1995). Second, in several (cross-sectional as well as longitudinal) studies parents' representations of attachment were related to the security of the parent–child attachment relationship as measured through the Strange Situation procedure. Autonomous parents tended to have secure children, dismissing parents had insecure-avoidant children, preoccupied parents had insecure-ambivalent children, and parents with unresolved loss or other trauma more often had disorganized children (Van Ijzendoorn, 1995). In longitudinal studies covering the first 15 to 20 years of life, the infant SSP classifications have been found to predict the later AAI classifications when major changes in life circumstances were absent (Waters, Hamilton & Weinfield, 2000).

FUTURE PERSPECTIVES AND CONCLUSIONS

We conclude that the Strange Situation Procedure, the Attachment Q Sort, and the Adult Attachment Interview have proven to be invaluable tools for testing empirical hypotheses. They have helped to advance attachment theory far beyond Bowlby's first draft some thirty years ago. During the past ten years or so, several other attachment measures have been developed, mostly based on the same construction principles that guided the development of the SSP, AQS, and AAI (Cassidy & Shaver, 1999). Some measures mirror the SSP and focus on attachment in preschoolers (the Preschool Assessment of Attachment), others involve projective techniques for preschoolers and older children, such as the SAT, drawings or photographs, or doll play. Other measures are adaptations of the AAI and cover younger (adolescent) age ranges or different representational dimensions (working model of the child; working model of caregiving). Self-report paper-and-pencil measures have been proposed for assessment of attachment in adolescence or adulthood, as well as interview measures for partner relationships. These alternative attachment measures are still in the process of validation, and do not yet present the psychometric qualities that SSP, AQS, and AAI have shown to possess (Cassidy & Shaver, 1999). In the near future, more data will become available on the reliability and validity of these promising measures. They may help to investigate attachment across the lifespan, in various contexts, populations, and cultures.

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RELATED ENTRIES

PERSONALITY ASSESSMENT (GENERAL), EMOTIONS, MOTIVATION, DEVELOPMENT (GENERAL), DEVELOPMENT: SOCIO-EMOTIONAL, PRE-SCHOOL CHILDREN

ATTENTION

INTRODUCTION

Attention involves being in a state of alertness, focusing on aspects of the environment that are deemed important for the task at hand, and shutting out irrelevant information. As the task demands change, attention involves the ability to flexibly shift focus to another target. Originally, attention was considered a unitary construct but currently it is conceptualized as a complex process involving (a) distributed neural systems, (b) perceptual, emotional, motivational and motor systems, as well as (c) links to multiple sources of environmental information.

Some commonly studied processes of attention include selecting, sustaining, and shifting. Selection refers to the ability to narrow the field of stimuli to which one attends for the purpose of enhanced processing. Sustained attention refers to the ability to maintain focus and alertness over time. Shifting refers to the ability to change focus of attention to suit one's goals and needs.

Research has focused on visual or auditory attention, although environmental stimuli are perceived through other modalities as well (i.e. touch, smell, taste). In addition, research has focused on attention to the external environment rather than to the internal environment (thoughts

and emotions) since the internal environment is less amenable to objective and reliable methods of assessment (See Underwood, 1993).

WHY IS IT IMPORTANT TO ASSESS ATTENTION?

Attention is central to the ability to function perceptually, cognitively and socially. For that reason it is important to have basic scientific understanding of attention processes and the psychological and environmental conditions that govern the development of attention and its deployment under specific circumstances. With such knowledge in hand, one can design environments that promote optimal attention to important characteristics in those settings.

In addition, it is important to assess attention so as to map out individual differences in the development and use of attention. These differences are mostly in the normal range but may also include deficits that are quite marked as seen in children diagnosed with Attention Deficit Disorder or in adults diagnosed with schizophrenia, depression or substance abuse problems. The assessment of attention is important for parents and teachers who detect difficulties in a child's ability to focus attention and wish to have the child evaluated. Similarly, attention problems may be presented in adults who have suffered head injuries or stroke, and who would need to be evaluated to determine the seriousness of the deficits involved. Diagnosing such deficits is dependent on information about individual differences in attention and on the availability of appropriate assessment tools.

ASSESSMENT METHODS

Methods have been developed for the assessment of specific aspects of attention, including selective attention, sustained attention, and shifting attention. These methods include performance tests, mapping brain activity during performance of tasks and, finally, rating scales. Table 1 lists commonly used performance tasks, the aspects of attention they assess and the contexts in which they are used (clinical or research). Additional information can be found in Barkley (1994). Other tests include Trenerry, Crosson and DeBoe's Visual Search and Attention Test (VSAT), Miller's California Computerized Assessment Package (CalCAP), Arthur, Barrett and Doverspike's Auditory Selective Attention Test (ASAT), and The Gordon Diagnostic System. Table 2 lists commonly used scales for rating attention.

FUTURE DIRECTIONS

Deal with Issues Pertaining to Assessment for the Purpose of Increasing Knowledge about Specific Processes

There is a need to understand to what extent the processes outlined above are really independent rather than different manifestations of the same core. This calls for a more integrated understanding of attention and for the development of a basic assessment battery that could be used when people are referred with problems in attention (see Ruff and Rothbart, 1996).

Checking Ecological Validity

To what extent are the assessments telling something about functioning under some specific environmental conditions but don't generalize to these processes as they operate in everyday, out of the lab environments? Questions remain about the extent to which it is possible to do well on all laboratory assessments but have problems in the everyday context. Similarly, is it possible to function well in the everyday environment and yet have problems on laboratory assessments.

Developing an Attention Battery

The battery would need to be based on normative data and would need to have specified cut off lines between the normal range and problem range. Children would benefit from a routine assessment using such a battery in the same way that they benefit from routine examination of their hearing and vision. Systematically evaluating how children perform in terms of their attention is important since children may have deficits that they mask through idiosyncratic cognitive strategies or by working harder than what would normally be required.

Table 1. Commonly used performance task

Process Assessment Name		Short Description	Assessed Behaviour	Contexts of Use
I. Selective Attention	Children's Checking Task	Symbol cancellation	Number targets identified; Number targets missed; Incorrect identifications	Research
	Digit Symbol/Coding	Wechsler scales subtest	Timed task of correctly indicating which symbol corresponds to a number	Clinical Research
	Stroop Colour-World Interference Test	Naming the ink colour of words that spell a colour different from the ink colour	Time to complete each portion; Number of correct responses	Research Clinical
	The Trail Making Test	Connecting letters and numbers placed randomly on a page	Time to complete each part; Number of errors	Research Clinical
	Children's Embedded Figures Test	Identifying a target figure embedded among non-targets	Mean time to respond; Number of correct responses	Clinical Research
	Posner's Visual-Spatial Selective Attention Test	Responding to targets presented to the left/right visual fields	Difference in reaction time in the presence of valid and invalid cues	Research
II. Sustained Attention	Reaction Time Task(s)	Responding to simple target visual stimuli	Mean reaction time; Variability of response time	Research
	Continuous Performance Test (CPT)	Responding to target stimuli and inhibiting response to on-target stimuli	Response time; Number correct responses; Errors of omission; Errors of commission	Research Clinical
	KABC Hand Movements	Imitating progressively longer sequences of skilled hand movements	Standard score of successful number of sequences	Research Clinical

III. Shifting Attention	Wisconsin Card Sorting Task	Sorting 128 cards containing sets of geometric designs – varying colour, form, number	% of correct; Number of categories achieved; Perseverative errors; Perseverative responses; Non-perseverative responses	Research Clinical
	Halstead–Reitan Neuropsych. Test Battery – Categories Test	Choosing from 1 of 4 choices from a projected stimuli based on a principle	Number of correct responses; Same behaviours as above	Clinical
IV. Numerical Mnemonic Attention	Digit Span	Wechsler scales subtest	Accurate memory for a specific string of numerical stimuli (forward & backward)	Research Clinical
	Arithmetic	Wechsler scales subtest	Correct solutions provided verbally	Research Clinical
V. Physiological	Heart Rate processes	Electrodes placed on chest record the electrocardiogram (EKG)	Decrements in heart rate reflect attention	Research
	Cortical Electrophysiology	Electrodes placed on scalp record the electroencephalograph (EEG)	Large, slow waves indicate lapses in attention during sustained attention task	Research
	Cerebral blood flow	Blood flow to brain regions is mapped by positron emission tomography (PET)	Denser distribution indicates more active metabolism	Research

Table 2. Commonly used scales for rating attention

Rating scales
Title
ADD-H Comprehensive Teacher Rating Scale
ADHD Rating Scale
Attention Deficit Disorders Evaluation Scale
Behaviour Assessment System for Children
Child Attention Profile by Edelbrock
Child Behaviour Checklist
Conners' Parent and Teacher Rating Scale – Revised
Hyperactive Behaviour Code

CONCLUSIONS

Attention is central to cognitive and social functioning and has been the subject of scientific research for decades. It is regulated by neural, perceptual, emotional, motivational and motor systems and influenced by both internal and external stimuli. Because of its central and complex role in behaviour, there are many methods for assessing its various aspects. Despite the long history of interest in the topic, scientists are still working to achieve greater understanding of attention processes and on developing new assessment tools.

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RELATED ENTRIES

Theoretical Perspective: Cognitive, Intelligence Assessment (General), Ambulatory Assessment, Brain Activity Measurement, Equipment for Assessing Basic Processes

ATTITUDES

INTRODUCTION

Evaluation is a fundamental reaction to any object of psychological significance (Jarvis & Petty, 1996; Osgood, Suci & Tannenbaum, 1957). The present entry reviews some of the major techniques that have been developed to assess these evaluative reactions, or attitudes. A discussion of methods based on explicit evaluative responses – direct and inferred – is followed by a consideration of disguised and implicit assessment techniques. Emphasis is placed on questions of reliability, validity, and practicality.

EXPLICIT MEASURES OF ATTITUDE

Virtually any response can serve as an indicator of attitude toward an object so long as it is reliably associated with the respondent's tendency to evaluate the object in question. In contrast to implicit responses, which cannot be easily controlled, explicit evaluative responses are under the conscious control of the respondent. Most explicit attitude measures either rely on direct attitudinal inquiries or infer the respondents' evaluations from their expressions of beliefs about the attitude object.

Direct Evaluations

Single-item direct measures. Laboratory experiments and attitude surveys frequently use single items to obtain direct evaluations of the attitude object. Confronted with the item 'Do you approve of the way the President is doing his job?' respondents may be asked to express their degree of approval on a five-point scale that

ranges from 'approve very much' to 'disapprove very much'. Such single items can be remarkably good indicators, especially for well-formed attitudes toward familiar objects. They are sometimes found to have quite high levels of reliability and to correlate well with external criteria. For example, the single item 'I have high self-esteem' (attitude toward the self), assessed on a five-point scale ranging from 'not very true of me' to 'very true of me', was found to have a test–retest reliability of 0.75 over a four-year period, compared to a reliability of 0.88 for the multi-item Rosenberg Self-Esteem Scale (Robins, Hendin & Trzesniewski, 2001, Study 1). Moreover, the single- and multi-item measures correlated highly with each other, and they had comparable correlations with various external criteria (e.g. self-evaluation of physical attractiveness, extraversion, optimism, life satisfaction).

However, single items do not always exhibit such favourable psychometric properties. They often have low reliabilities and can suffer from limited construct validity. Many attitude objects are multidimensional and a single item can be ambiguous with respect to the intended dimension (e.g. 'religion as an institution' vs. 'religious faith'). Furthermore, single items contain nuances of meaning that may inadvertently affect responses to attitudinal inquiries. An item inquiring whether the United States should *allow* public speech against democracy leads to different conclusions than one asking whether the United States should *forbid* such speech (see Schuman & Presser, 1981). In addition to such framing effects, research has revealed strong context effects in attitudinal surveys. Respondents tend to interpret a given item in light of the context created by previous questions. Thus, responses to questions about satisfaction with life in general and satisfaction with specific aspects of one's life, such as one's work or romantic relationship, are found to be influenced by the order in which these questions are asked (Schwarz, Strack & Mai, 1991).

Multi-item direct measures. It is possible to raise the reliability of a direct attitude measure by increasing the number of questions asked. The Rosenberg Self-Esteem Scale (Rosenberg, 1965), for example, contains 10 items, each a direct inquiry into self-esteem (e.g. 'I feel that I am a person of worth, at least on an equal basis with others'; 'All in all, I am inclined to feel that I am a failure'). Coefficients of internal consistency and test–retest reliability for this measure are typically quite high (see Robinson, Shaver & Wrightsman, 1991).

The most frequently employed multi-item direct measure of attitude, however, is the evaluative semantic differential (Osgood et al., 1957). Using large sets of seven-point bipolar adjective scales, Osgood and his associates discovered that evaluative reactions (i.e. attitudes) capture the most important dimension of any object's connotative meaning. Consequently, it is possible to obtain a measure of attitude by asking respondents to rate any construct on a set of bipolar evaluative adjective scales, such as *good–bad*, *harmful–beneficial*, *desirable–undesirable*, *pleasant–unpleasant*, and *useful–useless*. When a sufficient number of such scales is used, the evaluative semantic differential is found to have very high internal consistency and temporal stability. One caveat with respect to the semantic differential has to do with possible 'construct-scale interactions'. Although certain adjective pairs generally indicate evaluation, these adjectives can take on more specific denotative meaning in relation to particular attitude objects. Thus, the adjective pair *sick–healthy* usually reflects evaluation when rating people, but it may be a poor measure of evaluation when respondents are asked to judge the construct 'mental patients'.

Inferred Evaluations

Although multi-item direct attitude measures exhibit high degrees of reliability, they do not address the problems raised by the multidimensionality of attitude objects, or by framing and context effects, problems that jeopardize the validity of direct evaluations. Several standard attitude-scaling methods, such as Thurstone and Likert scaling, avoid these difficulties by sampling a broad range of responses relevant to the attitude object and then inferring the common underlying evaluation. Whereas responses to items on a Thurstone scale are required to have a curvilinear relation to the overall attitude, the more common Likert method requires that item operation characteristics have a linear or at least monotonic shape (Green, 1954). In practice, an investigator using Likert's method of summated

ratings (Likert, 1932) begins by constructing a large set of items, usually statements of belief, that are intuitively relevant for the attitude object. To illustrate, the following items are part of a Likert scale that was designed to assess attitudes toward illegal immigrants (Ommundsen & Larsen, 1997).

- Illegal aliens should not benefit from my tax dollars.
- There is enough room in this country for everyone.
- Illegal aliens are a nuisance to society.
- Illegal aliens should be eligible for welfare.
- Illegal aliens provide the United States with a valuable human resource.
- We should protect our country from illegal aliens as we would our own homes.

The investigators initially constructed 80 items of this kind. Selection of items that had high correlations with the total score yielded a final 30-item scale. Most Likert scales ask respondents to indicate their degree of agreement with each statement on a five-point scale (*strongly agree*, *agree*, *undecided*, *disagree*, *strongly disagree*). Responses to negative items are reverse scored and the sum across all items constitutes the measure of attitude. The respondents' attitudes are thus *inferred* from their beliefs about the attitude object (see Fishbein & Ajzen, 1975).

By covering a broad range of issues relevant to the attitude object, multi-item belief-based scales can do justice to the multidimensional nature of the issue under consideration, avoiding the potential ambiguity of direct measures. Furthermore, by including many differently worded questions that appear in unsystematic order, they also avoid idiosyncratic framing and context effects. As a result, standard multi-item attitude scales tend to have high reliability and, in many applications, exhibit high degrees of predictive and construct validity (Ajzen, 1982). Collections of scales designed to assess social and political attitudes can be found in Robinson, Shaver, and Wrightsman (1991, 1999). The obvious disadvantage in comparison to direct attitude assessment lies in the increased time and effort required to develop multi-item inferred attitude scales and in the fact that such scales may not be suitable for large-scale telephone surveys.

DISGUISED ATTITUDE MEASURES

Notwithstanding the psychometric advantages of inferred attitude measures over direct assessment techniques, all explicit measures – direct and inferred – are subject to response biases that may jeopardize their validity. The most serious of these biases is the tendency to respond to attitudinal inquiries in a socially desirable manner (Paulhus, 1991). This tendency is a particularly severe threat to validity when dealing with such socially sensitive issues as racism and sexism, or with potentially embarrassing topics, such as sexual behaviour or tax evasion. Various methods have been developed in attempts to overcome or at least alleviate social desirability responding.

One approach assumes that individuals differ in their tendency to provide socially desirable responses. Scales are available to assess a person's general tendency to respond in a socially desirable manner (see Paulhus, 1991), and these scales can be used to select attitude items that are relatively free of general social desirability influences or to statistically remove variance due to individual differences in social desirability responding. Unfortunately, this approach fails to identify socially desirable responses that are not part of a general tendency but rather are unique to a given topic or assessment context.

The problem of social desirability responding arises because the purpose of explicit attitude measures is readily apparent. Other approaches to this problem therefore attempt to reduce the measure's transparency or completely disguise its purpose. In measures of whites' attitudes toward African Americans, for example, item wording has changed over the years to accommodate the changing social climate. The ethnocentrism scale (Adorno, Frenkel-Brunskwik, Levinson & Snaford, 1950), used in the 1950s, contained such blatantly racist statements as, 'Manual labor and unskilled jobs seem to fit the Negro mentality and ability better than more skilled or responsible work'. About 15 years later, the Multifactor Racial Attitude Inventory (Woodmansee & Cook, 1967) employed more mildly worded items, such as, 'I would not take a Negro to eat with me in a restaurant where I was well known'. The most popular explicit attitude scale used today, the Modern Racism Scale

(McConahay, Hardee & Batts, 1981), is an attempt at a relatively non-reactive measure that captures the ambivalence many people experience with respect to African Americans: negative feelings that contrast with a desire to live up to ideals of equality and fairness. Among the items on this scale are, 'It is easy to understand the anger of black people in America' and 'Blacks are getting too demanding in their push for equal rights'.

Although less blatant than earlier measures, the Modern Racism Scale is still quite transparent in its attempt to assess attitudes toward African Americans and is thus potentially subject to social desirability responding. The error-choice method (Hammond, 1948) was an early attempt to avoid social desirability responding by disguising the purpose of the measurement and exploiting the tendency of attitudes to bias responses without a person's awareness. Respondents are asked to choose which of two apparently factual items, equidistant from the known state of affairs, is true (e.g. '25% of African Americans attend college' versus '55% of African Americans attend college'). Choice of the low estimate may indicate a more negative attitude, but because the survey is presented as a fact quiz, participants will usually not be aware that their attitudes toward African Americans are being assessed and their responses may thus be uninfluenced by social desirability concerns.

IMPLICIT MEASURES OF ATTITUDE

Perhaps the most effective way to avoid response biases associated with explicit attitude measures is not to obscure the test's purpose but to observe evaluative responses over which respondents have little or no control.

Bodily Responses

A variety of physiological and other bodily responses have been considered as possible indicators of evaluation, including facial expressions, head movements, palmar sweat, heart rate, electrical skin conductance (GSR), and constriction and expansion of the pupil (see Petty & Cacioppo, 1983). By and large, measures of this kind have been found to have relatively low reliability and to be of questionable validity as measures of attitude. The most promising bodily response measure to date is the facial electromyogram (EMG), an electrical potential accompanying the contraction of muscle fibres. Subtle contractions of facial muscles during exposure to attitude-relevant stimuli appear to reveal underlying positive or negative affective states (Petty & Cacioppo, 1983). Relatively few studies have been conducted to test the validity of this method, but even if its validity is confirmed, the facial EMG requires extensive training and complex technology. It is thus not a very practical method for conducting large-scale attitude surveys, although it may be quite useful in a laboratory context.

In a related method, electrodes are attached to various sites and an attempt is made to persuade respondents that physiological responses are being measured and that these responses provide a reliable indication of their true attitudes. Even though no physiological measures are actually taken, respondents believing that their true attitudes are being read by the machine are expected to provide truthful answers to attitudinal inquiries (Jones & Sigall, 1971). Empirical evidence suggests that the 'bogus pipeline' method can indeed help to reduce response biases due to social desirability concerns (Quigley-Fernandez & Tedeschi, 1978). This method, however, again requires a fairly complex laboratory setup.

Response Latency

Somewhat more practical are methods that rely on response latencies to assess implicit attitudes because the time it takes to respond to an attitudinal inquiry can be assessed with relative ease. The most popular response-latency method is the Implicit Association Test (IAT; Greenwald, McGhee & Schwartz, 1998) which is based on the assumption that evaluative responses or judgements can be activated automatically, outside the respondent's conscious awareness. Participants are asked to respond as quickly as possible to words that signify the attitude object and words with positive or negative valence. When measuring implicit attitudes toward African Americans, for example, the attitude object may be represented by first names recognized as belonging to white or black

Americans (e.g. 'Josh' vs. 'Jamel') and the valenced words by common positive or negative concepts (e.g. 'health' vs. 'grief'). Instructions that require highly associated categories to share a response key tend to produce faster reactions than instructions that require less associated categories to share a response key. Prejudiced individuals would therefore be expected to respond more quickly to combinations of black names with negative words than to combinations of black names with positive words, and they should show the reverse pattern for white names. The discrepancy between the response latencies for the two situations is taken as a measure of implicit acceptance of the association between an attitude object and valenced attributes, thus providing an implicit measure of attitude.

An alternative procedure relies on sequential evaluative priming (Fazio, Jackson, Dunton & Williams, 1995). Applied to the measurement of racial attitudes, photos of black and white faces may be presented as primes, followed by positive or negative target words. The participant is asked to judge the valence of each target word as quickly as possible. As in the IAT, a low response latency is taken as an indication of a strong association between the valenced word and the category ('black' or 'white') represented by the prime. Thus, if words with negative valence are judged more quickly when they follow a 'black' prime as compared to a 'white' prime, and when the opposite is true for positive words, it is taken as evidence for a negative attitude toward African Americans.

Response-latency measures have been used mainly in attempts to assess implicit racial and sexual stereotypes and prejudice. Test–retest reliabilities of implicit measures have been found to be of moderate magnitude (0.50 to 0.60) over a time span of one hour to three weeks (Kawakami & Dovidio, 2001); they tend to be virtually uncorrelated with corresponding explicit measures (Fazio et al., 1995; Greenwald et al., 1998; Kawakami & Dovidio, 2001), indicating that they indeed tap a different type of attitude; and they tend to reveal prejudice where explicit measures reveal little or none (e.g. Greenwald et al., 1998), suggesting that implicit measures may be subject to less social desirability bias than explicit measures. However, questions have been raised with respect to the predictive validity of implicit attitude measures. It has been suggested that low response latencies reflect commonly shared and automatically activated stereotypes, but that privately held, explicit beliefs in conflict with the implicit stereotype can override the automatic response in determining actual behaviour (Devine, 1989).

FUTURE PERSPECTIVES AND CONCLUSIONS

The great effort that has been invested over the years in the development of attitude measurement procedures attests to the centrality of the attitude construct in the social and behavioural sciences. Table 1 summarizes the different types of measures commonly employed in attitude research. Single items are often used with considerable success to assess evaluative reactions to attitude objects, but multi-item instruments that infer attitudes from a broad range of responses to the attitude object tend to yield measures of greater reliability and validity. Implicit attitude measure hold out promise for overcoming people's tendencies to respond in socially desirable ways to explicit attitudinal inquiries, especially when dealing with sensitive issues or with domains in which attitudes are conflicted or ambivalent. However, more work is needed to establish the conditions under which implicit attitude measures are better indicators of response dispositions than are explicit measures. It appears that implicit attitudes may be predictive of actual behaviour in ambiguous contexts where the relevance of an explicit

Table 1. Common attitude assessment techniques

Response type	Representative technique
Explicit – direct	
Single-item	Self-rating scale
Multi-item	Semantic differential
Explicit – infrared	Thurstone scaling, Likert scaling
Disguised	Error-choice method
Implicit	
Bodily responses	GSR, heart rate, papillary response, EMG
Response latency	Implicit association test, evaluative priming

attitude is unrecognized or can be denied, but explicit attitudes may override implicit response tendencies when the relevance of the explicit attitude is readily apparent (see Fiske, 1998 for a discussion of these issues).

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Icek Ajzen

RELATED ENTRIES

Personality Assessment (General), Interest, Emotions, Environmental Attitudes and Values, Values

ATTRIBUTIONAL STYLES

INTRODUCTION

Shortly after research on attribution theory blossomed, measures were developed to assess attributional style – the presence of cross-situational consistency in the types of attributions people make. Two approaches to measuring attributional style are reviewed here. The first involves global measures that assume attributional style and broadly applies across a variety of situations (see Table 1 for a list of the most widely used measures of attributional style). These measures were developed to test predictions from the reformulated theory of learned helplessness depression (Abramson, Seligman & Teasdale, 1978). The second approach involves more specific measures of attributional style. This approach emerged, in part, from critiques of the cross-situational consistency of the global measures. These measures assess attributional style in more limited contexts such as work, school, and relationships.

GLOBAL MEASURES OF ATTRIBUTIONAL STYLE

Dimensional Measures

Dimensional measures of attributional style require respondents to generate causes for hypothetical events and then to rate them along several attributional dimensions. The Attributional Style Questionnaire (ASQ; Peterson, Semmel, Von Baeyer, Abramson, Metalsky & Seligman, 1982) is the most widely known. It contains 12 hypothetical events, half describing positive events ('you meet a friend who compliments you on your appearance') and half describing negative events ('you go out on a date and it goes badly'). Events are further divided into an equal number of interpersonal and achievement contexts. The perceived cause of each event is rated along the dimensions of locus (due to the person or the situation), stability (likely or unlikely to occur again), and globality (limited in its influence or widespread) using seven-point scales. Scores can be computed for each dimension within positive and negative events. Factor analyses of the ASQ have supported the presence of distinct attributional styles for negative and positive events (Xenikou, Furnham & McCarrey, 1997), although results presented by Cutrona, Russell, and Jones (1985) indicate that each event on the ASQ represents its own factor. However, findings suggest that attributions for negative events are most strongly related to depression (Sweeney, Anderson & Bailey, 1986). Scores can be further analysed within interpersonal and achievement contexts, a distinction that appears to be more relevant to positive than negative events.

The ASQ has proven to be a valid predictor of depression. People who make internal, stable, and

Table 1. Widely used measures of attributional style

Global measures
Attributional Style Questionnaire (ASQ; Peterson et al., 1982)
Attributional Style Assessment Test (ASAT; Anderson & Riger, 1991)
Children's Attributional Style Questionnaire (CASQ; Seligman et al., 1984)
Content Analysis of Verbatim Explanations (CAVE; Peterson, 1992)
Intermediate measures
Academic Attributional Style Questionnaire (AASQ; Peterson & Barrett, 1987)
Organizational Attributional Style Questionnaire (OASQ; Kent & Martinko, 1995)
Relationship Attribution Measure (RAM; Bradbury & Fincham, 1990)

global attributions for negative events tend to be more depressed. However, there are at least four problems with the ASQ. First, internal consistency for the ASQ ranges from adequate to low, especially for the locus dimension. A frequent solution is to combine the three dimensions into a single index to increase reliability, as the dimensions tend to correlate highly with one another. However, this creates a second problem: one of interpretation. There are unique predictions for each attributional style dimension; using a composite score prevents valid tests of the model (Carver, 1989). Several authors advise researchers to analyse ASQ data in terms of both individual dimensions and composite scores. The third problem is also related; the ASQ does not assess the key attributional dimension of controllability. The few studies that included controllability consistently find that it is the most important attributional style dimension, whereas globality is the least important (e.g. Deuser & Anderson, 1995). The fourth problem concerns the affiliation versus achievement distinction; several of the 'achievement' items involve affiliative contexts. The *Expanded Attributional Style Questionnaire* (EASQ; Peterson & Villanova, 1988) uses an identical format to the ASQ and addresses the problem of low reliability by increasing the number of situations included in the measure. However, reliabilities remain modest and the other problems remain unresolved.

The third and fourth versions of the Attributional Style Assessment Test (ASAT-III and ASAT-IV) provide another dimensional assessment of attributional style (Anderson & Riger, 1991). These measures use a format similar to the ASQ but they incorporate a larger number of items (20 for the ASAT-III and 36 for the ASAT-IV), include the controllability dimension, and use success and failure items that mirror each other (e.g. 'succeeded' vs. 'failed' at coordinating an outing for a group of people...). The interpersonal versus non-interpersonal subsets of items are more clearly differentiated than the affiliation versus achievement items of the ASQ. Internal reliabilities at the subscale level tend to be weak to modest, in the 0.5–0.6 range; collapsing across situation types (e.g. ignoring the interpersonal vs. non-interpersonal distinction) yields somewhat larger alphas. These scales have successfully predicted depression, loneliness, and shyness as well as depressive-like motivational deficits in laboratory settings. Furthermore, this body of work has demonstrated the importance of assessing attributional styles separately for interpersonal and non-interpersonal situations. Finally, this work has shown substantial correlations between attributional styles for successful events and depression (and loneliness and shyness).

Several other dimensional measures of attributional style use the same basic approach as the ASQ and ASAT. The *Balanced Attributional Style Questionnaire* (BASQ; Feather & Tiggemann, 1984) uses a format similar to the ASQ but, like the ASAT, the positive and negative items mirror one another. The scales have moderate reliabilities and correlate with depression, self-esteem, and protestant work ethic. The *Real Events Attributional Style Questionnaire* (REASQ; Norman & Antaki, 1988) requires that respondents generate the positive and negative events for which they then make attributions. This may yield a better prediction of depression, but the loss of item standardization creates other problems.

Forced-Choice Measures

Forced-choice measures have respondents select a cause from a list of potential explanations. One benefit is that this method may more accurately mirror how people typically select a cause (i.e. without thinking about dimensions). Also, the types of causes in the list can be restricted to only those attributions of theoretical interest. Forced-choice measures also require less time to complete.

The ASAT-I and ASAT-II use this forced-choice format. Respondents are provided with a number of hypothetical situations (20 for the ASAT-I and 36 for the ASAT-II). On the ASAT-I, the listed types of causes are strategy, ability, effort, personality traits, mood, and circumstances. ASAT-II includes only strategy, effort, and ability causes. The number of times a particular cause is selected is summed to create a measure of attributional style for that dimension. Kuder–Richardson (K-R 20) reliabilities for the subscales tend to be in the low to moderate range. Correlations with loneliness and depression have established the validity of these scales

in both US and Mainland China college student populations (Anderson, 1999).[1]

Measures for Children

The *Children's Attributional Style Questionnaire* (CASQ; Seligman et al., 1984) was developed to allow researchers to study attributional style in children aged 8–13. The CASQ includes 48 items divided equally between positive ('You get an "A" on a test') and negative events ('You break a glass'). The scale uses both a forced choice and a dimensional approach. Respondents select between two possible causes for the event, and each option represents the presence or absence of one attribution dimension (for example, an internal or external cause). Attributions for each dimension are computed by summing the number of internal, stable, or global responses. Scores similar to the ASQ can then be computed. Internal consistency of the CASQ is low to adequate and improves when the separate dimensions are combined into a single composite.

Content Analysis Measure

The *Content Analysis of Verbatim Explanations* (CAVE; Peterson, 1992) technique assesses attributional style through a content analysis of an individual's writing. This allows analysis of ecologically valid events without requiring the participant to complete a questionnaire. The CAVE can also be applied to historical data, and it has established the stability of attributional style over a 52-year period (Burns & Seligman, 1989). Coders first extract causal explanations from a text, then rate them along the dimensions of locus, stability, and globality. Inter-rater reliability for the CAVE technique is satisfactory, and internal consistency has been reported as low to adequate. More standard questionnaire measures of attributional style may be better predictors of depression, but the CAVE technique has proven useful when written content is all that is available.

INTERMEDIATE MEASURES OF ATTRIBUTIONAL STYLE

Global measures of attributional style assume a high degree of cross-situational consistency in the types of attributions people make. However, several studies have questioned this assumption. Cutrona et al. (1985) found that the ASQ was a poor predictor of attributions for actual events, suggesting that situational factors may play a more important role in predicting attributions. Factor analyses by Cutrona et al. (1985) suggest that there is little cross-situational consistency in global measures of attributional style. Intermediate measures of attributional style address this problem by limiting the situations about which an explanatory style is being assessed. Increased specificity should increase the ability of such measures to predict actual attributions. The ASAT's emphasis on four situation types (success/failure by interpersonal/non-interpersonal) is one approach to increasing specificity. Other research on this issue has been mixed, however (Henry & Campbell, 1995), suggesting that further work is needed to establish the appropriate level of specificity in attributional style measures.

Academic Settings

Two measures have been used to assess attributional style in academic settings. The *Academic Attributional Style Questionnaire* (AASQ; Peterson & Barrett, 1987) uses the same format as the ASQ and contains descriptions of 12 negative events that occur in academic settings. The measure has demonstrated high internal consistency, and findings suggest that students who make internal, stable, and global attributions for negative events tend to do more poorly in classes. Henry and Campbell (1995) also developed a measure of attributional style for academic events. Their measure contains 20 items, equally divided between positive and negative events. The measure displayed adequate to good reliability and also predicted academic performance.

Work Settings

The *Organizational Attributional Style Questionnaire* (OASQ; Kent & Martinko, 1995) was developed to assess attributional style for negative events in a work setting. The format is similar to that of the ASQ, and the measure contains descriptions of 16 negative events that can occur in a work setting. After writing down an explanation for the event, respondents rate the

explanation along the dimensions of internal locus, external locus, stability, controllability, globality, and intentionality. The internal consistency for the scale is moderate to good.

Relationships

Several different types of intermediate attributional style measures have been developed for measuring attributions in the context of relationships. The *Relationship Attribution Measure* (RAM; Bradbury & Fincham, 1990) assesses the types of attributions people make for a spouse's negative behaviour. Respondents read a hypothetical negative action by their partner and rate the causes of that event along six dimensions: locus, stability, globality, and responsibility (intent, selfishness, and blame). Researchers can use either a four- or eight-item version. A composite of all attributional dimensions displays high internal consistency and predicts marital satisfaction. Partners who attribute negative partner behaviour to internal, stable, and global causes are more likely to be dissatisfied with the relationship. Fincham has also developed a version of the RAM for use with children to assess attributions for parent–child interactions. The *Children's Relationship Attribution Measure* (CRAM; Fincham, Beach, Arias & Brody, 1998) uses a format similar to the RAM, and contains descriptions of two negative events.

FUTURE PERSPECTIVES AND CONCLUSIONS

Measures of attributional style have generated several issues which require additional research. The first issue involves level of specificity. Many studies question the presence of a global attributional style, and it is not clear if intermediate measures provide a satisfying solution to this problem. Additional research is needed to resolve these issues. Furthermore, attributional style measures typically suffer from poor reliability. New measures need to be developed to address this shortcoming. Finally, more research is needed on the controllability dimension of attributional style and on the unique contributions of the various attributional dimensions.

There are numerous ways of measuring attributional style, each with particular strengths and weaknesses. In deciding which scale to use, the researcher needs to carefully consider the specific goals of the research project, and then pick the tool that best meets the needs of that project. The modest reliabilities of these scales suggests that considerable attention be paid to sample size and power.

Note

1 The various ASAT scales, as well as Chinese versions of that ASAT-I, the Beck Depression Inventory, and the Revised UCLA loneliness scales, can be downloaded from the following web site: psych-server.iastate.edu/faculty/caa/Scales/Scales.html

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RELATED ENTRIES

Personality Assessment (General), Cognitive Styles, Motivation, Irrational Beliefs

AUTOBIOGRAPHY

INTRODUCTION

Autobiography constitutes a critical resource for psychological assessment and yet a complex challenge to it. The essence of this challenge lies in the fact that autobiography can be seen as both a focus of assessment and a means of conducting it. Since autobiography does not lend itself to assessment by instruments or scales, the sections in this entry will focus on general issues associated with the defining, assessing, and researching of autobiography, as well as on future developments concerning it.

DEFINING AUTOBIOGRAPHY

Autobiography is a narrative accounting of a person's life as interpreted or articulated by the person him or herself. It is a self-report by which a person expresses, explains, or explores his or her subjective experience over time. It thus represents a route to what it means and feels like to *be* that person, on the inside. Such a definition distinguishes immediately between autobiography and biography (an account of a life, presumably with greater objectivity, by someone else). An equivalent term for autobiography would be life *story*. This can in turn be distinguished from life *history*, or indeed *case* history, which is an account of a life for specific purposes by, for example, a social worker or physician.

Starting from this basic definition, autobiography can be categorized according to whether it is formal or informal. Though the distinction can be a fine one, formal autobiography means a deliberate and comparatively structured recounting of one's

life with the express intention of summing it up to date or making a public statement concerning it. While the expression may take many forms, including poetry and sculpture, obvious examples range from a published memoir to a curriculum vitae. Informal autobiography includes what one reveals about oneself in less intentional ways, through one's speech, as in conversation or therapy, one's words, as in letters or diaries, or one's gestures and deeds. Behind both formal and informal autobiography lies one's autobiographical memory, or the memory one has of one's life as a whole (Rubin, 1996). However, insofar as such memory is internal to a person, assessments of its structure and possible impairments are impossible except as it is mediated by that person's actions or words. In this entry, then, 'autobiography' means any autobiographical *activity* that has some mode of external expression.

Additional distinctions by which autobiography can be categorized – and assessed – are whether it is voluntary (spontaneous, self-directed) or involuntary (requested, assigned); intended for a public audience or for private reflection; partial (concerning a particular period or theme in one's life) or complete (concerning one's life as a whole); superficial or in-depth; and whether the cue prompting it is specific or general (for example, *What was it like growing up blind?* or simply *Tell me about your life*).

ASSESSING AUTOBIOGRAPHY

What is assessed from autobiographical activity, the method or instrument by which the assessment is carried out, and the theoretical perspective(s) in which the assessment is rooted, depends on the discipline or context that is involved.

Within the context of psychology, the most obvious example of this point is in relation to psychotherapy, and not least to the field of psychoanalysis. While the assessment and interpretation of autobiography constitute an integral source of information about an individual and about possible issues or themes on which the analysis can focus, the focus itself depends on the therapeutic perspective that is employed. Accordingly, it may be on, for example, a person's self-concept; degree of introversion–extroversion; obvious omissions from the person's self-report and their possible significance; evidence of self-deception or of specific disorders; and/or locus of control.

Within developmental psychology, the focus may be on one's interpretation of life events; on one's life-course trajectory; on the evolution of personal identity (McAdams, 1988); on guiding personal metaphors; on the relationship between life story and values or emotions; and on changes over time in the content and form of one's self-report – or 'the development of autobiography' (Bruner, 1987). Within social psychology, sociology, and anthropology, the focus of assessment may be on the social constructedness of the self and on how 'narrative practice' (Holstein & Gubrium, 2000) concerning the self is portrayed and utilized. As conventions of self-talk and self-representation, or 'forms of self-telling' (Bruner, 1987), can vary profoundly by culture, language, gender, ethnicity, and class, they are necessarily of major concern in assessing differences in the accounts that individuals give of their lives.

Within cognitive science, the aim of assessment may be on the formation and function of one's autobiographical memory and on its completeness, reliability, and accuracy – that is, the interplay between fact and fiction within autobiographical memory (Rubin, 1996), or between 'historical truth' and 'narrative truth' (Spence, 1982).

Within a healthcare context, autobiographical activity can convey invaluable information concerning a patient's medical history, social networks and relationships, living conditions, and overall emotional and cognitive status. It can also provide a reference point for assessing differences between subjective and objective measures of physical health; and can assist in the detection and diagnosis of particular pyschopathologies, including dementia.

Within the humanities, and specifically literary criticism, assessment of autobiographical activity may draw upon psychological or psychoanalytic theory to focus on the various functions, personal and social, that autobiography serves for the person who engages in it (LeJeune, 1989). In addition, it can focus on the narrative structure and integrity of particular autobiographical texts in terms of, for instance, plot, genre, theme, metaphor, point of view, and voice; on the role of language, and thus culture, in the formation and development of self-awareness and subjectivity; on the complex inter-relationships between

author, text, context, and audience (Olney, 1980); and on the philosophical and hermeneutical significance of being, at once, composer, narrator, editor, character, and reader in relation to one's own life story (Randall, 1995).

Finally, within gerontology, the study and assessment of autobiographical activity has perhaps a special significance insofar as gerontology is concerned with social and psychological development across the lifespan. Accordingly, the focus may overlap with that used in other disciplines and be on, for example, an individual's subjective experience of the ageing process, or *biographical* ageing; on the question of competence and of the relationship between person and environment (Svensson, 1996); and on the role played by autobiographical activity in relation to life review, generativity, spirituality, and preparing for death.

One particular method that uses autobiography in working with older adults – as a means not only of assessment but also of education, recreation, and (informal) therapy – is called 'guided autobiography' (Birren & Deutchman, 1991). In guided autobiography, persons write about their lives in relation to set themes – such as career, family, money, health, and love – and then share their writings with other individuals in a group setting. Such groups have been shown to be successful for those involved in increasing their sense of self-understanding and of personal integration.

In general, autobiographical activity in an advanced age can be assessed and utilized in terms of numerous functions that it can be said to serve:

- identifying and honouring key turning-points during one's life-course
- coming to grips with past resentments and negative feelings
- setting the record straight
- finding meaning amid life's struggles and challenges
- seeking answers to personal issues
- reviewing one's life to attain a sense of peace
- leaving a unique legacy of experience and wisdom.

It should be noted, though, that autobiographical activity can serve many of the above functions at any point throughout the lifespan, and not only in later life.

RESEARCHING AUTOBIOGRAPHY

From a research perspective, it would be valuable to examine the development of autobiography using qualitative methods within a longitudinal design. Of course, the very nature of autobiography leads us to treat it as 'longitudinal', since it provides a good characterization of how a person perceives his or her past in light of what life is like today and is expected to be like tomorrow, or in the future. However, such data represents not the past as it was at the time it occurred – not the 'true story' – but the past as perceived at the time it is recounted, and as portrayed to a particular audience. Of central interest in research on autobiography, then, would be how people's perception of their lives change, or remain stable, as they age, and what changes occur in both the selection of events that they recount and the angle or tone from which those events are interpreted and told.

One possible design is to ask people at age 60, for example, to tell about their lives at 60, at age 70 to tell about life at 70, and so on. This would enable an assessment of the degree of change or stability in the content of their autobiographies as they grow older. Similarly, asking people at 70 to tell about life at 60, and at 80 to tell about life at 70 (and 60), would permit an assessment of change and stability in people's perspectives on both their age and the ageing process. Finally, having people at 60 tell about their entire lifespan, at 70 the same, and so on, would provide a picture of the relative change and stability in their perspectives on the content and significance of their lives as a whole. Overall, such a design would permit a better understanding of how people perceive, represent, and interpret their lives at different stages.

FUTURE PERSPECTIVES AND CONCLUSIONS

In the future, due to rapid social change, there will probably be a more pronounced need and use of autobiography as a means for individuals to evaluate, understand, and integrate their lives, if not as a continuous process, then at different intervals over the lifespan. From a research perspective, there will most probably be a greater focus on using autobiographical data in longitudinal studies, especially of older persons, to

gain a sense of change and stability in their inner experiences of the ageing process.

Though it presents many issues for consideration, autobiography constitutes a valuable tool in several disciplines for assessing people's perceptions of their lives. In many ways, however, it has not yet been fully exploited as a qualitative method, especially in longitudinal research. As a complement to various tests and measures, it merits greater use in order to provide a fuller description and a richer understanding of the process of human life.

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RELATED ENTRIES

Qualitative Methods, Theoretical Perspective: Constructivism, Self-Presentation Measurement, Subjective Methods, Self, The (General)

AUTOMATED TEST ASSEMBLY SYSTEMS

INTRODUCTION

Historically, test construction in education and psychology has shown a development from: (1) the construction of standardized tests to the practice of assembling tests from item banks tailored to the test assembler's specifications; (2) the use of intuitive rules of test construction to the application of model-based algorithms; and (3) manual sorting of items on index cards to selection by a computerized system.

Test assembly can be characterized as the task of finding a combination of items from an item pool that satisfies a list of content specifications and is optimal in a statistical sense. Formally, the problem has the structure of a constrained combinatorial optimization problem in which an objective function is maximized subject to a set of constraints, both typically modelled using 0–1 decision variables for the inclusion of the items in the test. Currently, a large variety of test assembly problems have been modelled this way and powerful algorithms for solving them are available.

MODELLING TEST ASSEMBLY PROBLEMS

A common view underlying all attempts to automate test assembly is to see each item in the pool as a carrier of a set of *attributes* relevant to the psychological variable or the domain of knowledge or skills the pool is designed to measure. A formal distinction can be made between the following

types of attributes:

1. Categorical attributes, such as item content, cognitive level, format, answer key, and item author. This type of attribute implies a discrete classification of the pool; that is, a partition with classes of items containing the same attribute.
2. Quantitative attributes, such as item parameter estimates, expected response time, previous exposure rate, and word counts. This type of attribute is a value on a variable or parameter that, for all practical purposes, is to be considered as continuous.
3. Logical attributes, which imply relations among subsets of items in the pool, mostly relations of inclusion or exclusion. A relation of inclusions exists if an item has to be presented with other items in the pool because they share a stem or the description of a case. A relation of exclusion exists if items cannot be in the same test form, for instance, because some of them clue the correct answer to the others.

In addition to item attributes, it is useful to introduce the notion of test attributes. A test attribute is defined as a (function on the) distribution of item attributes (van der Linden, 2000a). Examples of test attributes are: the distribution of item content or *p*-values in a test, its information function, the number of items with a gender orientation, and its (classical) reliability. A test can now be defined as a set of items from a pool that meets a list of specifications with respect to its attributes.

An important distinction is between test specifications formulated as constraints and as objective functions:

1. A specification is a *constraint* if it requires a test attribute to meet an upper limit, lower limit, or equality.
2. A specification is an *objective function* if it requires a test attribute to take a minimum or maximum value.

The standard format of a test assembly problem is illustrated by the following example of a classical test assembly problem:

Maximize test reliability
subject to

1. Number of items on knowledge of facts smaller than 15;
2. Number of items on application equal to 20;
3. All items having four response alternatives;
4. Number of items with graphics at least 10;
5. Total number of items equal to 50;
6. No items with more than 150 words;
7. All item difficulties larger than 0.40;
8. All item difficulties smaller than 0.60;
9. All item discrimination indices larger than 0.30;
10. Item 73 and 98 not together in the test.

When translating test specifications into constraints, each constraint is required to have a simple form. For example, though it seems convenient to combine Constraint 7 and 8 into a 'single' constraint ('All item difficulties between 0.40–0.60'), such a step would obscure the total number of constraints actually involved in the problem. Also, for each problem only one objective function can be optimized at a time. If we have more functions, optimizing one of them automatically gives a suboptimal solution for the others. Finally, exchanging objective functions and constraints does not sometimes have too much effect. For example, we can replace the objective function in the above example by one in which the test is constrained to have reliability close to an educated guess of its optimum value and replace Constraint 7 and 8 by an objective function that minimizes the distances between the item difficulties and a target value of 0.50. In large-scale testing programmes, test assembly problems in a standard format can easily have more than 200 constraints. For a more complete introduction to item and test attributes, test specifications, and rules for translating specifications into objective functions and constraints, see van der Linden (in preparation; Chapter 2).

A mathematical solution to test assembly problems becomes possible if the objective function and constraints are modelled using variables for the decision to select the items in the test. Let index $i = 1, \ldots, I$ denote the items in the pool. The most commonly used decision variables are binary variables x_i, where $x_i = 1$ denotes the selection of item i and $x_i = 0$ otherwise. (Other types of variables are sometimes necessary though; see section entitled 'Some Applications'.)

A few examples of constraints modelled in terms of decision variables are:

1 Constraint 2 in the above example is a constraint with respect to a categorical attribute. If V_a denotes the set of indices of the items with the attribute Application, the constraint can be modelled as:

$$\sum_{i \in V_a} x_i = 20. \quad (1)$$

2 Constraint 7 is an example of a constraint with respect to a quantitative attribute. If p_i denotes the p-value of item i, it can be modelled as:

$$p_i x_i \leq 1, \quad i = 1, \ldots, I. \quad (2)$$

3 Constraint 10 is a logical constraint. It can be modelled as:

$$x_{73} + x_{98} \leq 1. \quad (3)$$

All these constraints are linear equalities or inequalities in the decision variables. The feature holds nearly universally for all test specifications used in practice. A simple recipe to check if constraints are modelled correctly is to substitute trial values for the decision variables and determine the truth-value of the constraint. Examples of objective functions modelled in terms of decision variables are given in the section on Applications, below.

SOLVING TEST ASSEMBLY PROBLEMS

Mathematical optimization problems with a linear objective function and linear constraints belong to the domain of Linear Programming (LP). The first to see the applicability of LP to test assembly were Feuerman and Weiss (1973) and Votaw (1952). If the decision variables are binary, the problem is known as a 0–1 LP problem. For a general introduction to these optimization techniques, see Nemhauser and Wolsey (1988) or Wagner (1972).

Once a test assembly problem has been modelled as a 0–1 LP problem, a solution can easily be found by solving the model for optimal values of the decision variables using one of the algorithms available from the literature. Although 0–1 LP problems are known to be NP-hard – that is, to have solutions that cannot generally be found in a time bounded by a polynomial in the size of the problem – current technology has reached a level of sophistication that allows us to find exact solutions to problems with 1000–2000 variables and hundreds of constraints within seconds. Sometimes, test assembly models have the special structure of a network-flow programming problem. For such structures solutions to problems of virtually unlimited size can be calculated within a second (for examples, see Armstrong, Jones & Wang, 1995). A very efficient general-purpose LP software package is CPLEX 6.5 (ILOG, 2000). A dedicated software package that helps test assemblers to define their problem and then translates the problem into an LP model is ConTEST (Timminga, van der Linden & Schweizer, 1997).

An alternative to model-based test assembly is test assembly based on a heuristic. Test assembly heuristics are computer algorithms that assemble a test in a sequential fashion, that is, by selecting one item at a time. They do so using an item-selection criterion designed to meet the test specifications. Because of their sequential nature, heuristics are generally fast. However, steps early in the sequential process cannot be undone later, and heuristics produce solutions that are not optimal. Another difference between the two approaches becomes manifest if a new class of test assembly problems has to be addressed. In an LP approach, the problem only has to be modelled and the model can be solved immediately by the algorithms and the software already available, whereas in a heuristic approach a new item-selection criterion and computer algorithm have to be developed and checked for the quality of their solutions. Examples of test assembly heuristics proven to be useful are given in Luecht (1998) and Swanson and Stocking (1993).

SOME APPLICATIONS

Target Information Function

The practice to assemble a test to meet a target for its information function was introduced in Birnbaum's (1968) pioneering work on

IRT-based test assembly. Theunissen (1985) was the first to realize that the problem can be solved using 0–1 LP, provided the information function is required to meet the target, $T(\theta)$, only in a series of discrete points, θ_k, $k = 1, \ldots, K$. Uniform approximation of the test information function to a series of target values is possible through a maximin approach (van der Linden & Boekkooi-Timminga, 1989). In this approach, test information is required to be in intervals about the target values, $(T(\theta_k) + y, T(\theta_k) - y)$, and the objective function minimizes the common size of the intervals. Formally, the model is

$$\text{minimize } y \tag{4}$$

subject to

$$\sum_{i=1}^{I} I_i(\theta_k)x_i - T(\theta_k) \leq y, \quad k = 1, \ldots, K, \tag{5}$$

$$\sum_{i=1}^{I} I_i(\theta_k)x_i - T(\theta_k) \geq -y, \quad k = 1, \ldots, K, \tag{6}$$

where y is a real-valued decision variable with optimal value to be calculated by the algorithm. (LP problems with both integer and real-valued variables are known as mixed integer programming problems.) Of course, these equations should be extended with a set of constraints to meet the content specifications for the test.

An empirical example for a pool of 753 items from the Law School Admission Test (LSAT) is given in Figure 1. The test length was set at 75 items. (The actual LSAT is longer because it duplicates one of its sections.) In all, a 0–1 LP model with 804 variables and 276 constraints was needed to assemble the test to deal with all specifications (including an item-set structure of some of the sections; see subsection entitled 'Tests with Item Sets'). The test information function had to approximate the target at five values. Figure 1 shows both the information function of the test assembled and the full target.

Multiple Test Forms

If examinees are allowed to take tests at different sessions, tests are often assembled as sets of parallel forms. The best result is obtained if such sets are assembled simultaneously. If they are assembled sequentially, the value of the objective functions of each next form can be expected to be worse than those of its predecessors.

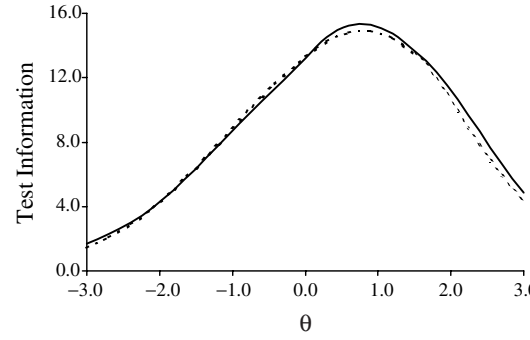

Figure 1. Information function for test form assembled from an LSAT pool (solid line represents target).

Multiple test forms can be assembled simultaneously if the following modifications are introduced:

1. The decision variables are replaced by variables x_{if}, with value 1 if item i is assigned to form $f = 1, \ldots, F$ and value 0 otherwise.
2. Constraints are added to the model to guarantee that each item is assigned to no more than one form:

$$\sum_{f=1}^{F} x_{if} \leq 1, \quad i = 1, \ldots, I \tag{7}$$

For the same LSAT item pool, Figure 2 shows the information functions of three parallel forms assembled to meet the same target as in Figure 1. For more on this application as well as methods to deal with large multiple-form assembly problems, see van der Linden and Adema (1998).

Tests with Item Sets

Tests with item sets are popular because they allow for the testing of knowledge or skills using the same case for more than one item. Often, the item pool has more items per set than needed in the test. Let $s = 1, \ldots, S$ denote the item sets in the pool, $i_s = 1, \ldots, I_s$ the items in set s, and n_s the

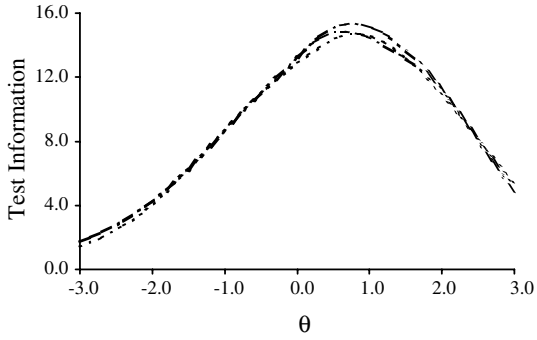

Figure 2. Information functions for three parallel test forms assembled from an LSAT pool (same target as in Figure 1).

number of items required from set s if it is selected to be in the test.

Tests with item sets can be assembled if the following modifications are introduced:

1 In addition to decision variable for the items, 0–1 variables z_s for the selection of set s are introduced.
2 Constraints are added to the model that both coordinate the selection of item and sets and guarantee the correct number of items in each selected set:

$$\sum_{i_s}^{I_s} x_{i_s} - n_s Z_s = 0, \quad s = 1, \ldots, S. \tag{8}$$

The LSAT form assembled for Figure 1 had an item-set structure for some of its sections. For other empirical examples and approaches to assembling tests with item sets, see van der Linden (2000a).

Other Applications

The above applications illustrate only a few of the options made possible by 0–1 LP test assembly. Other options include: (1) classical test assembly, with Cronbach's alpha represented by a combination of an objective function and a constraint; (2) assembly of tests required to match a given test form item by item; (3) assembly of tests measuring a multidimensional ability; (4) assembly of multiple test forms that differ systematically – for example, a set of subtests for a multi-stage testing system or testlets for testlet-based computerized adaptive testing (CAT); (5) assembly of tests with observed scores equated to those on a previous version of the test. A recent review of these and other applications is given in van der Linden (1998; in preparation).

FUTURE PERSPECTIVES

Though the development of computerized adaptive testing (CAT) was mainly motivated by statistical considerations, real-life CAT systems have to meet a host of non-statistical specifications as well. A recent development is the use of 0–1 LP test assembly to introduce non-statistical constraints in CAT (van der Linden, 2000b). The technique is applied through the assembly of a *shadow test* prior to the selection of the next item for an examinee. Shadow tests are tests that: (1) contain all items already assembled; (2) meet all constraints that have to be imposed on the adaptive test; and (3) have maximum information at the last update of the ability estimator. The item actually administered is the most informative item in the shadow test not administered to the examinee yet. Because after each update of the ability estimate the shadow test is re-assembled, the adaptive test is maximally informative. In addition, because each shadow test meets all necessary constraints, the adaptive test does.

Even though automated test assembly guarantees the best test from the pool, the result may be of low quality if the item pool is poor. In the parlance of 0–1 LP test assembly, the most important constraint imposed on the assembly of the test may be the poor composition of the item pool. It is therefore expected that an important future activity will be the development of methods to design item pools better targeted towards the tests to be assembled from them. A first attempt at optimal item pool design is given in van der Linden, Veldkamp and Reese (2000). A key notion in their approach is the one of a design space for the item pool. This space is defined as the Cartesian product of all statistical and non-statistical item attributes involved in the specifications for the tests from the pool. (This operation may require discretization of quantitative attributes.) A point in this space identifies a possible item in the pool. The technique of integer programming is then used to calculate

an optimal blueprint of the item pool from the specifications for the tests the pool has to serve. The blueprint specifies the optimal number of items required for each point in the design space.

CONCLUSIONS

Over the last decade several models and algorithms for automated test assembly have been developed. Automated assembly is now possible for almost every type of test and every set of specifications. This development seems timely because automated test assembly is the key to any form of computer-based testing and the current expectations about the improvements in the practice of testing that have become possible by the introduction of computers in testing are high.

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RELATED ENTRIES

ITEM RESPONSE THEORY: MODELS AND FEATURES, ITEM BANKING, CLASSICAL AND MODERN ITEM ANALYSIS, ADAPTIVE AND TAILORED TESTING, THEORETICAL PERSPECTIVE: PSYCHOMETRICS

B

BEHAVIOURAL ASSESSMENT TECHNIQUES

INTRODUCTION

A major impetus for behaviour therapy was disenchantment with the medical model of psychopathology that views problem behaviours as the result of an underlying illness or pathology. Behaviourists assert that both 'disordered' and 'non-disordered' behaviour can be explained using a common set of principles describing classical and operant conditioning.

Behaviourists believe that behaviours are best understood in terms of their function. Two 'symptoms' may differ in form, while being similar in function. For example, Jacobson (1992) describes topographically diverse behaviours such as walking away or keeping busy that all function to create distance between a client and his partner. Conversely, topographically similar behaviours may serve different functions. For example, tantrums may serve to elicit attention from adults or may be an indication that the present task is too demanding (Carr & Durand, 1985). Behaviour therapists try to understand not only the form but also the function of problem behaviours within the client's environment (Froyd et al., 1996).

The initial goals of assessment are to identify and construct a case formulation of the client's difficulties that will guide the clinician and patient towards potentially effective interventions. For the behaviour therapist, this involves identifying problem behaviours, stimuli that are present when the target behaviours occur, associated consequences, and organism variables including learning history and physiological variables (Goldfried & Sprafkin, 1976). The results of this functional analysis are used to design a behavioural intervention that is tailored to the individual client and conceptually linked to basic learning principles.

Assessing Target Behaviours

The process of defining and measuring target behaviours is essential to behavioural assessment. Vague complaints must be expressed as specific quantifiable behaviours. For instance, anger might include responses such as hitting walls, refusing to talk or other specific behaviours. The client's goals must be defined in terms of those specific behavioural changes that would occur if treatment were effective.

Target behaviour selection can be complicated by the complexity with which many responses are expressed. Behaviourists have long recognized that many clinical problems involve responses that cannot be readily observed. Some responses such as intrusive thoughts or aversive mood states are private by nature. Others, such as sexual responses, may be private and unobservable due to social convention. Many clinical

complaints may include both observable and private responses. For example, depressed mood and suicidal ideation might be accompanied by crying, or other overt behaviours. Public and private responses may not always appear consistent. For example, an agoraphobic client may enter a shopping mall during an assessment but may do so only with extreme subjective distress.

Cone (1978) suggested that the bioinformational theory of emotion developed by Lang (1971) is useful for conceptualizing clinical problems. Lang (1971) asserted that emotional responses occur in three separate but loosely coupled response systems. These are the cognitive/linguistic, overt behavioural, and psychophysiological systems. A given response such as a panic attack may be divided into physiological responses such as increased heart rate and respiration, cognitive responses such as thoughts about dying or passing out, and overt behavioural responses such as escape from the situation, sitting down, or leaning against a wall for support. Ideally, each response mode should be assessed, there being no a priori reason to value one modality over another (Lang, 1971). Discrepancies are best considered with regard to the particular client, the goals of therapy, and ethical considerations. For example, it may be wise to take verbal reports of pain seriously even if they do not match evidence of tissue damage or physiological arousal.

The triple response conceptualization of clinical problems has encouraged the development and utilization of methods that more or less directly assess each response mode. Overt behaviours have been assessed by direct observation, with psychophysiological assessment used to assess bodily responses, and self-report measures developed to quantify subjective experiences. The apparent link between assessment methods and particular response modes is not absolute. For example, a client might verbally report sensations such as heart pounding, muscle tension, or other noticeable physical changes. However, in some cases, the method of assessment is more closely bound to a particular response mode. This is true of physiological processes such as blood pressure that are outside of the client's awareness, and in the case of thoughts or subjective states that can only be assessed by verbal report. In the following sections self-report measures, direct observation, and psychophysiological measurements are described in more detail.

SELF-REPORT METHODS

There are several formats for collecting self-report data. These include interviews, questionnaires and inventories, rating scales, think-aloud, and thought-sampling procedures. It is most often the case that an assessment would include several of these methods.

Interviews

The clinical interview is the most widely used method of clinical assessment (Watkins, Campbell, Nieberding & Hallmark, 1995), and is particularly advantageous in the early stages of assessment. The most salient of its advantages is flexibility. The typical interview begins with broad-based inquiry regarding the client's functioning. As the interview progresses, it becomes more focused on specific problems and potential controlling variables. Interviewing also provides an opportunity to directly observe the client's behaviour, and to begin developing a therapeutic relationship.

The clinical interview also has important disadvantages. Interviews elicit information from memory that can be subject to errors, omissions, or distortions. Additionally, the interview often relies heavily on the clinician to make subjective judgements in selecting those issues that warrant further assessment or inquiry. One could reasonably expect that different clinicians could emerge from a clinical interview with very different conceptualizations of the client (Hay, Hay, Angle & Nelson, 1979).

Structured and semi-structured interviews were developed in order to facilitate consistency across interviewers. Structured interviews are designed for administration by non-clinicians such as research assistants in large-scale studies. A structured interview follows a strict format that specifies the order and exact wording of questions. Semi-structured interviews are more frequently used by trained clinicians. They provide a more flexible framework for the course of the interview while providing enough structure to promote consistency across administrations. While specific questions may be

provided, the interviewer is free to pursue additional information when this seems appropriate. In general, the goal of enhanced reliability has been attained with the use of structured and semi-structured interviews (Matarazzo, 1983). However, the majority of these interviews are designed for purposes of diagnosis rather than more particular target behaviours or functional assessment.

Just as the clinical interview proceeds from a general inquiry to more focused assessment of behavioural targets, other self-report measures vary in the degree to which they assess general areas of functioning versus particular problem behaviours. In general, those measures that assess general constructs such as depression or general domains of functioning are developed using group data and are meant to be applicable to a wide range of clients. Examples of these nomothetic measures include personality inventories and standardized questionnaires. Other self-report methods can be tailored more toward individual clients and particular problem responses. These include rating scales and think-aloud procedures. Each of these methods is described briefly in the following subsections.

Questionnaires

Questionnaires are probably the next most common assessment tool after interviews (Watkins, Campell, Nieberding & Hallmark, 1995). Questionnaires can be easily and economically administered. They are easily quantified and the scores can be compared across time to evaluate treatment effects. Finally, normative data is available for many questionnaires so that a given client's score can be referenced to a general population.

There has been a rapid proliferation of questionnaires over the last few decades (Froyd & Lambert, 1989). Some questionnaires focus on stimulus situations provoking the problem behaviour, such as anxiety provoking situations. Other questionnaires focus on particular responses or on positive or negative consequences. The process of choosing questionnaires from those that are available can be daunting. Fischer and Corcoran (1994) have compiled a collection of published questionnaires accompanied by summaries of their psychometric properties.

Many behaviourists have expressed concern with the apparent reliance on questionnaires both in clinical and in research settings. These criticisms stem in part from repeated observations that individuals evidence very limited ability to identify those variables that influence their behaviour. Additionally, behaviourists point out that we tend to reify the constructs that we measure. This may lead to a focus on underlying dispositions or traits in explaining behaviour rather than a thorough investigation of environmental factors and the individual's learning history. Behaviourists do make use of questionnaires but tend to regard them as measures of behavioural responses that tend to correlate rather than as underlying traits or dispositions.

Rating Scales and Self-Ratings

Rating scales can be constructed to measure a wide range of responses. They are often incorporated into questionnaires or interviews. For example, a client may be asked to rate feelings of hopelessness over the past week on a scale of 0–8. Clinicians might also make ratings of the client's noticeable behaviour during the interview or the client's apparent level of functioning.

The main advantage of rating scales is their flexibility. They can be used to assess problem behaviours for which questionnaires are not available. Additionally, rating scales can be administered repeatedly with greater ease than questionnaires. For example, rather than pausing to complete an anxiety questionnaire, a client might provide periodic self-ratings of discomfort during an anxiety-provoking situation. The main disadvantage of rating scales is the lack of normative data.

Thought Listing and Think-Aloud Procedures

Clinicians are sometimes interested in the particular thoughts that are experienced by a client in a situation such as a phobic exposure or role-play. The use of questionnaires may interfere with the situation and may not capture the more idiosyncratic thoughts of a particular client. Think-aloud and thought sampling procedures may be used under these circumstances.

These procedures require the client to verbalize thoughts as they occur in the assessment situation. Thoughts can be reported continually in a think-aloud format or the client may periodically be prompted to report the most recently occurring thoughts in a thought-sampling procedure. When the requirements of think-aloud procedures may interfere with the client's ability to remain engaged in the assessment situation, the client may be asked to list those thoughts that are recalled at the end of the task. These procedures carry the advantage of being highly flexible. Like other highly individualized methods, they also carry the disadvantage of lacking norms.

DIRECT OBSERVATION AND SELF-MONITORING

One of the most direct forms of assessment is observation by trained observers. Direct observation can be conducted by clinicians, professional staff, or by participant observers who already have contact with the client. Rather than reporting in retrospect, observers can record all instances of the target behaviour that they witness, thereby producing a frequency count. Depending on the type of target response, this task could be arduous. Recording all instances of highly frequent and repetitive behaviours can place undue demands on observers. There are several ways to decrease the demands on the observer and thereby facilitate more faithful data collection. One option is the use of brief observation periods. For example, a parent might be asked to record the frequency of the target behaviour at intervals during those specific situations when the behaviour is probable. When the target behaviour is an ongoing response, the observer might employ momentary sampling procedures and periodically check to see if the behaviour is occurring. For a more thorough discussion of alternative procedures of direct observation see Baird and Nelson-Gray (1999).

Direct observation carries some disadvantages. It can be costly and time-consuming. In the strictest sense it would be favourable to utilize multiple observers so that the concordance of their recording could be checked. It has been shown that the reliability of observations is enhanced when observers know that the data will be checked (Weinrott & Jones, 1984). However, this may not be practical, particularly in clinical settings. The use of participant observers may be a less costly alternative in many cases.

Direct observation can also result in reactive effects. Reactivity refers to changes in behaviour that result from the assessment procedure. Making clients aware that they are being observed can alter the frequency or form of the target response (Kazdin, 1979). This can occur even with the use of participant observers (Hay, Nelson & Hay, 1980). The variables that influence observee reactivity are not well understood. For ethical reasons, it may be unwise to conduct observations without the client's awareness.

Self-Monitoring

In self-monitoring procedures, the client is asked to act as his or her own observer and to record information regarding target behaviours as they occur. Self-monitoring can be regarded as a self-report procedure with some benefits similar to direct observation. Because target behaviours are recorded as they occur, self-monitored data may be less susceptible to memory related errors. Like other self-report methods, self-monitoring can be used to assess private responses that are not amenable to observation. Self-monitored data also have the potential to be more complete than that obtained from observers, because the self-monitor can potentially observe all occurrences of target behaviours (Kazdin, 1974).

There are several formats for self-monitoring. Early in assessment, a diary format is common. This allows the client to record any potentially important behaviours and their environmental context in the form of a narrative. As particular target behaviours are identified, the client may utilize data collection sheets for recording more specific behavioural targets and situational variables. When behaviours are highly frequent or occur with prolonged duration, the client may be asked to estimate the number of occurrences at particular intervals or the amount of time engaged in the target response.

It is often desirable to check the integrity of self-monitored data. Making the client aware that their self-monitored data will be checked is known to enhance the accuracy of data collection (Lipinski & Nelson, 1974). Self-monitored data

can be checked against data obtained from external observers or can be compared to measured by-products of the target response. For example, self-monitored alcohol consumption can be compared to randomly tested blood alcohol levels.

Among the disadvantages of self-monitoring are its demands on the client for data collection and the lack of available norms. Like direct observation, self-monitoring also produces reactive effects. However, this disadvantage in terms of measurement can be advantageous in terms of treatment. This is because reactive effects tend to occur in the therapeutic direction, with desirable behaviours becoming more frequent and undesired behaviours tending to decrease. This temporary effect of the procedure can produce some relief for the client and help to maintain an investment in treatment. More information on self-monitoring methods is provided in the self observation (Self-Monitoring) entry in this encyclopedia.

PSYCHOPHYSIOLOGICAL ASSESSMENT

Psychophysiological assessment is a highly direct form of measurement that involves assessing the byproducts of physiological processes that are associated with behavioural responses. For instance, a cardiotachometer can be used to measure electrical changes associated with activity of the heart. While clients can verbally report many physiological changes, a direct measurement via instrumentation carries several advantages. Physiological measures can be sensitive to subtle changes and to physiological processes that occur without the client's awareness. They can also provide both discrete and continuous data with regard to physiological processes while requiring only passive participation from the client (Iacono, 1991). Additionally, most clients lack familiarity with psychophysiological measurement, making deliberate distortion of responses improbable (Iacono, 1991). Korotitsch and Nelson-Gray (1999) provide a more detailed discussion of psychophysiological measures.

The main disadvantage of psychophysiological measurement is the cost of equipment and training. This problem is compounded by the observation that it is often desirable to include measures of multiple physiological channels. For example, there can be substantial variance across individuals in the degree of response exhibited on a given physiological index. Those measures that are most sensitive for a given individual may not be included in a limited psychophysiological assessment. With technological advances in this area, less costly instrumentation will likely become more available.

FUTURE PERSPECTIVES

Over the past two decades, research devoted to direct observation and self-monitoring procedures has declined dramatically. This trend has been mirrored by a rapid proliferation of questionnaires and research examining their psychometric properties. One likely reason for this shift is the current climate of managed healthcare. The goal of more efficient and less costly healthcare has created pressure for more rapid and inexpensive forms of assessment and treatment. Psychophysiological recording equipment is simply too expensive for most clinicians to afford and maintain. The task of training and paying trained observers can also be costly. Even when participant observers are used, the procedure can place inordinate demands on these individuals. While self-monitoring is less costly, it does place more demands on the client and more time is required to obtain useful information beyond an initial interview. In general, the more direct methods of behavioural assessment have the disadvantage of also being more costly and time consuming. The trend toward more rapid assessment seems to select for brief, easily administered, and relatively inexpensive questionnaires and rating scales. There have been calls for more research devoted to behavioural assessment methods (Korotitsch & Nelson-Gray, 1999; Taylor, 1999). This research might lead to more efficient methods for implementing these assessment procedures. There is also a need to determine if the data from these assessments facilitates more efficient and/or effective treatment (Korotitsch & Nelson-Gray, 1999). If empirical support for the utility of behavioural assessment techniques is generated, this may help to increase the receptiveness of third party payers to the use of these procedures.

CONCLUSIONS

The goals and conduct of behavioural assessment are directly linked to learning theory and to the goal of altering behaviour through the use of behavioural principles. The hallmark of behavioural assessment is an emphasis on the function rather than the form of problem behaviours, and on the specification of problem behaviours, as well as their environmental and organismic controlling variables in more detail than is typical of diagnostic classification. While diagnostic assessment tools might be included, behavioural assessment demands further molecular analysis of specific target behaviours and controlling variables.

Behaviour therapists have long recognized that clinical problems are often part of the client's private experience, and that many are a combination of verbal, physiological, and overt behavioural responses. A comprehensive assessment considers each of these modalities. While these ideas are still fundamental in behavioural assessment, the more costly and time-demanding methods of behavioural assessment are becoming more difficult to include in clinical assessment and are less apt to be the focus of research.

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RELATED ENTRIES

THEORETICAL PERSPECTIVE: BEHAVIOURAL, THEORETICAL PERSPECTIVE: COGNITIVE-BEHAVIOURAL, OBSERVATIONAL METHODS (GENERAL), OBSERVATIONAL TECHNIQUES IN CLINICAL SETTINGS, SELF-REPORTS (GENERAL), SELF-REPORTS IN BEHAVIOURAL CLINICAL SETTINGS, PSYCHOPHYSIOLOGICAL EQUIPMENT AND MEASUREMENTS, APPLIED FIELDS: CLINICAL, ANALOGUE METHODS, SELF-OBSERVATION (SELF-MONITORING)

B BEHAVIOURAL SETTINGS AND BEHAVIOUR MAPPING

INTRODUCTION

At first it might seem that behaviour settings and behavioural mapping are two separate and unrelated methods. Yet the true meaning of behaviour setting is that all behaviour is linked to a particular time and place; so any behavioural map is simply a record of behaviour that has always to be used within a behaviour setting. In a very literal sense behavioural mapping is really the footprint of a behaviour setting or settings.

For those unfamiliar with the term 'behaviour setting', it refers to a standing pattern of behaviour which is tied to a particular place and time, (these) are simply the easily observed events of everyday life like the grocery store, the lawyer's office, 3rd grade class. They can be observed to begin at a regular time and end at a regular time and contain a recognized pattern of behaviour which is constantly repeated. If it is unclear whether settings which are adjacent in time or place are really separate, the K-21 scale is used. This scale is available in Barker and Wright (1955), Schoggen (1989) or Bechtel (1997). The central idea is overlap of population and behaviour. If there is more than a fifty per cent overlap on the seven scales (population, space used, leadership, objects, action, time, mechanisms) the putative settings are really one. The score of 21 is arbitrarily chosen as the cut off point to separate two units but any score between 17 and 23 can indicate some boundary problems (Bechtel, 1977) of observed human behaviour. They are the units into which humans sort themselves to get the daily business of living done.

Behavioural mapping is the narrower recording of specific behaviours within settings. A behavioural map (Ittelson, Rivlin & Proshansky, 1976) is a recording of where behaviour takes place on a floor plan of the setting, providing a two-dimensional record of the behaviour. In special cases it is also possible to record the behaviour automatically (Bechtel, 1967). Behavioural maps can include more than one behaviour setting.

BEHAVIOUR SETTINGS AS ASSESSMENT TOOLS

A behaviour setting census – that is, a complete count of behaviour settings in a community over a year – is used to assess either a community or an individual. Community assessment is done by counting the number of behaviour settings (with their population numbers) that occur in a defined community for one year. Assessment of an individual is done by collecting the *behavioural range*, the number of settings an individual enters in a year or a shorter time span, depending on the purpose of the assessment. A year is necessary in order to include the kinds of settings which only occur once a year like Christmas Eve, Easter, Fourth of July, etc. Merely counting the number of settings can provide a measure of health for both communities and persons.

A healthy community can be defined as one that provides an adequate, or, preferably, more than adequate, number of resources for its inhabitants. Healthy communities have about two settings available for each inhabitant. But there are other aspects which can be deduced from these numbers. For example, when two communities were compared (Barker & Schoggen, 1973), it was observed that one, a midwest town, had more behaviour settings available per child than a town in Great Britain. This was explained by the different philosophies on child rearing that existed in the two communities. In the midwest town it was assumed that the best way to rear children was to get them participating in adult life as soon as they could even though they might not be capable of performing at the adult level. In the British community children were withheld from

participation until it was deemed they were capable of participating at a reasonably competent level. The result was the midwest town had twice as many settings where children were present. If one agreed that the midwest philosophy was more valid, then the greater participation would be a measure of a healthy environment for children (and could even quantify the number of settings available to children vs. number of children and be used to evaluate goals). Organizations can be assessed by use of behaviour settings. For example, in the study of school size (Barker & Gump, 1964), it was discovered that large schools had twenty times as many students as small schools but only five times as many settings. The consequence of this was that small schools can have twice the participation level of large schools in extra curricular activities, simply because there is more activity per student. The psychological consequences of this size discrepancy are also critical. Small schools report more satisfaction, competence, being challenged, engaging in important actions (leadership), being involved, achieving more cultural and more moral values. By contrast, large schools report more vicarious enjoyment (passive roles), large affiliation, and learning more about the school and persons in it.

Leadership is another important variable that can be measured when taking a behaviour-setting census. A simple scale is used for each behaviour setting: six is applied to a leader without whom the setting could not take place. A one-person radio station is an example. A teacher of an unfamiliar language like Urdu might be another. There are few truly six-rated settings because most are shared leadership. For example, any organization with a vice president has a shared leadership. Most settings have leaders rated at the five level. Fours are officials like secretaries, treasurers, board members, etc. Anyone who has a role above that of plain member is a four.

Even a janitor is a four. Threes are the bona fide members of the setting who are not officials in any way. Twos are visitors to the setting and ones are onlookers outside the setting looking in. Sidewalk superintendents are ones. This simple leadership breakdown for every setting can be used to calculate the leadership roles available per person in a town. To return to our midwest versus British towns, the midwesterners had control of four times as many settings as the British. This was because the British town had many outside persons entering and controlling settings. It is obvious that this simple scale can also be used as a measure of opportunity. For example, in small versus large military bases in Alaska (Bechtel, 1977) it was shown that there was a much better chance at leadership roles in the smaller bases.

Using the Behavioural Range can be an effective way to measure the involvement of a patient outside of therapy (Bechtel, 1984). This method can be used to measure an average day, a month or a whole year in a person's life. The entire year is an accurate measure of lifestyle. For a quicker assessment, the therapist merely asks about the number of activities the patient engages in and assumes these are settings. Also critical is the role the patient takes in each setting, whether passive or some form of leadership. Two alcoholic women, aged 50, were assessed in this manner. The first patient had very few activities, and when she saw how sparse her day was remarked, 'Gee, I don't do very much.' Part of the therapy contract was to get her involved in more activities. The second patient made a rather impressive list of activities and was surprised by the breadth of engagement. Her contract was to use these settings as a better resource. The fact of participation was itself reassuring, however.

The Behavioural Range can also be used as a personal leadership measure by using the 1–6 scale for participation in each behaviour setting.

BEHAVIOUR MAPPING AS AN ASSESSMENT TOOL

Behavioural mapping was first used by Ittelson (1961) in a mental ward of a veteran's hospital (see Table 1). Patients in the ward were directly observed and their movements and behaviour coded on a floor plan of the ward. Cherulnik (1993) provides two examples of behavioural mapping used to evaluate changes in mental hospital wards. In both cases physical arrangements were modified to allow patients a closer proximity in order to encourage social interaction. And in both cases this was successful because pre–post behavioural mapping showed significant increases in social interaction.

A scale drawing of the place to be measured is first necessary with each physical feature labelled. The categories of behaviour should be observable and codable. One problem is the intrusiveness of

Table 1. Behavioural mapping categories from a mental ward (from Ittelson et al., 1976: 344)

Behaviour	Observational categories	Analytic categories
Patient reclines on bench, hand over face, but not asleep Patient lies in bed awake	Lie awake	
Patient sleeps on easy chair One patient sleeps while others are lined up for lunch	Sleeping	Isolated passive
Patient sits smiling to self Patient sits, smoking and spitting	Sitting alone	
Patient writes a letter on bench Patient takes notes from book	Write	
Patient sets own hair Patient sits, waiting to get into shower	Personal hygiene	
Patient reads newspaper and paces Patient reads a book	Read	Isolated active
Patient and nurse's aid stand next to alcove Patient stands in doorway smoking	Stand	
Patient paces between room and corridor Patient paces from room to room saying hello to other patients	Pacing	
Upon receiving lunch some patients take it to bedroom Patient sits at table and eats by self	Eating	
Patient cleans the table with sponge Patient makes bed	Housekeeping	
Two patients listen to record player Patient turns down volume on radio	Phonograph-Radio	Mixed active
Patient knits, sitting down Patient paints (oils), sitting down	Arts and crafts	
Patient and registered nurses watch TV, together Patient watches TV, goes to get towel, returns	TV	
Patient stands and watches card games Patient sits on cans in hall watching people go by	Watching an activity	
Patient play soccer in corridor Patient and doctors play chess	Games	
One patient talks to another in reassurance tones Four patients sit facing corridor, talk sporadically		Social
Patient fails to respond to doctor's questions	Talk	
Patient introduces visitors to other patient Patient stands near room with visitors	Talk (visitor)	Visit
Patient comes in to flick cigarette ashes Patients go to solarium	Traffic	Traffic

observers. Usually observers are introduced as 'architecture students' who want to observe how the design elements are used. Another problem is the time sampling. If architectural features are to be evaluated, the time of maximum use must first be determined. Another aspect, however, may be the span of time where the features being studied are not used at all. Use and disuse are often problems with the same design feature. For example, in one study of a hospice done by Bill Ittelson and I, it was discovered that the chapel of the hospice was seldom used compared to other places. But when patients and staff were quizzed, it became apparent that the symbolic importance of the chapel made it more important than the actual use. An advantage of both the behaviour setting and behavioural mapping techniques is that they are essentially atheoretical and can be used to test any theory that proposes to influence behaviour or design.

FUTURE PERSPECTIVES AND CONCLUSIONS

The use of behaviour settings and behavioural mapping continue in many post-occupancy and other evaluation studies. It is often the practice to include them as part of several methods in post-occupany evaluation (POEs). However, many of the quantitative scales are often not used because researchers are not aware of their utility. For example, in several studies, the K-21 scale was used to measure boundary problems between two settings located adjacent to each other (see Barker, 1968 and Bechtel, 1984). Many times this scale can answer the question of whether a wall should be constructed between the settings.

The future of these measures is potentially greater than ever. The kind of data obtained is more readily understood by architects and engineers because it measures easily observed phenomenon (settings) which any layman can see and relate to. I can remember a conversation with Burgess Ledbetter, one of the architects I have worked extensively with in past years. He was designing a church of 10,000 members. I asked how he went about such an enormous task. He replied without hesitation, 'I just counted the potential behaviour settings.'

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RELATED ENTRIES

BEHAVIOURAL ASSESSMENT TECHNIQUES, OBSERVATIONAL METHODS (GENERAL), PERSON/SITUATION (ENVIRONMENT) ASSESSMENT, THEORETICAL PERSPECTIVE: BEHAVIOURAL, COGNITIVE MAPS, POST-OCCUPANCY EVALUATION FOR THE BUILT ENVIRONMENT, LANDSCAPES AND NATURAL ENVIRONMENTS

BIG FIVE MODEL ASSESSMENT

INTRODUCTION

The Big Five model of personality traits derives its strength from two lines of research, the psycholexical and the factoranalytic tradition, from which the interchangeably used names Big Five model and Five Factor model respectively originate. The two traditions have produced remarkably similar five-factor structures that mark a point of no return for personality psychology. An extensive review of history and theory with respect to the Big Five can be found in De Raad (2000).

The Big Five factors have been endorsed with a distinctive status, derived from the extensive, omnibus-character of the underlying *psycholexical* approach, and based on two characteristics, namely its *exhaustiveness* in capturing

the semantics of personality and its recourse to *ordinary language*. Though both these characteristics may be improved upon, in comparison to other approaches to personality, the psycholexical approach outranks semantic coverage, and it has optimized the level of communication on personality traits by faring merely on readily intelligible units of description.

The model has served as a basis for the development of assessment instruments of various kinds. In the following paragraphs, different assessment forms based on the Big Five model, as well as some representative assessment systems, are briefly described, including Big Five trait-markers, Big Five inventories, and some instruments that have been moulded after the Big Five framework. To begin with, a brief content description of the Big Five constructs is given.

THE BIG FIVE CONSTRUCTS

The Big Five constructs, Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Intellect/Autonomy, made a long journey, covering about a whole century, towards a strong performance in the psychological arena during the last decade of the twentieth century. A straight count of the references made to each of the presently identified Big Five constructs in abstracts since 1887 tells that, of the total number of 17,262 references made, Extraversion (and Introversion) and Neuroticism (and Emotional Stability) are the absolute winners, with 8574 and 6189 references respectively. This picture sustains the historical 'Big Two' of temperament (Wiggins, 1968). The historical third, Intellect, with 1534 references, may refer to both traits and abilities.

Extraversion and Introversion

No single pair of traits of personality has been quite so widely discussed and studied as that of Extraversion and Introversion. Their main understanding at the onset of their appearance was Jungian. To Jung Extraversion is the outward turning of psychic energy toward the external world, while Introversion refers to the inward flow of psychic energy towards the depths of the psyche. Extraversion is denoted by habitual outgoingness, venturing forth with careless confidence into the unknown, and being particularly interested in people and events in the external world. Introversion is reflected by a keen interest in one's own psyche, and often preferring to be alone.

Extraversion is a dimension in almost all personality inventories of a multidimensional nature, which in fact sustains its relevance and its substantive character. Moreover, many studies have provided behavioural correlates of this construct, such as the number of leadership roles assumed, and frequency of partying. Extraversion has also been found relevant in contexts of learning and education (De Raad & Schouwenburg, 1996) and of health (e.g. Scheier & Carver, 1987).

Agreeableness

Agreeableness is the personality dimension with the briefest history. Yet, while longtime constructs as Love and Hate, Solidarity, Conflict, Cooperation, Kindness, which are part and parcel of this dimension, may have been pivotal to the organization of social life throughout the history of mankind, as a personality dimension it essentially popped up with the rise of the Big Five. Agreeableness can be considered as being dominated by 'communion', the condition of being part of a spiritual or social community. Graziano and colleagues have described the details of the history of this construct (e.g. Graziano & Eisenberg, 1997).

Agreeableness is argued to play a role as a predictor of training proficiency (e.g. Salgado, 1997). In health psychological research, Agreeableness plays a documented role. Coronary heart disease is more likely to develop in competitive and hostile people than in those who are more easygoing and patient (*cf.* Graziano & Eisenberg, 1997).

Conscientiousness

Conscientiousness has been drawn upon as a resource in situations where achievement is of important value; that is, in contexts of work, learning and education. The construct represents the drive to accomplish something, and it contains the characteristics necessary in such a pursuit: being organized, systematic, efficient, practical, and steady.

Conscientiousness is found to be consistently related to school performance (e.g. Wolfe & Johnson, 1995), and job performance (e.g. Salgado, 1997).

Emotional Stability and Neuroticism

The first inventory measuring neurotic tendencies is Woodworth's (1917) Personal Data Sheet, developed to assess the ability of soldiers to cope with military stresses. Thurstone and Thurstone (1930) developed a neurotic inventory called 'A Personality Schedule' to assess the neurotic tendencies of university freshmen. As one of the 'Big Two', Neuroticism (or 'Anxiety') had been observed by Wiggins (1968) most notably in several of the works of Eysenck, Cattell, Guilford, and Gough.

Neuroticism has been found relevant as a predictor of school attainment (e.g. Entwistle & Cunningham, 1968). In the clinical situation, neuroticism is found relevant in the assessment of personality disorders (*cf.* Schroeder, Wormworth & Livesley, 1992). Neuroticism correlates significantly with measures of illness (e.g. Larsen, 1992).

Intellect and Openness to Experience

Feelings are usually running highest for the Fifth of the Big Five. This refers to its naming but also to its origin and its relevance as a personality trait factor. Discussions with respect to this factor incorporate the various points of criticism that are expressed over the Big Five as a model. Several candidates for factor five have been suggested, such as Culture, Intellectance, and Openness to Experience (see De Raad, 2000).

In assessment situations the Fifth of the Big Five may be relevant in psychiatry and clinical psychology. Aspects of Openness to Experience seem to be related to several disorders (Costa & Widiger, 1994). In contexts of learning and education, Openness to Experience has been related to learning strategies. Learning strategies possibly mediate a relationship between Openness to Experience and grade point average (*cf.* Blickle, 1996).

FACETS OF THE BIG FIVE

The Big Five factors represent an abstract level of personality description that may capture specificity at a lower level. Perugini (1999) distinguishes two ways to specify different levels of abstractness, a hierarchical and a circumplex approach. The *hierarchical* approach considers facets as first order factors and the Big Five as second order factors. The *circumplex* approach represents a fine-grained configuration in which facets are constituted as blends of two factors, based on the observation that many traits are most adequately described by two (out of five) substantial loadings. Because of its explicit coverage of the trait domain, the latter model provides an excellent starting point for the development of personality assessment instruments.

BIG FIVE TRAIT-MARKERS

Possibly the most direct way to arrive at an instrument assessing the Big Five is to select trait-variables as *markers* of the Big Five, on the basis of their loadings on those factors. Simply taking the first n highest loading trait-variables per factor might do the job. A frequently used marker list to measure the Big Five is the one described in Norman (1963). The list is based on earlier work by Cattell (1947). For the history of this and similar constructs from the same period, as well as for a comprehensive coverage of many psycholexical studies, see De Raad (2000). Goldberg (1992) developed an adequate list of 100 'unipolar' markers for the Big Five. In his 1992 article Goldberg concludes: 'It is to be hoped that the availability of this easily administered set of factor markers will now encourage investigators of diverse theoretical viewpoints to communicate in a common psychometric tongue.'

BIG FIVE INVENTORIES AND QUESTIONNAIRES

Several instruments have been developed to assess the Big Five factors. Besides those that are briefly described in the following sections, a few others should be mentioned such as the BFI (John, Donahue & Kentle, 1991), the HPI (Hogan & Hogan, 1992), the IPIP (Goldberg, 1999) and the HiPIC (Mervielde & De Fruyt, 1997). A few characteristics of some main Big Five instruments are summarized in Table 1.

Table 1. Summary of the some main Big Five inventories

Instrument	Authors	Factors					Variables
		I	II	III	IV	V	
100 Unipolar markers	Goldberg	Extraversion/ surgency	Agreeableness	Conscientiousness	Emotional stability	Intellect	100 adjectives
FFPI	Hendriks, Hofstee, De Raad	Extraversion	Agreeableness	Conscientiousness	Emotional stability	Autonomy	100 items
NEO-PI-R	Costa, McCrae	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness to experience	240 items
BFQ	Caprara, Barbaranelli, Borgogni, Perugini	Energy	Friendliness	Conscientiousness	Neuroticism	Openness	120 + 12 Lie items
FF-NPQ	Paunonen, Ashton, Jackson	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness to experience	60 non-verbal items

FFPI (Five Factor Personality Inventory)

This inventory (Hendriks, Hofstee & De Raad, 1999) is unique in several respects. It took its starting point in the circumplex approach with the so-called Abridged Big Five Circumplex (AB5C), distinguishing 90 facets that provide an optimal coverage of the semantics of the Big Five system. The pool of 914 items, that was agreed upon to represent the AB5C system, was made available with approximately identical phrasings in Dutch, German, and English. Items were only accepted for the final pool if clear, unambiguous translations in those languages could be found. The final instrument, comprising 100 items, 20 for each of the five scales, is trilingual in nature. The items have a simple and easy to understand behavioural format, put in third person singular, which makes them suitable for both other-ratings and self-ratings. Some examples of items are: Has a good word for everyone, Makes friends easily, Suspects hidden motives in others, Makes people feel uncomfortable, Feels at ease with people, Shows his/her feelings, Gives compliments, and Respects others. Besides scores for the Big Five dimensions, the FFPI enables the computation of an additional 40 bipolar facet scores, derived as blends of the Big Five.

NEO-PI-R (NEO Personality Inventory Revised)

Costa and McCrae's (1992) NEO-PI-R is the most frequently used personality questionnaire to assess the Big Five. The development of the N (Neuroticism), E (Extraversion), and O (Openness to Experience) scales started with cluster analyses of 16PF data, yielding two clusters called 'Adjustment-Anxiety' and 'Introversion–Extraversion', and a third cluster conceptualized as an Experiential Style dimension (openness versus closedness to experience). After taking knowledge of an early Big Five formulation, Costa and McCrae added Agreeableness and Conscientiousness to their three-dimensional system, assuming that their three dimensions, including Openness to Experience, captured the first three of the Big Five. Costa and McCrae's first Big Five version (the NEO-PI) included scales to assess six facets of Neuroticism, Extraversion, and Openness to Experience. Only the 240-item NEO-PI-R (Costa & McCrae, 1992) also included six facets of Agreeableness and Conscientiousness.

BFQ (Big Five Questionnaire)

The Big Five Questionnaire (BFQ; Caprara, Barbaranelli, Borgogni & Perugini, 1993) has been developed using a top down approach, by first defining the five dimensions, and subsequently defining the most important facets for each dimension. The BFQ was developed alongside the first psycholexical study in Italian and some of its findings were taken into account, especially, to define the first factor. Accordingly, in the BFQ, the first factor is defined as Energy – rather than as Extraversion. The BFQ is easily administered and includes unique features such as a relatively small number of items (120) and scales to assess two facets per factor; in addition, it provides a Social Desirability response set scale of 12 items. Recently, a children version (BFQ-C, 65 items) has also been developed.

FF-NPQ (Five-Factor Nonverbal Personality Questionnaire)

A controversy with respect to verbal self- and other-ratings is that they may reflect consistencies in language rather than consistencies in observed behaviour. For this reason, Paunonen, Ashton, and Jackson (2001) developed an instrument that did not make use of verbal items, but included cartoon-like pictures, in which a person performs specific behaviours in specific situations. The investigators initially developed a non-verbal item pool for a person perception study and aiming to represent traits of Murray's system of needs. From this item pool a subset of 136 items was selected to form the Nonverbal Personality Questionnaire (NPQ) measuring 16 personality traits. With a few exceptions items were selected from the NPQ to form the 60-item FF-NPQ, with 12 items measuring each of the Big Five factors. This instrument takes about 10 minutes to finish.

QUESTIONNAIRES RELATED TO OR MOULDED AFTER THE BIG FIVE

The impact of the Big Five factors have been such that researchers often clarify the relations of their

own alternative trait models with the Big Five. A few such alternative models have been proposed, such as a Big Three (Peabody & Goldberg, 1989), a Big Six (Jackson, Ashton & Tome, 1996), a Big Seven factor model (Almagor, Tellegen & Waller, 1995) and an alternative Five Factor model (Zuckerman, 1994). All these models share features with the Big Five but differ too.

In addition, some classic instruments to assess important personality dimensions have been moulded after the Big Five. Typically, this implied the development of a new coding format for existing items in those instruments so as to yield a measure of the Big Five factors. Examples of such instruments are the ACL (FormyDuval et al., 1995) and the 16PF (Hofer, Horn & Eber, 1997). A more specific situation is provided by the recoding of the MMPI-2 into the *Personality Psychopathology-Five Questionnaire* (PSY-5). The MMPI is one of the most used personality inventories for psychopathological assessment, originally developed in the 1940s and recently refurbished (MMPI-2). Harkness and McNulty (1994) developed the so-called PSY-5 constructs starting from a pool of symptoms and characteristics of both normal and dysfunctional personality functioning leading to the identification of 60 major topics in human personality. These topics were used to generate five higher order aggregates that have some resemblance with the Big Five, with especially the fifth factor remaining evidently uncovered.

FUTURE PERSPECTIVES

Because the Big Five model has acquired the status of a reference-model, its uses can be expanded to that of systems of classification and clarification for descriptive vocabularies that are not developed from a Big Five perspective, in order to evaluate the comprehensiveness of the trait-semantics of those vocabularies. Examples of such uses are given in De Raad (2000). Moreover, the model is expected to play an important role in modern theory building, because its five main constructs capture so much of the subject matter of personality psychology. An example is Digman (1997), who succeeded in relating the Big Five factors to a higher order schema which brings together central concepts from various theories from the history of personality psychology.

Many more instruments along the main Big Five theme will be developed in the near future, as translations of existing instruments or as instruments that are completely developed within particular languages. Especially efforts may be expected to specify facets of the Big Five that can be cross-culturally validated.

CONCLUSIONS

Trait structures from different languages differ, and so do assessment instruments, imported or not. This conclusion is not dramatic; it is a challenge to cross-cultural research-programmes to isolate and identify what is valid across cultural borders, and to specify the particulars of the different cultures. A lot has yet to be done. The Big Five factor model has shown to be highly prolific in the construction of assessment instruments, notwithstanding the fact that its significance has only been recognized during the last decade of the twentieth century. Moreover, the Big Five factors are far from definitive, and the derived assessment instruments deserve constant atttention and an open eye for new facets and features to be included, in the model as well as in its assessment.

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Boele De Raad and Marco Perugini

RELATED ENTRIES

PERSONALITY ASSESSMENT (GENERAL), THEORETICAL PERSPECTIVE: PSYCHOMETRIC, TRAIT-STATE MODEL

BRAIN ACTIVITY MEASUREMENT

INTRODUCTION

Electroencephalograms (EEGs) from the human scalp were first recorded in 1924 by Hans Berger. It is assumed that they are generated by brain activity related to information processing. EEG is mainly caused by nerve cell activity, whereas other brain imaging methods are more related to blood flow and metabolic parameters. Moreover, the direct coupling of EEG with biological flow of information allows a continuous and chronometric approach to the basis of cognitive processing. Variations of EEG require synchronous and massive parallel activity in wide-ranging populations of neurons and the measures are done in a great distance to the generators. Thus spatial resolution is less than in other brain imaging techniques.

Actually EEG potentials occur in several locations with alternating polarity. This finding is consistent with models of information processing assuming separate modules of cognitive functioning, which interact continously in terms of uptake, processing and passing on of information.

The main fields of the psychological use of EEG are in *cognition*, in search of cognitive relevant modules in the brain and their temporal interaction. Distortion of common spatial or temporal regularity in potential dynamics (such as dimensional complexity) can be interpreted as a sign of uncommon or *emotional processing*. Brain activity is present when awake as well as during sleep, in which a number of *sleep stages* and sleep parameters can be differentiated by using certain criteria. Deviant patterns of EEG activity can be used to characterize *psychopathological states* or could be caused by *drug effects*.

PARAMETERS

Neurophysiological Basis

It is widely accepted that most of the time both excitatory and inhibitory postsynaptic potentials simultaneously are present in the pyramidal cells of the upper and middle cortical layers. Usually they are in balance without releasing considerable action potentials. It is assumed that this is particularly true when a module became charged without immediate output. A negative potential on the surface is measured because excitatory synapses are predominant in upper layers (negative interstitium in the upper layers). The release of action potentials (negative interstitium far below) will change the dipole causing a positive potential.

Basic Activity

Negative and positive potentials in EEG alternate with main fluctuations within about 0.1 s (equivalent to around 10 Hz). Dominant frequencies in the range of about 8–12 Hz are called *EEG alpha*. Alpha is observed in awake but resting subjects without demanding memory load. Alpha is generated by burst activity produced by loops between thalamic nuclei and the related cortical areas in case of attenuated stimulation. A lower portion of the alpha band (8–10 Hz) is discussed as reflecting attenuation of cortical activity during mental load while attending stimuli actively, for example in a time series resulting in partial loss of feature-related activation. The upper portion of alpha seems to be closer related to a more general attenuation of mental load mainly in processing stimuli, even by exogenous stimulation. Frequencies of 12–14 Hz (*EEG spindles*) seem to be indicative of active suppression of sensory stimuli during sleep.

Frequency 4–8 Hz (*EEG theta*) is discussed as indicative for extension of receptive fields, for example in coarse classification of stimuli. Theta is found to be increased during drowsiness and undirected memory search (flight of thought) as well as during top down or effortful processes causing directed memory search. The latter findings gave rise to the view that theta reflects

involvement of hippocampal memory functions. Theta power can be found in posterior locations as well as above the premotor cortex indicating activated wide motor concepts. In learning response concepts, frontal theta is increased in good learners compared to poor learners.

Frequencies < 4 Hz (*EEG delta*) are found in slow wave sleep. Frequencies in the range of 40 Hz (*EEG gamma*) correspond to activities of neuronal ensembles, where some particular stimulus features are bound together building up a cognitive representation of an object or a gestalt. It is discussed that frequencies of 6 Hz may give rise to about seven oscillations of 40 Hz representing about seven distinct information chunks per second. There is a broad range of irregular frequencies between 14 and 40 Hz contributing to the shape of raw EEGs of awake subjects, which is called *EEG beta*.

Analysis of EEG basic activity needs data processing in the frequency domain and is useful for characterizing widespread cortical processes. It can be done for any time range as conceded by resolution and lower limit of the frequencies of interest, such as for mental states or for epochs chosen in relation to certain events.

Event-Related Potentials

Information processing can often be related to external events, such as the onset of a stimulus or a response. EEG potentials in the time domain corresponding to assumptions on expecting or processing of stimuli as well as preparing or evaluating of responses allow a kind of mental chronometry.

The most common potential observed before stimulus onset is a *contingent negative variation* (CNV) in the case of so-called imperative stimuli (which request fast responses) revealing increasing motor preparation. Consecutive to the onset of a stimulus, negative potentials reflect the load of certain brain areas stimulated by individually significant stimulus features. Physical features produce a load in modal specific areas in a time range of about 150 ms after onset, called *processing negativity* (N1). More abstract or related features lead to a load mainly depending on context information, for example in case of similar stimuli, in the context of a task, or in case of other kinds of involuntary or voluntary attention. Under these circumstances mental load mostly can be interpreted as a kind of mismatch and the related potential in the time range between 200–300 ms after onset is called *mismatch negativity* (N2).

Information load in individual brain areas is mostly followed by passing forward information to related or higher order areas, as revealed by a positive potential. An early positive deflection P1 (circa 100 ms) reflects forward processing of prepared (biological or overlearned) stimulation. A positive potential P2 (circa 200 ms) in the time range between N1 and N2 could be interpreted as forward processing from physical to psychological relevant features. Extraction of the psychological content ('semantics') means classification and relating to an abstract concept. Forward processing after this by a P3 or P300 (> 300 ms after onset) is discussed as cognition of the stimulus in terms of upgrading of the hitherto model of the environmental context. While most of the processes up to P3, even automatic respondings, are unconscious, forward processing after mismatch is assumed to be obligatory for being aware of the stimulus.

Longer-lasting processing increases P3 latency and widens the peak. Peak amplitude increases with task relevance and stimulus uncertainty. Important properties of stimulus processing can be studied by the odd ball paradigm. This paradigm consists of at least two classes of stimuli appearing randomly in time, where the instances of one stimulus are rare (20–30%) and a task should be done by using the rare stimuli (for example counting). Under these circumstances rare stimuli are responded by potentials with high P3s.

In case of mismatch of the extracted meaning of a stimulus compared to its semantic context, late negative and positive potentials can occur. S*emantic mismatch* occurs if a sentence ends with unexpected words or phrases (N400). Conducting information processing to a *reanalysis* is discussed in cases when a late positive potential follows (P600).

DATA ACQUISITION

The EEG Laboratory

EEG raw data have to be obtained in a laboratory protected against vibration and noise. Recording can be done without electric

field protection, if external field generators are weak and well known (50/60 Hz). Usually a separate space for subjects (including display and response devices) and acquisition apparatus (amplifier and monitoring) should be provided. The electrical potentials recorded from the scalp are of low amplitude and have to be preamplified close behind the electrodes and amplified by high quality amplifiers. A/D converter is used to convert the analogue time-continuous voltage-time series into a digitalized time-discrete signal. Analogue–digital conversion rate (sampling rate) has to be at least twice as high as the highest frequency of interest in the signal to be measured to prevent the appearance of frequencies not present in the original signal. Preparation of derivation should be conducted by trained personnel. Otherwise all requirements, instruction, supervision and data acquisition by an examiner and/or computer has to be done as is usual in psychological experiments.

Electrode–Skin Interface

In the brain, a great variety of processes takes place, continuously generating time varying (bio)electric potential fields over the scalp. EEG signals are voltage time series reflecting the potential difference between two field points derived from the scalp by electrodes. Analyses of human EEG are usually based on frequencies of 0 to 100 Hz containing magnitudes approximately of 0 to 200 μV.

Employing high input impedance EEG amplifiers, a variety of different electrode materials (Ag/AgCl, tin, silver, gold) in combination with electrode jelly may be used. Caps with embedded electrodes permit simple handling and replication. Impedances up to 40 kΩ are permitted (Ferree et al., 2001), but less than 5000 Ω are usually preferred. This can be attained by abrading slightly the surface or even scratching the skin surface with a sterile needle. However, injuries have to be avoided.

Points of Derivation

Referential recording is based on the assumption that one electrode site is an inactive reference site and the active site of interest is recorded with respect to that reference. Reference sites with minor electrical activity such as the earlobes, mastoids, nose are preferred.

A reference-independent measure of the potential field is required for studying scalp topography and for source localization. One approach to overcome the reference-site problem is to use the so called average-reference using the mean of all recording channels at each time point to approximate an inactive reference. (Recording) problems arise because electrodes are not evenly distributed over the head surface. Another approach is to use reference-free transformations, such as current source density analysis (CSD), which is based on the second derivative of the interpolated potential distribution (Laplacian operator). The latter method accentuates local sources and masks interelectrode correlations. In order to get valid approximations, both approaches require a sufficient spatial electrode density.

Due to the prerequisites especially for successful topographic mapping and source localization a standardized system of electrode placement with up to 74 electrodes is usually used (10–10 system or '10% system'). Depending on certain research questions, a fewer number is used and/or interpolated sites are chosen. Advanced derivations use a 5% system with up to 345 electrodes (Oostenveld & Praamstra, 2001).

Common Steps in Artefact Rejection

The raw EEG signal may be contaminated by both technical (as power supply) and biological electric fields (electric activity of eyes, heart, muscle tension etc.). Parts of the EEG signal which are not generated by distinct brain processes are called 'artefacts'. Artefacts are not easy detectable and there are no common methods of artefact rejection. Thus contaminations of the brain signals have to be avoided by careful planning of the derivation setting (avoiding technical carelessness and unnecessary muscular activity as well as eyeblinks). After derivation the experimenter should do some 'eyeballing' on the signals. With DC-derivations it is useless to define an amplitude criterion for rejection (for example +80 μV). Noisy parts of the signal should be removed. Within one experiment the same criteria have to be applied for all subjects. Correction of ocular artefacts

could be done in some cases (for uneasy children or patients) by use of special algorithms. Zero phase-shift low pass filters (about 20 Hz) are used for signal smoothing in ERP analyses.

DATA ANALYSIS

Signal Characteristics

Event-related potential (ERP) analysis is based on the assumption that part of the electrical brain activity is in a stable time relationship responding to a stimulus and the remaining brain activity is considered to be stationary noise. Hence segment-averaging is used to reduce variance depending on the ratio of time-locked to non-time-locked signal portion.

In general EEG signals are considered to be generated by stochastic processes with unknown probability density functions. Hence the processes are characterized by moments and moment functions. Usually EEG time series are studied up to second order of moments (mean, variance) and moment functions (covariance functions). *Higher-order statistics* (HOS) have to be used to analyse signal properties which deviate from Gaussian amplitude distribution (signal skewness, signal kurtosis). Given a signal of interest with non-zero HOS noised by Gaussian noise, then HOS is less affected by noise than second-order analyses.

Apart from the stochastic approach attempts have been made to describe EEG signals as the output of a complex *deterministic process* by use of non-linear difference equations. The corresponding mathematical base originates from the field of 'deterministic chaos'. One frequently used measure is called *EEG dimensional complexity* (DCx) and this yields information regarding the complexity of processes in the brain.

Methods of Spectral Estimation

One widely used method when analysing EEG time series is spectral analysis, which means analysing a given signal with respect to its properties within the frequency domain. (Problems arise in analysing rapid amplitude changes within low frequency bands.)

Spectra can be obtained by filtering the signal with a set of narrow bandpass filters. This procedure is common in determining *event-related desynchronization* (ERD) where activated cortical areas are assumed to be desynchronized compared to an idling state. After averaging over trials to discriminate between event-related and non-event-related power changes a standardized difference term between signal power in the analysed interval (A) and in a reference interval (R) is calculated:

$$\mathrm{ERD} = ((R - A)/R) \times 100\%.$$

Fourier transform (FT) and wavelet transform (WT) are linear transformations of the signal from time to frequency domain. The most widely used approach for spectral estimation based on FT is the periodogram. Here the estimation is achieved by decomposing the signal recorded over time T in sines and cosines. To get reliable spectral estimates when analysing short epochs in the range of a few seconds (*short time Fourier transform* – STFT), a correction of the data segments is required. This could be done by tapering functions in the time domain (for example Hanning window). Additionally segment-averaging or smoothing is used to reduce variance. Note that frequency resolution (in hertz) is inverse proportional to the epoch length T (in seconds). With STFT, dynamics over time can be displayed in a time–frequency plane.

The idea behind *wavelets* is simply to have more appropriate functions than sines and cosines when dealing with non-stationary impulse-like events (spikes and transients, for example high-frequency bursts and K-complexes). The principal way of wavelet analysis is to define a wavelet prototype function $W(t)$ as an analysis template. The corresponding wavelet basis, $W_{s,l}(t)$, is obtained from the mother wavelet $W(t)$ by varying the scaling parameter s and the locating parameter l. Thus, the wavelets $W_{s,l}(t)$ are time shifted (l) and scaled (s) derivations of $W(t)$. Each analysis template $W_{s,l}(t)$ represents a band pass function with a central frequency f_0, localized in the time–frequency plane at $t = 1$ and $f = f_0/s$. At any scale s the wavelet has not one frequency, but a band of frequencies, and the bandwidth is inverse proportional to s. The finer the resolution in time domain (small s) the less is the resolution in frequency domain and vice versa. The output can be displayed in the time–frequency plane

analogous to STFT, reaching a maximum when the signal of interest most resembles the analysis template. Summing up, it may be said that the short-time Fourier transform is well adapted for analysing all kinds of longer lasting oscillatory like waveforms, whereas wavelets are more suited for the analysis of short duration pulsations and for signal detection, for instance in ERPs.

With *model based methods of spectral estimation* the raw EEG is interpreted as the output of a linear filter excited by white noise. EEG signal modelling and hence spectral estimation is based on derivates of the autoregressive moving average model (ARMA), which is described by a linear difference equation:

$$X_t = a_1 X_{t-1} + \cdots + a_p X_{t-p} + b_1 \mathrm{e}_{t-1} + \cdots + b_q e_t - q + et \quad (1)$$

where p denotes autoregressive lags and q denotes moving average lags. Terms containing e characterize white noise.

A multitude of models similar to Equation (1) is used. All of them are based on assumptions concerning the underlying stochastic processes rather than describing a certain biophysical model. Successful spectrum estimation depends critically on the selection of the appropriate model, the model order and the fitting method for estimating the coefficients (for example least-square-methods, maximum-likelihood-methods). Model-based spectral estimation compared to the Fourier transform approach is useful when dealing with very short segments.

Generally Used Spectral Estimations

The *power spectrum* (auto-spectral density function) displays the signals distribution of variance or power over frequency. The *cross-power spectrum* (cross-spectral density function) reflects the covariance between two EEG channels as a function of frequency.

A frequently used quantity is the cross-power spectrum normalized by the autospectra, the so called *coherence spectrum Coh*. EEG coherence analysis is regarded as a tool for studying interrelationships with respect to power and phase between different cortical areas during a certain psychological manipulation (such as sensory stimulation, voluntary movements). The values of the coherence function lie in the range from 0 to 1. It is assumed that a strong functional relationship between two brain regions is reflected by a high coherence value. To avoid trivial results (volume conduction) coherence should only be interpreted if the phase lag between the two channels is non-zero. Erroneous estimations may be caused for example by A/D converters producing artificial phase lag while sampling the data or by reference electrode effects.

The *bispectrum Bi* (the product of two spectra) and its normalized derivate *bicoherence* are third order measures in the frequency domain related to the signal skewness. They are tools for detecting the presence of non-linearity, particularly quadratic phase-coupling, i.e. two oscillatory processes generate a third component with a frequency equal to the sum (or difference) of two frequencies f1 and f2. As compared to the power spectrum, more data is usually needed to get reliable estimates.

Non-Invasive Localization of Neuronal Generators

The EEG can be used as a method for functional neural imaging. Its advantage is to display dynamic brain processes on a millisecond time scale. The problem of determination of intracerebral current sources from a given scalp surface potential is a so called inverse problem with no unique solution. It is necessary to make additional assumptions in order to choose a distinct three-dimensional source distribution among the infinite set of different possible solutions. Regularization methods are:

- *Equivalent dipole/dipole layer localization*: Scanning the head volume with the model source until an error function is minimized.
- *Weighted minimum norm*: Among all possible solutions, choosing the one containing the least energy.
- *Low resolution electromagnetic tomography* (Loreta): Assumes that neighbouring neurons are simultaneously and synchronously activated. Its aim is to find out the smoothest of all possible solutions.

High resistance of the skull is responsible for reduced spatial resolution. It has been shown

(Cuffin et al., 2001) that best average localization that can be achieved is approximately 10 mm using a spherical head model consisting of concentric spheres as brain, skull, and scalp.

FUTURE PERSPECTIVES AND CONCLUSIONS

Due to wavelet transform, there exists a great number of wavelet families. Selecting a certain wavelet depends on previous knowledge of the biophysics of brain processes. It would be desirable to build up a wavelet library for different EEG phenomena.

The reason for the use of a great number of EEG channels is to attain maximum spatial resolution of the scalp voltage distribution to improve topographic mapping considering the inverse estimate problem in neural imaging. A further goal might be to attain realistic head models, and to get individual parameters for the size of brain and skull.

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RELATED ENTRIES

Psychophysiological Equipment and Measurements, Equipment for Assessing Basic Processes, Theoretical Perspective: Cognitive, Applied Fields: Psychophysiology, Applied Fields: Neuropsychology

BURNOUT ASSESSMENT

INTRODUCTION

Job burnout is a prolonged response to chronic interpersonal stressors on the job. It has been recognized as an occupational hazard for various people-oriented professions, such as human services, education, and health care. Recently, as other occupations have become more oriented to customer service, and as global economic realities have changed organizations, the phenomenon of burnout has become relevant in these areas as well. Burnout is defined by the three dimensions of exhaustion, cynicism, and inefficacy. The standard measure that is used to assess these three dimensions is the Maslach Burnout Inventory (MBI).

As a reliably identifiable job stress syndrome, burnout places the individual stress experience within a larger organizational context of people's relation to their work. Interventions to alleviate burnout and to promote its opposite, engagement with work, can occur at both organizational and personal levels. The social focus of burnout, the solid research basis concerning the syndrome, and its specific ties to the work domain make a distinct and valuable contribution to people's health and well-being.

CONCEPTUALIZATION

Burnout is a psychological syndrome of exhaustion, cynicism, and inefficacy in the workplace. It is an individual stress experience embedded in a context of complex social relationships, and it involves the person's conception of both self and others on the job. Unlike unidimensional models of stress, this multidimensional model

conceptualizes burnout in terms of its three core components.

Exhaustion refers to feelings of being overextended and depleted of one's emotional and physical resources. Workers feel drained and used up, without any source of replenishment. They lack enough energy to face another day or another person in need. The exhaustion component represents the basic individual stress dimension of burnout.

Cynicism refers to a negative, hostile, or excessively detached response to the job, which often includes a loss of idealism. It usually develops in response to the overload of emotional exhaustion, and is self-protective at first – an emotional buffer of 'detached concern'. But the risk is that the detachment can turn into dehumanization. The cynicism component represents the interpersonal dimension of burnout.

Inefficacy refers to a decline in feelings of competence and productivity at work. People experience a growing sense of inadequacy about their ability to do the job well, and this may result in a self-imposed verdict of failure. The inefficacy component represents the self-evaluation dimension of burnout.

What has been distinctive about burnout is the interpersonal framework of the phenomenon. The centrality of relationships at work – whether it be relationships with clients, colleagues or supervisors – has always been at the heart of descriptions of burnout. These relationships are the source of both emotional strains and rewards, they can be a resource for coping with job stress, and they often bear the brunt of the negative effects of burnout. Thus, if one were to look at burnout out of context, and simply focus on the individual exhaustion component, one would lose sight of the phenomenon entirely.

In this regard, the multidimensional theory is a distinct improvement over prior unidimensional models of burnout because it both incorporates the single dimension (exhaustion), and extends it by adding two other dimensions: response toward others (cynicism) and response toward self (inefficacy). The inclusion of these two dimensions add something over and above the notion of an individual stress response and make burnout much broader than established ideas of occupational stress.

ASSESSMENT

The only measure that assesses all three of the core dimensions is the *Maslach Burnout Inventory* (MBI), so it is considered the standard tool for research in this field (see Maslach et al., 1996 for the most recent edition). There are now three versions of the MBI, designed for use with different occupations. The original version of the MBI was designed for people working in the human services and health care, given that the early research on burnout was conducted within these occupations and focused on the service relationship between provider and recipient. It is now known as the MBI–Human Services Survey (MBI-HSS). A second version of the MBI was developed for use by people working in educational settings (the MBI–Educators Survey, or MBI-ES). In both the HSS and ES forms, the labels for the three dimensions reflected the focus on occupations where workers interacted extensively with other people (clients, patients, students, etc.): emotional exhaustion, depersonalization, and reduced personal accomplishment.

Given the increasing interest in burnout within occupations that are not so clearly people-oriented, a third, general version of the MBI was developed (the MBI–General Survey, or MBI-GS). Here, the three components of the burnout construct are conceptualized in slightly broader terms, with respect to the general job, and not just to the personal relationships that may be a part of that job. Thus, the labels for the three components are: exhaustion, cynicism (a distant attitude toward the job), and reduced professional efficacy. The MBI-GS assesses the same three dimensions as the original measure, using slightly revised items, and maintains a consistent factor structure across a variety of occupations.

The items in the three MBI subscales are written in the form of statements about personal feelings or attitudes (e.g. 'I feel burned out from my work', 'Working all day is really a strain for me'). The items are answered in terms of the frequency with which the respondent experiences these feelings, on a seven-point, fully anchored scale (ranging from $0 =$ never to $6 =$ every day). Because such a response format is least similar to the typical format used in other self-report measures of attitudes and feelings, spurious correlations with other measures (due to

similarities of response formats) should be minimized. Furthermore, the explicit anchoring of all seven points on the frequency dimension creates a more standardized response scale, so that the researcher can be fairly certain about the meanings assumed by respondents for each scale value. The MBI has been found to be reliable, valid, and easy to administer.

As a result of international interest in burnout research, the MBI has been translated into many languages. In most countries, the MBI has simply been translated and its psychometric properties taken for granted. However, some language versions, most notably the French, German, and Dutch versions, have been extensively studied psychometrically. Generally speaking, foreign language versions of the MBI have similar internal consistencies and show similar factorial and construct validity as the original American version. Moreover, the three-factor structure of the MBI appears to be invariant across different countries.

Despite these similarities in psychometric properties of the MBI measure, there are national differences in the average levels of burnout. For instance, several studies of various European workers have found lower average levels of exhaustion and cynicism, compared to similar North American samples.

CORRELATES OF BURNOUT

The current body of research evidence yields a fairly consistent picture of the burnout phenomenon (see Schaufeli & Enzmann, 1998). Because burnout is a prolonged response to chronic job stressors, it tends to be fairly stable over time. It is an important mediator of the causal link between various job stressors and individual stress outcomes. The exhaustion component of burnout tends to predict the rise of cynicism, while the inefficacy component tends to develop independently.

The primary antecedents of the exhaustion component are work overload and personal conflict at work. A lack of resources to manage job demands also contributes to burnout. The most critical of these resources has been social support among colleagues. Support underscores shared values and a sense of community within the organization, which enhances employees' sense of efficacy. Another important resource is the opportunity for employees to participate in decisions that affect their work and to exercise control over their contributions.

Of the three burnout components, exhaustion is the closest to an orthodox stress variable, and therefore is more predictive of stress-related physiological health outcomes than the other two components. In terms of mental, as opposed to physical, health, the link with burnout is more complex. Is burnout itself a form of mental illness, or is it a cause of it? Much of this discussion has focused on depression and burnout, and research has demonstrated that the two constructs are indeed distinct: burnout is job-related and situation-specific, as opposed to depression which is general and context-free.

Burnout has been associated with various forms of job withdrawal – absenteeism, intention to leave the job, and actual turnover. However, for people who stay on the job, burnout leads to lower productivity and effectiveness at work. To the extent that burnout diminishes opportunities for satisfying experiences at work, it is associated with decreased job satisfaction and a reduced commitment to the job or the organization.

People who are experiencing burnout can have a negative impact on their colleagues, both by causing greater personal conflict and by disrupting job tasks. Thus, burnout can be 'contagious' and perpetuate itself through informal interactions on the job. There is also some evidence that burnout has a negative 'spillover' effect on people's home life.

Although the bulk of burnout research has focused on the organizational context in which people work, it has also considered a range of personal qualities. Burnout scores tend to be higher for people who have a less 'hardy' personality or a more external locus of control, or who score as 'neurotic' on the five-factor model of personality. People who exhibit Type-A behaviour tend to be more prone to exhaustion. There are few consistent relationships of burnout with demographic characteristics. Although higher age seems to be associated with lower burnout, it is confounded with both years of experience and with survival bias. The only consistent gender difference is a tendency for men to score slightly higher on cynicism.

FUTURE PERSPECTIVES

The extensive research on burnout has consistently found linear relationships of workplace conditions across the full range of the MBI subscales. Just as high levels of personal conflict are associated with high levels of exhaustion, low levels of conflict are strong predictors of low exhaustion. Conversely, high efficacy is associated with supportive personal relationships, the enhancement of sophisticated skills at work and active participation in shared decision making. These patterns indicate that the opposite of burnout is not a neutral state, but a positive one of job engagement. New research is defining engagement in terms of the positive ends of the three dimensions as burnout. Thus, engagement consists of a state of high energy (rather than exhaustion), strong involvement (rather than cynicism), and a sense of efficacy (rather than inefficacy).

One important implication of the burnout-engagement continuum is that strategies to promote engagement may be just as important for burnout prevention as strategies to reduce the risk of burnout. A workplace that is designed to support the positive development of the three core qualities of energy, involvement, and effectiveness should be successful in promoting the well-being and productivity of its employees, and thus the health of the entire organization.

FUTURE PERSPECTIVES AND CONCLUSIONS

The personal and organizational costs of burnout have led to the development of various intervention strategies. Some try to treat burnout after it has occurred, while others focus on how to prevent burnout by promoting engagement. Intervention may occur on the level of the individual, workgroup, or an entire organization. At each level, the number of people affected by an intervention and the potential for enduring change increases.

The primary emphasis has been on individual strategies to prevent burnout, rather than social or organizational ones, despite the fact that research has found that situational and organizational factors play a bigger role in burnout than individual ones. Also, individual strategies are relatively ineffective in the workplace, where the person has much less control of stressors than in other domains of his or her life. There are both philosophical and pragmatic reasons underlying the predominant focus on the individual, including notions of individual causality and responsibility, and the assumption that it is easier and cheaper to change people instead of organizations. However, any progress in dealing with burnout will depend on the development of strategies that focus on the job context and its impact on the people who work within it.

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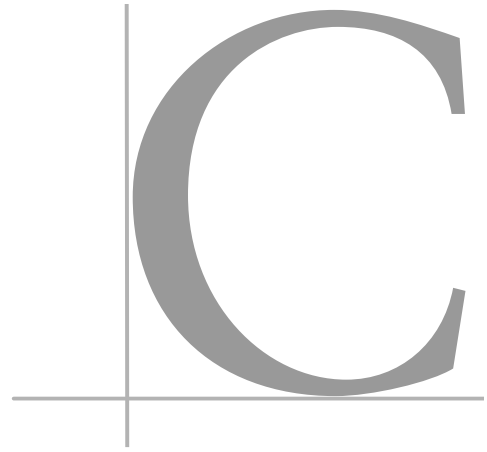
Christina Maslach

RELATED ENTRIES

Applied Fields: Clinical, Applied Fields: Health, Caregiver Burden, Applied Fields: Work and Industry, Personality Assessment (General)



CAREER AND PERSONNEL DEVELOPMENT

INTRODUCTION

The information revolution and globalization have affected the strategy and structures of larger organizations. They now engage in different forms of employment relationship with different groups of employees. For some employees, employers provide career assessment and manage their careers; for the majority, the onus is on them to assess themselves. Whilst employers use sophisticated tools such as assessment centres for the few, the majority use a variety of questionnaire and interactive methods. The exchange of career assessment information between organization and employee will aid subsequent necessary career dialogue.

CHANGES IN THE CONTEXT OF CAREERS

Traditionally, career assessment has been carried out by employers in order to enable them to manage the careers of employees more effectively. However, the nature of the employment relationship, and hence of career management, has been changing over the last three decades (Herriot, 2001a). Consequently, the purposes of career assessment, the responsibility for its conduct, and the nature of what is being assessed have all changed too.

The changes in the nature of career have been profound. However, they have not been so radical as current managerial rhetoric alleges. The traditional organizational career is not at an end, as some argue (e.g. Bridges, 1995). Rather, in the USA and Europe at least, the length of time which an employee spends in each organizational employment has been gradually decreasing over a long period. Similarly, for the majority of employees, careers are not 'boundaryless' (Arthur & Rousseau, 1996). That is, employees are not free to move across or between organizations, or in and out of employment, as it suits them; the labour market power is more often with the employer than with the employee.

Nevertheless, fundamental changes have occurred. First, much *restructuring* of organizations has been undertaken. Downsizing, the removal of positions and their holders, has been a frequent managerial response to the perceived need to reduce costs to remain competitive; and delayering, the removal of levels of the organizational hierarchy, has also occurred. Delayering appears to be a consequence of information technology reducing the need for middle management; of work becoming more frequently organized into projects; and of

responsibility being devolved further down the hierarchy. The second fundamental change to have occurred is that the variety of forms of employment contracts has increased. Management has sought to ensure *flexibility* in the supply of labour by offering temporary or part-time contracts; and it has aimed at increasing functional flexibility by designing work so as to break down craft and professional silos.

IMPLICATIONS FOR CAREERS

The consequences of these structural and contractual changes for careers have been considerable. Many employees have lost confidence in the possibility of progress in an upward direction within their organization, or indeed of retaining their present job. As a result, careers are more often subjectively than objectively defined (Ornstein & Isabella, 1993). That is, rather than concentrating upon a progressive sequence of positions held, employees construe their careers in a variety of ways. For example, they may view career as the acquisition over time of knowledge and skills and a consequent increase in employability; or as a narrative story, which makes some sort of sense of what may be chaotic past, present, and likely future experiences; or as a series of different forms of employment relationship.

As a consequence of these changes, the purposes of assessment in relation to career, the responsibility for and ownership of assessment data, and the nature of what is assessed, have all become more varied. First I will consider the increased variety of *purposes*.

There is now a major degree of *segmentation* in most larger organizations, such that different categories of employees have very different career deals (Hirsh & Jackson, 1996). For example, many organizations continue to separate out a cohort of high flyers, either on recruitment, or relatively early in their organizational career. A lot of development resource is put into these employees, in an effort to ensure that at least a good proportion of senior managers is internally recruited. In the case of these favoured employees, career assessment will be used initially to identify whether they have senior management potential; to discover their development needs; and to decide whether they are ready to be moved on to their next position.

Other employees, on the other hand, are perhaps less likely than before to have any attention paid to their future development. Rather, it is their present performance and its improvement which are of utmost concern to their managers. In terms of career assessment, they may have to make do with an annual appraisal which concentrates on performance, but which may make a gesture towards their career development (Drenth, 1998). Furthermore, their line manager, who is now likely to have complete responsibility for their appraisal, is unlikely to have the skills or knowledge to provide career advice. They are likely to have to rely on bulletin boards for internal job opportunities, and on advertisements for external ones. They will almost certainly have to find out for themselves what their interests and developmental capabilities are. The major purpose of this self-assessment is to help them to decide which career direction to seek to take. In order to aid them, their employer now, at best, gives them some help in formulating a personal development plan, and provides some sort of opportunity for self-assessment of interests, career aims, and development needs. However, such help is relatively rare.

Thus the *responsibility* for, and *ownership* of, career assessments has become varied also. For high flyers, the organization is likely to take most of the responsibility for assessment, and to own the data (although it will share much of it with the employee). For most others, the responsibility is now mostly their own to gain whatever assessment information they can. However, as a consequence, they are its owners, and can choose how much of it, if any, they share with their employer. If they enter into a psychological contract with their employer regarding their career development, they may use their assessment data as evidence of what they have to offer to the organization and what their development needs are.

Finally the *nature* of career assessment is becoming increasingly varied. High flyers are likely to undergo an expensive range of assessments, which are mostly conducted by others. Considerable effort is put into feeding back the results to the individual, and pointing them in the

direction of ways to meet their development needs. Developmental placements in positions which will stretch the employee may be agreed as a consequence of the assessment (Kotter, 1982), often in negotiations at the highest level of the organization. The career assessment and management of this category of employee is normally integrated within a corporate resourcing strategy, aimed at ensuring that the appropriate levels of senior managerial capability will be available to the organization. Assessment and development centres are a favoured method of career assessment for this category of employees; and their development needs are likely to be described in terms of various managerial competencies (Sparrow, 1998).

Other employees, however, are more likely to assess themselves on the basis of their achievements, interests, and aspirations (Kidd, 1998), and to place their work career into the context of the rest of their lives when doing so. Moreover, the analysis hitherto has assumed that employees are located in large organizations with sophisticated Human Resource processes. Even in post-industrial and industrialized nations, up to half of the working population may be employed in small and medium sized enterprises. These are unlikely to have career management processes in place. Hence the majority of employees have to manage their own careers and conduct or purchase their own assessment methods.

ASSESSMENT TOOLS

First, I will review assessment tools used by organizations to assess potential and development needs. The assessment centre method has increased in popularity recently for both these purposes. It normally employs a variety of assessments, including individual and group exercises, structured interviews, and psychometric tests (Zaal, 1998). The exercises may assess performance at tasks required of employees at one or several levels ahead of the assessee's current position; or they may consist of off-the-shelf tasks designed to assess competencies, and not sampled from the organization's actual work. The results of these different modes of assessment are transformed into ratings of various competencies; that is, behavioural repertoires which people input to a job, role, or organizational context. Typical examples of managerial competencies are oral communication, and planning and organizing. These competency ratings may then be reduced to a summary rating of potential, the overall assessment rating.

Assessment methods have traditionally been evaluated in terms of their reliability and validity. Assessment centres have demonstrated good levels of these psychometric properties, with particular success in predicting subsequent performance in training. Where applicants or employees have had little experience of the level of work for which they are being selected, the potential to be successfully developed for that level is what is being assessed. However, much predictive power is lost when assessments are reduced to an overall assessment rating. Moreover, it has been demonstrated repeatedly that even well-trained assessors assess on the basis of how well assessees perform overall on each exercise rather than on ratings of competencies. Thus the rationale for using assessment centres to assess competencies seems flawed, and a more realistic approach would regard the exercises as samples of the job.

There are two other types of criteria by which assessment centres should be evaluated. The first is their utility: the extent to which their benefits exceed their costs (Boudreau, 1991). Assessment centres are expensive, especially in terms of the time and training of the assessors, often senior managers. The method therefore needs to add validity above that obtained by cheaper methods if its expense is to be justified. On the other hand, it has other advantages, which are not normally included in utility estimates: it is acceptable to assessees (Iles & Mabey, 1993), and it gives assessors the belief that they are influencing important outcomes.

The second evaluative criterion relates to the time span for which the potential is being assessed. It is argued (Sparrow, 1998) that the competencies assessed are those which are required for the jobs of the present rather than those of the future. This is because of the method by which competencies are discovered. Typically, current good performers are compared to poor ones, with the consequence that the competencies inferred are those which are necessary to succeed at the time of the

comparison. However, it is very difficult to predict what competencies will be required in the medium or longer term. One alternative is to assume that the key competencies will be meta-competencies of a more generic form; for example: the ability to learn new knowledge and skills rapidly; the capacity to manage one's own career and development; and the resilience and adaptability to make continuous career transitions. Many psychologists are convinced that psychometric tests of general intellectual aptitude are the best tools for the assessment of this more general potential (Schmidt & Hunter, 1998) but few organizations are willing to base decisions solely or mainly upon them, for a variety of good reasons.

The appraisal process is another method of assessing development needs. However, appraisers are usually line managers whose main purpose in appraisal is to assess employees' performance, set objectives, and allocate performance-related pay. Hence if appraisees admit to and identify their own development needs, they put their performance rating at risk. A recently popular alternative is 360 degree feedback, which requires appraisees to be assessed, usually anonymously, by superiors, peers, subordinates, and sometimes by clients or customers too. Of course, the advantage of this method is that different perspectives are obtained from different stakeholders, and hence a more rounded view of current development needs is obtained. However, the same difficulties arise as with the use of assessment centres if 360 degree feedback is used to assess potential: it is hard to decide what are the key competencies for the future.

Thus the assessment tools designed for the organizational purposes of assessing longer term potential or development needs have their problems. However, there exist a wide variety of instruments available to help individuals discover their interests and longer-term career aims (Kidd, 1998). For example, the Vocational Preference Inventory and Self-Directed Search (Holland, 1985a, 1985b) are valuable tools which can enable individuals to match their interests to occupations or organizations. These questionnaires are based upon Holland's theory of vocational preferences which could be more accurately described as a personality typology. Holland specifies six different orientations: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional. If one arranges these orientations into a hexagonal shape, in the above order, then those next to each other are considered to be more similar than those two or three places away. Similarity is construed in terms of whether or not the orientation is people-oriented, and whether it is more intellectual or practical in nature. The individual's top three interest orientations can then be matched to the coding given to each occupation, and an indication of individual/occupation fit obtained. The same exercise can be carried out to assess the individual's fit with an organization (provided, of course, that the questionnaire has been administered to existing employees). One of the issues which arises in the case of Holland's and other such methodologies is the degree to which interests change over time. In the course of organizational socialization, individuals' interests may change to the extent that what was originally a poor fit becomes a much better one.

The Career Anchors questionnaire (Schein, 1985) helps to identify those career values which are crucial to the individual. Again, the idea is that individuals have one particular career anchor (or set of talents, motives, and values) which they develop as adults and maintain over the course of their working lives. Although they may be successful in terms of upward career progression, it does not follow that their career has permitted them to express their favoured anchor. Schein identified five such anchors in his original version of the questionnaire, which were: technical/functional competence; managerial competence; security and stability; entrepreneurship; and autonomy and independence. He subsequently added three more: service/dedication; pure challenge; and lifestyle integration. For many people, the scores obtained on the questionnaire do not clearly indicate one anchor as much preferred to the others, and Schein argues that detailed career interviews are required to have a great deal of confidence in the identification of the anchor. One of the important outcomes of discovering one's anchor is that this enables the individual to identify which form of career relationship within an organization they will prefer. So, for example, an individual with a managerial anchor will welcome a position in a larger organization offering the opportunity

Table 1. Some career instruments, their authors, and assessment

Instrument	Author	Assessment
Adult Career Concerns Inventory	Super et al. (1988)	Career socialization
Adult Life Stage Questionnaire	Hopson & Scally (1989)	Stage norms
Career Anchors Questionnaire	Schein (1985)	Fundamental motive
Career Beliefs Inventory	Krumboltz (1991)	Attitudes to career
Career Concept Questionnaire	Driver & Brousseau (1981)	Job moves
Life Career Rainbow	Super (1980)	Work and life roles
Self-Directed Search	Holland (1985a)	Occupational interests
Vocational Preference Inventory	Holland (1985b)	Occupational interests
Work Locus of Control Scale	Spector (1988)	Self-development

of promotion and increasing power and responsibility; autonomous people will prefer small professional groupings or self-employment.

The Career Beliefs Inventory (Krumboltz, 1991) aims to reveal the individual's beliefs and attitudes regarding the nature of career itself. It offers five sets of questions: current career beliefs; what I need to be happy in my career; what influences my career decisions; what changes I am willing to make; and what effort I am willing to put in. While this instrument appears to offer the opportunity for some self-insight, its psychometric properties of validity and reliability are not good however.

These and other instruments are presented in Table 1, and they are some of the better known and more valid assessment tools. However, it should be noted that because of their age, some of them make normative assumptions about, e.g., the stages of adult life which are not now justified in the light of changed social norms.

Additionally, the Internet now permits access to a range of self-assessment techniques, including much more interactive procedures which provide some of the advantages of face-to-face career counselling.

FUTURE PERSPECTIVES AND CONCLUSIONS

One of the problems with assessment is that psychologists have concentrated so heavily on the theory and methods of assessment that they have paid too little attention to the uses to which it is put. This is true of career assessment, both in the case of assessment by the organization for its own purposes, and of self-assessment by employees to help them discover their career direction.

As far as the organization is concerned, all too frequently career assessment has been introduced to meet a specific human resource need at a particular moment (for example, to retain a category of employees who were demonstrating a high rate of turnover). Instead, it should be integrated into an overall human resource strategy, which should itself be part of the overall business direction. It should, in other words, be a process which fits into a coordinated set of philosophies, policies, practices, and processes (Schuler, 1998).

In the case of individual self-assessment, practice has often been too narrowly confined. Work career cannot be seen in isolation from the individual's life career and identity. Hence the self-assessment of competencies or aptitudes is only part of the task. Rather, individuals need to reflect upon themselves: their identities, beliefs, and values, their past histories and their aspirations for the future.

Above all, career assessment has to be considered in the context of the employment relationship. The employment relationship is at present under great strain in many organizations in industrial and post-industrial economies; fundamental relational elements may be lost. Many organizations refer to employees as resources which they own, whilst many employees believe that they can rely only upon themselves (Herriot, 2001b). Hence the purposes of career assessment may, on the one hand, be considered solely those of maximizing the profitability of the firm's human capital; and on the other, those of securing one's personal survival

during the turmoil of globalization and the information revolution. However, the sharing of the means and the products of career assessment between employers and employees is essential if a reciprocal employment relationship is to be maintained. For career assessment provides reliable and valid information about employees which meets the needs of both parties. It is therefore vital that such information is shared and forms the basis of informed career dialogue between them.

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RELATED ENTRIES

PERSONNEL SELECTION, ASSESSMENT IN, ORGANIZATIONAL CULTURE, LEADERSHIP IN ORGANIZATIONAL SETTINGS, TOTAL QUALITY MANAGEMENT, APPLIED FIELDS: WORK AND INDUSTRY, APPLIED FIELDS: ORGANIZATIONS

CAREGIVER BURDEN

INTRODUCTION

Caregiver burden refers to the physical, psychological and social consequences of taking care of a patient. Our aim is to raise the most important research issues on caregiver burden. After introducing the concept, we discuss the predictors, the impact of physical versus cognitive impairment and the gender differences, on burden. Most of the research has been made on demented individuals and elders but also on other chronic patients, as we will refer. Some widely used instruments are briefly presented and the future perspectives on this issue are pointed together with the concluding remarks.

The problem of caregiving has been studied extensively since the 1980s. This issue became of major importance namely because of the growing number of elders and the changing patterns of families and women, that traditionally assume the caregiver role (Biegel et al., 1991).

The conceptual framework to explain burden is the stress model. The physical overload of stress is derived from performing, or helping the patient perform, the activities of daily living (ADLs). The psychological and social costs of the caregiver role are much more difficult to measure but not less important in determining the stress of the caregiver.

According to Aneshensel et al. (1996) the stressors are the problematic conditions and difficult circumstances experienced by caregivers. The outcomes are the effects on individual health and emotional well being. There are also moderators that comprise social, personal and material resources that help modify or regulate the causal relationship between stressor and outcomes and the proliferation of stressors outside the boundaries of caregiving. The primary stressors are the objective conditions of caregiving (managing the patient's needs) and the subsequent sense of overload. The secondary stressors arise as a result of primary stressors and include strains in roles outside of caregiving (e.g. career) and intrapsychic strains.

Pearlin et al. (1990) view caregiver stress as a consequence of a process comprising a number of interrelated conditions, including the socio-economic characteristics and resources of caregivers and the primary and secondary stressors to which they are exposed. Primary stressors are hardships and problems anchored directly in caregiving. Secondary stressors are (1) the strains experienced in roles and activities outside of caregiving and (2) intrapsychic strains, involving the diminishment of self-concepts. Coping and social support can potentially intervene as buffers at multiple points along the stress process.

It is well established that caregiving is burdensome and is generally believed that caring for a demented individual present's the greatest challenge of all. We still know little about what is most distressing, the patient's decline, or providing daily care. The hypotheses that explain the evolution of caregiving are: (1) the wear-and-tear hypothesis suggesting that there will be a decrement in caregiver functioning as the illness progresses; (2) the adaptation hypothesis considering that caregivers will eventually adapt to the demands of the situation, stabilizing or even improving caregiving; (3) the trait hypothesis suggesting that caregivers maintain a constant level of functioning, depending on their resources of coping skills and social support; and (4) the glucocorticoid cascade hypothesis stating that the effect of chronic stressors could have persistent and severe consequences for immune function in elders (Schulz & Williamson, 1994).

Researchers frequently conceptualize caregiver behaviour in terms of specific tasks in relation to ADLs. The focus on tasks is very important but limits the understanding of caregiving to an objective burden and helps forget the subjective burden of the process that is embedded in personal relationships and extended to many other areas of the personal life of women caregivers (Abel, 1990).

According to Gottlieb (1989) the objective (primary demands of caregiving) and subjective burden (secondary demands involving dislocations) is determined by four sets of variables: (1) the past and present quality of the relationship

between caregiver and care recipient; (2) the role's reverberations on other life spheres; (3) the support available from the caregiver's social ecology; and (4) psychosocial variables of the caregiver response to the demands of caregiving.

Risk factors for burden included the worsening of the relationship between caregiver and patient, being a spouse, shorter length of caregiving, poor caregiver self-rated health, greater physical disability, and behaviour and mood disturbances in the patient (Draper et al., 1995). Another model of caregiver burden (Vitalino et al., 1991) considers the distress as the relation of exposure to stress plus the vulnerability, over psychological and social resources; the caregivers with high vulnerability and low resources had higher burden.

The differential impact of physical versus cognitive impairment on caregiver burden is difficult to determine but a lot of studies show evidence that behavioural problems are the most difficult to manage for the caregivers and tend to produce more burden over time (e.g. Gaugler et al., 2000).

Next, we present a synthesis of objective and subjective variables appearing in literature on caregiving burden (Table 1).

Caregiving is gendered, defined and largely assumed by wives and daughters (Gottlieb, 1989), placing significant burden on women and generally considered their 'natural work' (Lee, 1999). It seems that caregiving burden affects females more than males in what concerns their mental and physical health (Pruchno et al., 1990).

Davis (1992) describes the profile of caregivers at risk as a middle aged or older woman, living with the care recipient, the sole care provider, with personal health problems, limited in personal, social or financial resources, has other family social or job-related obligations that compete with the demands of caregiving, previously has had problems in personal relationship with the care recipient and perceives the caregiver experience to be a major personal life disruption.

As the patient's disability and care demands increase over time the caregiver's capacity of coping with the demands of caregiving is eroded as the wear-and-tear hypothesis preview (Schulz et al., 1993). The pattern of coping of the caregiver is considered in several studies the most important factor of burden and most

Table 1. Synthesis of variables of caregiving burden

Context of caregiving	*Caregiver characteristics*	*Tasks performed (ADLs and IADLs)*: the level of work and effort the caregiver must expend with care	*Caregiving outcomes*
Household congruence between physical environment and patient capacities (architectonical barrier and aids)	Age, gender and SES	Time spent	Physical burden
Income	Baseline physical and mental health	Tasks performed	Immunological functioning
Available formal service	Development stage	Information	Symptoms and complaints
	Beliefs and attitudes about caring	Competence	Medicine consumption
	Conflicts between caregiving and job		*Psychological burden*
	Conflicts between caregiving role and family life		Depression, anxiety, irritability, cognitive distress
	Care recipient characteristics		*Social burden*
	Age, gender and SES		Isolation
	Type of impairment: physical, mental or both		Family disruption
	Level of disability		Career disruption
	The prognostic of illness (life expectancy, progressive or stable condition)		Satisfaction
	Relationship caregiver/ care recipient		
	Being a relative, friend, neighbour		
	Quality of the actual and past relationship		

researchers considered caregiver burden an individual problem of women who do not have the ability to cope with it (e.g. DeVries et al., 1997).

The competing role of working and giving care is of particular importance for employed women having to take care of a parent or parent-in-law. Contrary to employed men, the employed women provided similar care than the non-employed ones (Kramer & Kipnis, 1995).

One of the other areas of caregiver burden studies is the care for disabled children. The amount of children having chronic diseases is enormous, and so, the number of primary caregivers involved that suffer the impact of illness. Especially the mothers reported greater role strain, and less time spent in recreational activities (e.g. Quittner et al., 1998).

Recently, AIDS became a significant chronic illness. As in other progressive illnesses, the expanding demands of caregiving and the sense of captivity of caregiver role, invading social leisure and occupational life of the caregivers is responsible for the increased burden of caregiver (e.g. Pearlin et al., 1997).

Most of the studies exploring the burden of caregivers of patients with schizophrenia found a higher level of distress in primary caregivers and families (e.g. Brown & Wistle, 1998).

INSTRUMENTS TO ASSESS CAREGIVER BURDEN

Some of the most well-known measures of the impact of informal caregiving of elders are: *Burden Interview* (BI) (Zarit et al., 1980), with one factor that considered the impact as disruptions or changes in social activities, physical and financial strain, emotional upset and elder–carer relationship; *Caregiver Strain Index* (CSI) (Robinson, 1983), with one factor that measures physical tiredness, restriction of social life, loss of time to self, interference with life plans, emotional upset and financial loss; *Caregiver Burden Inventory* (CBI) (Novak & Guest, 1989) is a multidimensional instrument that measures the impact of burden on caregivers of cognitively impaired individuals with five factors: (1) Time dependence burden, (2) Developmental burden, (3) Physical burden, (4) Social burden and (5) Emotional burden; *Caregiving Appraisal* (Lawton et al., 1989) represents the dimensions of subjective caregiving burden, caregiving satisfaction and caregiving impact factors. The major contribution of this instrument is the suggestion that caregiving may be appraised in positive or negative ways (see Orbell et al., 1993, for a review).

FUTURE PERSPECTIVES AND CONCLUSIONS

Longitudinal studies are needed to know the long-term impact of different illnesses on physical, psychological and social health burden of caregivers and on the well-being of care recipients.

Caregiver burden has consequences not only for the caregiver herself but also for all the family and the care recipient by disrupting the affective relationships between them, lowering patient well-being and fostering the risk of institutionalization resulting in a long term growth of health and social expenses with carer and care recipient.

Caregiver burden is not only an individual but also a society problem (e.g. Braithwaite, 1996) and our society should radically restructure care to meet the needs of different caregivers and care recipients. The study on caregiver burden should address the problem from a public policy perspective (Lee, 1999), fostering the buffering effect (e.g. Rapp et al., 1998) of social support on caregiver burden.

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Constança Paúl and Ignacio Martin

RELATED ENTRIES

Applied Fields: Clinical, Applied Fields: Health, Burnout Assessment, Job Stress

CASE FORMULATION

INTRODUCTION

One of the principal aims of a psychological assessment is to evaluate the form and function of target behaviours. The term case formulation can be defined as the process of operationalizing target behaviours[1] (determining the form) and evaluating relationships among target behaviours and potential controlling factors (determining the function) for an individual client.

The aforementioned definition has several important features. First, the identification of *causal functional relationships* is a central element of case formulation. Although functional relationships may be either correlational or causal, by itself, a functional relationship implies only covariation

between two variables. Because a case formulation is primarily used in treatment planning, the identification and quantification of causal functional relationships among target behaviours and controlling factors are of primary interest.

Causal functional relationships are best thought of as elevated conditional probabilities (James, Mulaik & Brett, 1982), wherein the probability of observing a change in the form of a target behaviour (change in frequency, intensity, duration of response), given the occurrence of a hypothesized causal event (the conditional probability of the target behaviour), is greater than the probability of observing a change in the form of a target behaviour without the prior occurrence of the hypothesized causal event (the base rate or unconditional probability of the target behaviour). To illustrate, let A equal an increase in the frequency of worry experienced by a middle-aged client (the target behaviour), let B equal an increase in work stress (hypothesized causal event), and let P equal the probability. A tentative causal functional relationship between worry and work stress would be inferred if the probability of the frequency of worry after an increase in work stress [P(AlB)] was greater than the base rate probability of worry [P(A)].

Many internal and situational events may be causally associated with a target behaviour. For example, changes in central nervous system neurotransmitter levels, loss of response-contingent reinforcement, increased levels of family conflict, negative expectations, and seasonal changes may all exert causal influences on depressed mood for a particular client. Although several causal relationships may exist, in designing an intervention, we are most interested in the subset of causal relationships that exert significant causal effects on a target behaviour. Therefore, a second characteristic of case formulation is a focus on the identification of *important* causal functional relationships.

However, important causal functional relationships are often uncontrollable. For instance, two sets of potentially important causal factors that cannot be controlled or modified include significant historical events, such as exposure to trauma or economic changes, and biological attributes, such as genetic predisposition. Because interventions are designed to elicit change in target behaviours by modifying potential causes, a third characteristic of case formulation is an emphasis on *current* and *controllable* causal functional relationships.

In addition, a fourth characteristic of case formulation is its idiographic focus. Specifically, case formulations are typically designed to identify causal functional relationships applicable to a *specific* set of target behaviours for an *individual* client. This idiographic approach is consistent with the notion that important between-person differences exist in the causes of behaviour and that interventions should be individually tailored in order to maximize effectiveness.

Finally, because case formulation is not restricted to a specific type of target behaviour or causal factor, it is likely that a wide range of causal relationships may be examined during an assessment. As a result, assessors must consider incorporating complex variations of antecedent–response, response–response, response–consequence, and antecedent–response–consequence interactions into the case formulation.

IDENTIFYING CAUSAL FUNCTIONAL RELATIONSHIPS

The identification of causal relationships is a critical step in the development of a case formulation. To plausibly argue that two variables are causally related, one must rely on 'cues to causality' (Einhorn, 1988). The more important cues to causality identified in the research literature are: (a) elevated conditional probabilities, reliable covariation, or concomitant variation, (b) temporal precedence – that is, the hypothesized causal variable precedes the observed effect on the target behaviour, (c) the exclusion of plausible alternative explanations for the observed relationship, and (d) a logical basis for inferring causality.

Several assessment methods can be used to evaluate the presence of these 'cues to causality'. Time series analysis and single subject designs can be used to evaluate covariation and temporal precedence (Barlow & Hersen, 1984). Self-monitoring of the target behaviour, its antecedents, and its consequences provides one source of data for such designs. These methodologies cannot, however, rule out third variable confounds or alternative accounts for the observed relationship. Furthermore, they can be problematic not only because they require multiple points of measurement and considerable effort from the client, but

also because they typically evaluate the interactions among only a few variables.

Concurrent administration of different behavioural assessment devices, such as self-report inventories, psychophysiological measures, and behavioural interviews, can also provide information about causal functional relationships. For example, a client may report high levels of public speaking anxiety on a self-report inventory, demonstrate high levels of physiological reactivity during a simulated speech in a lab setting, and be observed to have poor social interaction skills during a behavioural interview. Given these data, a therapist may infer that the client's public speaking anxiety is caused by excessive physiological activation combined with deficiencies in social interaction skills. However, not only do these causal speculations fail to unambiguously demonstrate temporal precedence, they remain susceptible to alternative explanations for the observed relationships. For example, it may be equally plausible to hypothesize that public speaking anxiety and excessive physiological activation cause deficiencies in social interaction skills.

A third way to infer the presence of causal functional relationships focuses on the use of marker variables which are conveniently obtained indices of causal functional relationships (Haynes & O'Brien, 1988, 1990). For instance, the CO_2 inhalation challenge, which is sometimes used to assist the diagnosis of panic disorder, is an example of an empirically validated marker variable. Specifically, patients with panic disorder, relative to controls, have been shown to be significantly more likely to experience acute panic symptoms when they inhale air with high concentrations of CO_2 (Barlow, 1988; Clark, Salkovskis & Chalkley, 1985). Thus, the observation of panic symptoms in response to CO_2 inhalation can be used as a marker for the presence of the causal relationships between biological variables and behavioural responses that characterize panic disorder.

Although the marker variable strategy can provide information about causal functional relationships, few empirically validated marker variables have been identified in the assessment literature (Haynes & O'Brien, 2000). As a result, many assessors tend to rely on unvalidated marker variables, such as client reports of causal relationships. For example, clients frequently make causal attributions about their target behaviours and report them to the assessor during an interview. Such reliance on client report may be problematic because the reported causal relationships, although salient to the client, may not be accurate.

Although several assessment methods exist, their strengths vary in psychometric integrity, practicality, and relevance for assessing a particular set of target behaviours and controlling factors for an individual client. The selection and implementation of assessment tools throughout the case formulation process should take these factors into account and, when possible, should be guided by psychometric data and relevant empirical research. The use of multiple assessment methods can aid in the identification of functional causal relationships and provide corroborating evidence for, or disconfirming evidence against, the hypothesized relationships.

FUTURE PERSPECTIVES AND CONCLUSIONS

Case formulation emphasizes the identification and evaluation of important, controllable causal functional relationships for the purposes of intervention design. Identifying and evaluating causal functional relationships using rigorous empirical procedures, however, remains a challenging task for most assessors. Indeed, reviews of the assessment literature revealed that pretreatment causal analyses were conducted in only approximately 20 per cent of published case studies (Haynes & O'Brien, 1990; O'Brien & Haynes, 1995). Furthermore, many clinicians appear to be unfamiliar with the procedures needed to adequately evaluate causal relationships with an individual client (O'Brien, 1995). Finally, most clinicians do not appear to systematically construct case formulations in their clinical practices (Elliot et al., 1996).

A number of important questions about case formulation procedures need to be addressed in upcoming years. First, do interventions based on a comprehensive and systematic case formulation lead to significantly better outcomes? Second, can assessors be trained to consistently use valid case formulation procedures? Third, how generalizable are case formulations across persons, behaviours, and settings? And finally, what are the decisional processes that govern the generation of a case formulation among behavioural assessors?

Note

1 The term target behaviour refers to cognitive-verbal, affective-physiological, and overt-motor responses that are the focus of assessment. Target behaviours may be considered problematic (e.g. excessive anxiety in the presence of innocuous stimuli) or adaptive (e.g. using positive self-statements to reduce anxiety).

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William H. O'Brien, Allison Collins and Mary Kaplar

RELATED ENTRIES

CLASSIFICATION (GENERAL, INCLUDING DIAGNOSIS), DIAGNOSIS OF MENTAL AND BEHAVIOURAL DISORDERS, EXPLANATION, ASSESSMENT PROCESS

CENTRES (ASSESSMENT CENTRES)

INTRODUCTION

In general terms, 'assessment centres' are those processes used for marking, evaluating and predicting people's applied skills, know-how and knowledge based on situational tests.

The empirical base for this method is simple, and has been voiced on various occasions.

According to experiments carried out in the behavioural branch of psychology, the best indicator of a person's behaviour is his past behaviour, shown in a given situation. As a result, if we want to predict a person's efficiency in a given situation or before a set of tasks which could prove critical in carrying out his future professional responsibilities, we must observe, classify and evaluate his behaviour accurately in these types of situations in the present, or determine what type of conduct was shown in the past.

Origin of the Assessment Centre (AC) Methodology

Beginning in the second half of the past century (see McClelland et al., 1958), all evaluation technology which took this simple principle as a reference point – with variations and technical differences at various points and according to different specialists – was called *situational assessment method* and, in its application to the Psychology of Organizations, 'Assessment Centre Method'.

Professor D. McClelland's contributions are considered the most significant source in experimental and conceptual development for building current AC methods.

Current AC Concept

Though AC's basic concept can be applied in evaluating behaviour in any type of situation (e.g. in a clinical environment, to evaluate ability in stressful situations; in an educational environment, to evaluate students' learning behaviour regarding specific pedagogical contents; in a social environment to evaluate group behaviour in emergency situations; etc.), in practice, its current usage is basically related to organizational psychology.

Currently, AC is a process aimed at evaluating and predicting the behaviour of professionals whether in a job position which needs to be filled (*selection*), in a professional position which is being performed (*performance assessment*) or in a position the subject can perform in the future and in which he must show competence and extensive knowledge (*potential assessment*).

In all cases, the results of the individual and group assessment are used to plan *development and training programmes*, aimed at improving worker skills and eradicate deficiencies involving technical knowledge in handling personal and professional situations.

AC Determining Elements

AC is a logical and ordered process of observation, registration, classification and evaluation. It assesses the behaviour of one or various subjects who are faced with a series of situations in a standardized manner and where they must answer with a result or specific out-put.

In general terms, the elements which differentiate the assessment process centre from other evaluating techniques are the following:

- Evaluation is done through situational tests.
- The subject is asked to solve a specific problem or situation within standardized parameters.
- The situation has been designed so that specific characteristics can be observed in the subject's behaviour (called COMPETENCIES), either in general or technical knowledge.
- The criteria delimits whether the behaviour being observed draws near or far from the model of abilities being evaluated; the latter have been previously established and described in detail as 'observable behaviour'.
- The subjects perform the tests before a group of observers who carefully record the behaviour.
- *Potential* as well as current ability is evaluated.

TYPICAL AC PROCESS

How does a typical AC process develop?

Analysis Phase

First, a technical team defines the AC *parameters*. On the basis of detailed objectives (why is there an evaluation and who is to be evaluated), the factors or abilities to be evaluated are determined.

The set of abilities to be evaluated in an AC is called an assessment 'framework'. The analysis framework is achieved through various methods.

The objective is to know in detail the content and the dynamics of key situations which the subject must face in a given position or those tasks for which he is being evaluated.

As a result of the analysis, various aspects can be accurately determined:

- Content representative of the work done or which needs to be done, in particular *critical situations or incidents* which he must successfully solve to achieve results that are part of his responsibilities.
- Behaviour characteristics (basic knowledge and abilities put into practice) which the person must master to overcome critical situations, i.e. the *competencies* he must demonstrate.
- Specific behaviour which shows whether or not the subject possesses the essential *abilities* required in a given situation; these are defined as *criteria*.

Design Phase

The series of tests and exercises which those being evaluated will be subject to during the assessment process are drawn from the established framework. The selection has various well-defined objectives:

- That the set of tests and exercises reveals, without any doubt, the presence or absence of *competencies* in the framework.
- That they represent professional or personal working situations, and that they closely resemble real life.
- That 'test convergence' occurs. One of the elements which significantly increases the quality and reliability of the evaluation is the so-called test convergence, so that a specific *compentency* is identified through various tests done at different times.
- That these be revealed during an assessment session.
- That these combine individual working sessions, one-on-one situations and group integration, parallel to real life situations of those being evaluated.
- That the session be engaging, motivating and stimulating for the participants, so that the rhythm and intensity are maintained throughout the session.

The series of tests and exercises which can be applied during an AC are unlimited. At the same time, these are classified by common characteristics in the type of competencies they elicit. There follows a short description of each type:

- *Business games*: Simulation of complex and consecutive decisions, generally with the help of a computer, offering various management alternatives, so that each variable affects the others.
- *Group/s dynamics or discussion*: Consists of posing a 'problem-situation' to a group of participants so that they must discuss among themselves until they reach a common or individual solution.
- *Analysis exercises*: Analysis of situations or a set or group of complex information relating to a situation, where the participant is expected to identify relevant information, a given structure, and arrive at logical conclusions in order to take the proper action to best solve a situation.
- *Fact finding*: Correctly identify important facts missing from given information. Any additional information which the evaluators provide, on the request of the evaluees, is designed and structured by levels of depth in the analysis.
- *Presentation Exercises*: These are simulations where the participant must make a presentation before an audience, followed by a roundtable discussion of the subject's behaviour.
- '*In-baskets*': The participant is shown a set of documents which he may find on any given work day in his in-basket. He must resolve the situation with the resources available. It is expected that he solve any technical, human, commercial, economic, financial and technical problems as best he can.
- *Role play*: The participant plays a brief role in a given situation (a difficult negotiation; a complaint; a sale; an unpleasant situation; etc.). Other roles are played by the evaluators or sometimes by professional actors trained for this purpose.
- *Mock interview*: Ask the participant to play the role of the evaluator in a given situation and with a specific goal which has been previously described. The nature of the

interview varies: sales interview, a counselling interview or an interview to discipline a co-worker.

Application Phase

When the AC is ready to be put into practice, several key factors, which have proved successful in past years, must be taken into account. Following are the most important:

- Number of participants: the ideal number is between 6 and 12.
- Number of observers/assessors: the ideal number of assessors or observers is one per three or four participants.
- Length of the evaluation process: there are some processes which are organized so that for each person being evaluated no more than half a work day is employed while there are some evaluations which can last up to 3 days per person being evaluated.
- Debate between assessors/participants: once the evaluation period is over, assessors and participants discuss individual results in a closing session until they reach a common ground.

FUTURE PERSPECTIVES AND CONCLUSIONS

In 2001, Professor Byham and his team developed a new perspective in the use of AC that has been labelled as *development centres*. The main aim of this version of AC processes is to enable the organizations not only to assess the actual capabilities and competencies shown by a given individual, but to predict the potential of development of such characteristics of behaviour – specially those related with the development of managerial potential – and to make reliable projections of the possible evolution of positive and necessary skills.

The concept of *potential derailers* as trends of behaviour which can miscarry the development of managerial capability is key to these *development centres*, and a lot of attention and focus is put in the early identification and reduction of them. A total of eleven possible *derailers* has been identified and described in terms of behavioural criteria and is currently used in the development centres.

In sum, AC technology appears, in the beginning of the twenty first century, as the most powerful and reliable set of tools HR professionals can use to determine and develop human potential.

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RELATED ENTRIES

Personnel Selection, Assessment in, Observational Methods (General), Observational Techniques in Work and Organizational Settings, Applied Field: Work and Industry, Applied Fields: Organizations

CHILD AND ADOLESCENT ASSESSMENT IN CLINICAL SETTINGS

INTRODUCTION

The assessment of behavioural and mental disorders in children and adolescents is one of the longest standing practices in the field of psychology. Amongst its pioneers are Itard, Preyer and Binet.

The American Academy of Child and Adolescent Psychiatry (1995) has outlined three main *purposes* in Child and Adolescent assessment: Determine whether psychopathology is present and, if so, establish a differential diagnosis. Determine whether treatment is suitable. Develop treatment programmes to encourage co-operative treatment between the family and patient.

Therefore certain *prerequisites* are essential:

- Assessment begins once the patient has had time to get used to the surroundings and the assessor.
- Multidisciplinary perspective. Paediatricians, neurologists, language specialists, psychologists, social workers, physiotherapists can contribute with additional points of view to the diagnosis of the problem and offer possible solutions.
- A variety of informants are consulted: parents, peers and teachers as well as the patient himself even if the various sources do not agree with each other. Assessment of very young children should be carried out in a variety of surroundings to see how these surroundings influence disturbed behaviour, especially when the probable cause is a reaction to the environment.
- Interaction and dynamics between different family members are assessed.
- Relationships with peers are assessed.
- The psychometric quality of instruments and possible variables during observation are controlled.
- Repetition of analyses as changes in behaviour in children and adolescents are typical.
- Evolutionary assessment since behaviour depends on the child's age.
- Children's behaviour is analysed within the cultural context in which it occurs to determine which behaviour is acceptable or not and whether its frequency or intensity is relevant.

Opportunity for child assessment depends on various factors:

Usually examination is requested by parents, advised by teachers or instructed by a law court or social services department. A child or adolescent

should be examined when they show signs of slow development, difficulty in interpreting symbols, bad relationships with peers, inability to accept or follow rules or difficulty in controlling emotions.

During the assessment *initial contact* is very important. The first thing to consider is *information* about the patient and their consent. Then the professional must choose the best form of initial contact.

It is not necessary to give a preliminary explanation to children under 3 years old, but it may be worthwhile describing the kind of situations they are going to experience. Between 4 and 6 informing the child directly before the visit is recommended. Clear and concise information should be given. Explanations should be restricted to those which answer any questions the child raises, if at all. Children between 7 and 12 should be informed several days before to get used to the idea. Information should be clear and exact and should stimulate the child to question any doubts or fears they may have. Communication is more difficult with adolescents: only 5–10% request psychological help themselves. Parents usually make the decision for them and should inform the adolescent when doing so. If they are unable to persuade the adolescent to see the specialist they will need support from teachers or other adults. Any form of punishment at this age is inappropriate.

With very young children (0–3 years old) initial contact is usually with the parents alone. The parents are usually present when the child is interviewed for the first time except in potential cases of child abuse. Sometimes consultation is with the parents alone, particularly in cases of controlling behaviour. Between the ages of 4 and 6 consultation could begin together or just with the parents depending on the child and the type of problem. From 7 to 12 years there is greater flexibility. With adolescents the first meeting should be with the patient and begin with general questions about school, friends and hobbies before asking more personal questions. If the adolescent refuses to answer certain questions the professional should change topic and wait until a more comfortable relationship has been established before asking them again. When the professional is of the opposite sex care should be taken so as to offer the right amount of empathy and avoid the natural tendency to establish an excessively intense sentimental relationship.

The first session is used to focus on the problem and then additional, more specific information is obtained later. With younger children it is advisable to begin sessions with games. If the child is not talking the session is used to observe their behaviour. If they can talk then the child can be asked questions about their interests, which helps facilitate communication. By the end of the *first interview* the professional should have a clear idea of:

- Their opinion of the visit to the psychologist.
- Their view of the problem that has caused the patient (or parents) to seek help.
- The kind of relationship they have with their parents.
- Who their friends are and the relationship they have with them.
- Their school marks and the relationship they have with their teachers.
- The kind of interests they have.

Confidentiality should be respected except in cases of abuse, suicide, drug addiction, or if the patient is a danger to the lives of others. In cases of divorce where custody is in question, both parents are entitled to the information even though only one of them is the client. Confidentiality is extremely important with adolescent patients. Consent must be obtained from the patient before communicating anything to the parents.

Based on the first meeting the assessment is focussed in a certain direction.

The most important *areas of assessment* are:

- *Assessment of intellectual, social and psychomotor development*. This is investigated especially if the patient shows any signs of being immature or mentally retarded for his age.
- *Medical examination*. Carried out when the probable cause of the problem is physical and could involve a neurological or endocrine examination.
- *Assessment of the family environment*. Previous history of mental illness in the family, especially that being investigated, needs to be checked for. Family interaction is also evaluated.
- *Assessment of the social environment*. Social values and motivation in the child's environment need evaluating along with the resources and support the child receives.

The four basic assessment *procedures* are: norm-referenced test, interviews, observation and informal assessment. The choice of assessment type depends on the theoretical framework it belongs to, the child's age and the type of problem.

There are two main types of diagnostic orientation: *categorical* and *dimensional*. The former has been developed in the world of medicine and psychiatry and is based on a consensus of subjective criteria. The latter has been developed in the field of psychology and uses empirical categories and factorial analysis (Mash & Terdal, 1988).

The basic criteria for establishing different diagnostic categories are the causes and symptoms. Given that the causes of most syndromes cannot be identified but the risk factors that increase the probability of occurrence can be listed, a description of symptoms is often used. To avoid excessive diagnostic variability a general consensus of the basic characteristic symptoms of each syndrome is sought from experts. The well-known categorical diagnostic systems *International Classification of Disease* (ICD) and the *Diagnostic and Statistical Manual* (DSM) (Table 1) began as adult classification systems with few references to disorders in children except for mentally retarded children. The ICD is more common in Europe and DSM is more widely used in America, although the latter is gradually replacing the former system. The first classification of child mental disorders was done by Kanner (1953) and appears in the DSM II (1968). In Europe, Rutter (1965) wrote the first classification of child mental disorders which later appeared in the ICD-9 in 1978.

DSM-IV has some obvious advantages: (i) an increase in diagnostic complexity by including symptoms as well as duration and prediction; (ii) the use of ordinary vocabulary; (iii) the improvement in diagnostic reliability; and (iv) the possibility of cross-cultural use. Disadvantages include the need to improve categories of child diagnosis keeping developmental problems in mind.

Each diagnostic system has characteristic *assessment tools*. Categorical diagnosis opts for interviews to check for characteristic symptoms. Interviews can be open or more structured and therefore it is easier to control their reliability. One of the first structured *clinical interviews* with children was carried out by Graham and Rutter (1968) and served as a guide to subsequent interviews. The two that are most well known and commonly referred to are shown in Table 2.

Dimensional diagnosis is a continuum on which behavioural disorders vary in intensity. Alterations are grouped together empirically and defined as certain symptoms obtained through factorial analysis. The method is quantitative and empirical. To obtain information, which will give a reliable grouping of symptoms, 'clusters', extensive assessment is necessary using *questionnaires* or *checklists* to evaluate large numbers of people.

The dimensional system stipulates both *generic* and *specific* assessment. Disorders like depression, hyperactivity and autism need specific assessment and are useful in determining the effectiveness of treatment.

Multidimensional or generic evaluation covers a wider spectrum of disorders. Like 'screening', it is used in the early stages of diagnosis to confirm observations made during the first interview and

Table 1. Diagnostic systems: DSM and ICD

DSM-IV (1994), USA, APA	ICD-10, Europe, WHO
Mental Retardation	Mental Retardation
Learning Disorders	Developmental Disorders
Motor Skills Disorders	Developmental Disorders
Communication Disorders	Developmental Disorders
Pervasive Developmental Disorders	Developmental Disorders
(Touly in adults) Classification	Mixed Emotional and Asocial Disorders
(Touly in adults) Classification	Emotional Disorders
Attention Deficit and Disruptive Behaviour Disorders	Behavioural Disorders, Hyperactivity
Feeding and Eating Disorders of Infancy or Childhood	Other Disorders
Tic Disorders	Tic Disorders
Elimination Disorders	Other Disorders
Other Disorders of Infancy, Childhood, or Adolescence	Social Behaviour Disorders

Table 2. Clinical interview types

Author	Name	Date	Age range	No of items	Applicant
Herjanic et al. (DICA)	Diagnostic Interview for Children and	1975	6–17	19 + 247	Parent Children
Reich Welner (DICA-R)	Adolescents	1978			Adolescent
Costello et al. (DISC)	Diagnostic Interview Schedule for Children	1984, 1986	6–17	246	Parent Children
Schaffer et al.		1997			

Table 3. Multidimensional or generic evaluation

Author	Name	Date	Age range	No of items	Applicant
Peterson (BPCL)	Behaviour Problem Check-list	1961	5–16	55	Parent
Quay & Peterson (LBCL)	Louisville Behaviour Check-list	1967	4–12	164	Parent
Conners (CARS)	Conners Rating Scale	1969 1973	6–12	39 48	Teachers Parent
Wirt et al. (PIC)	Personality Inventory for Children	1977	3–16	600	Parent Children
Achenbach & Edelbrock (CBCL)	Child Behaviour Check-list	1978 1984	6–16	118 118	Parent Teachers
Achenbach & Edelbrock (YSR)	Youth Self Report	1987	11–18	103	Youth

check that no other problems have been overlooked. Some of the most significant are shown in Table 3.

The well-known *Child Behaviour Check-list* (CBCL, Achenbach & Edelbrock 1978) has two parts: the first compares the child's social skills to other children their age and the second rates behavioural problems. Factorial analysis creates subscales and two significant second order factors: internalizing and externalizing problems. Reliability is adequate as is validity.

The TRF checklist for teachers (Achenbach & Edelbrock, 1984, 1986) applies to children from ages 6 to 16. It is similar to the one given to parents but includes more detail about behaviour and achievement at school and has excellent psychometric qualities.

The more recent *Youth Self Report* (YSR, Achenbach & Edelbrock, 1987) is for adolescents and deals with social adaptation and behaviour disorders. Its psychometric qualities are adequate.

By referring to the frequently used taxonomy of child disorders we are going to use (i) *internalizing* and (ii) *externalizing* behavioural problems.

Anxiety is a basic cause of many internalizing disorders (e.g. phobias, post-trauma syndrome). Each has different characteristics but all reveal high levels of anxiety. Questionnaires are usually completed by parents, children or teachers (see Table 4).

The widely-used *State–Trait Anxiety Scale for Children* (STAIC, Spielberger et al., 1973) deals equally with state and trait anxiety. To avoid any bias there is a balance of positive and negative items and it refers to children from ages 9 to 15. The validity and reliability of the test is adequate.

Fear forms a part of child behaviour and cannot be considered pathological unless it affects the everyday life of the child considerably and requires treatment. One of the first epidemiological studies was made by Lapouse and Monk (1959). Scherer and Nakamura (1968) devised one of the first scales for children, *Fear Schedule for Children* – FSSC, answered by children and revised by Ollendick (FSSC-R, 1983). Its psychometric qualities are adequate. The well-known *Louisville Fear Survey Schedule* (LFSS, Miller, Barret, Hampe & Noble, 1972) refers to classic fears: fear of physical injury, fear of

Table 4. Anxiety questionnaires

Author	Name	Date	Age range	No of items	Applicant
Castañeda et al. (CMAS)	Children's Manifest Anxiety Scale	1956	6–15	42	Parent
Spielberger et al. (STAIC)	State–Trait Anxiety Scale for Children	1973	9–15	40	Children
Reynolds & Richmond (CMAS-R)	Revised Children's Manifest Anxiety Scale	1978	6–19	37	Children and Parent
Gillis (CAS)	Children Anxiety Scale	1980	6–8	20	Children

Table 5. Depression evaluation questionnaires

Author	Name	Date	Age range	No of items	Applicant
Kovacs & Beck	Children's Depression Inventory	1977	9–16	27	Children and Adolescent
Kovacs (CDI)		1992			
Birleson (DSRS)	Depression Self-Rating Scale	1981	9–17	18	Children and Adolescent
Lang & Tisher (CDS)	Children Depression Scale	1978	9–16	66	Children
Reynolds (RADS)	Reynolds Adolescent Depression Scale	1986	13–19	30	Adolescents
Reynolds (RCDS)	Reynolds Child Depression Scale	1989	9–12	30	Children

natural elements, social fears. Since then many lists of children's fears have appeared.

Another technique used with children is a test with visual support material such as the *Fear Thermometer* (FT, Walk, 1956), variations of which are still used today.

Due to the late acceptance of child depression by the scientific world, evaluation questionnaires are recent, and the best known are shown in Table 5.

The well-known *Children's Depression Inventory* (CDI, Kovacs & Beck, 1977; Kovacs, 1992) evaluates the presence of symptoms on a scale 0–2 and in the most recent version there are four factors. Designed for children, parents and teachers, the psychometric qualities are good and results are homogenous in different cultures.

There are structured interviews for emotional disorders such as the *Children's Depression Rating Scale* (CDRS, Poznanski, 1979) and tests for peer evaluation: *The Peer Nomination Inventory for Depression* (PNID, Lefkowitz & Tesing, 1980).

Obsessive-compulsive disorders usually occur during adulthood although there are a few cases during adolescence (0.3 or 0.7%). One of the most recent tools is the *Leyton Obsessional Inventory Child Version* (LOI-CV, Berg et al., 1986) with 44 yes/no questions and adequate psychometric qualities.

Anorexia Nervosa is among the internal behaviour disorders because of its comorbility with anxiety. This occurs when 25% of normal body weight is lost without illness or medical treatment and can be assessed with the *Eating Disorders Inventory* (EDI, Garner & Garfinkel, 1979).

Conduct disorders appear when children express their dissatisfaction and the society around them suffers as a consequence. Some forms are: opposition disorders, conduct disorder and delinquency. When social norms are not respected there is a problem of opposition or conduct, but when the law is broken it is delinquency. Most generic tests include points about conduct disorder. The best known specific tests are the *Behaviour Problem Checklist* (BPC, Peterson, 1961) revised by Quay (1983), the *New York Teacher Rating Scale for Disruptive and Antisocial Conduct* (NYTRS, Miller et al., 1995) and the *Child and Adolescent Disruptive Behaviour Inventory* (CADBI, Burns & Taylor, 1999).

Table 6. Intelligence scales

Author	Name	Year	Age range
Binet & Simon-SB	Intelligence Scale	1905,	2–16
Terman & Merrrill	Stanford-Binet Intelligence Scale	1916 1937, 1960 1970, 1972	2–18
Thordike et al.,	Revised L-M	1986	
Leiter (LIPS)	Leiter International Performance Scale	1929, 1948	2–20
Roid & Miller (LIPS-R)	Leiter International Performance Scale – Revised	1997	
Cattell (CIIS)	Cattell Infant Intelligence Scale	1940	
Wechsler (WISC)	Weschler Intelligence Scale for Children	1949	6–12
Weschler (WISC-R)	Revised	1974	6–15
Weschler (WISC-III)		1991	6–12
Weschler (WPPSI)	Wechsler Preschool and Primary Scale of Intelligence	1963	4–6 1/2
Bayley (BSID)	Bayley Scales for Infant Development	1969	0–2 1/2
Raven (PM)	Raven's Progressive Matrices		5–11
Raven (PM-R)	Raven's Progressive Matrices – Revised	1986	
McCarthy (MSCA)	McCarthy Scales of Children Abilities	1972	2–8 1/2
Kaufman & Kaufman (K-ABC)	Kaufman Assessing Battery for Children	1983	2–12
Bracken & McCallum	Universal Test of Nonverbal Intelligence	1997	3–17
Naglieri & Das (CAS)	Cognitive Assessment System	1997	5–17

Among the most common causes of disruptive behaviour are hyperactivity and aggression. The well-known *Werry–Weiss–Peters Activity Rating Scale* (WWPARS, Werry, 1968) evaluates hyperactivity. It has been updated and is completed by parents. The *Home Situations Questionnaire* (HSQ, Barkley, 1981) evaluates the home environment. Physical and verbal aggression is evaluated in the *Aggression Fisical y Verbal* checklist (AFV, Caprara & Pastorelli, 1993). The evaluation covers two main areas: psychotic disorders and autism.

Psychotic Disorders assessment is complex and neurological and physiological alterations as well as mental retardation need to be investigated. In the field of psychology the well-known *Kiddie-Schedule for Affective Disorders in Present Episode* (K-SADS-P, Chambers et al., 1985) is a semi-structured interview for children and parents and detects affective, anxiety, conduct and psychotic disorders. It discriminates between illusions and delusions. The reliability and validity are good for *psychotic disorders*. The *Brief Mental Status Interview* is suitable for adolescent patients. In adolescents it is possible to use MMPI-A (Archer, 1992).

More specific evaluation is needed when dealing with autism. The well-known *Childhood Autism Rating Scale* (CARS, Schopler et al., 1980) explores, through 15 subscales, relationships, adaptation to change, verbal communication etc. Another big syndrome is *Mental Retardation*. A child is considered mentally retarded when his performance is two or more standard deviations below the population mean. The patient's mental age initially determined general cognitive functioning. The first scale, created by Binet (1905), was to locate children in schools according to their learning abilities following the compulsory schooling law in France (see Table 6). The scale was introduced in the USA by Goddard and revised by Terman (1916) and Terman–Merrill (1937, 1960, and

1972) who adopted Stern's concept of IQ. In 1949 the *Wechsler Intelligence Scale for Children* (WISC) was published and revised in 1974 (WISC-R). This scale contains items taken from Binet, Yerkes and Kohs and is probably the most used scale in the world with children. It has two factors, Verbal and Performance, and validity and reliability of this scale are good.

Since Cattell and Horn proposed their innovative theory about fluid (capacity) and crystallized (learning) intelligence, the effort to assess the other side of intelligent behaviour has been challenged. With the Russian prohibition of intelligence tests and the American idea that tests were culturally biased there were strong reasons to develop other forms of assessing children's intelligent behaviour. Stenberg distinguished three different types of intelligence: componential (internal mental mechanism), experiential (internal and external world interaction) and contextual (adaptation). Finally, today's concept of intelligence has become more Piagetian. Social and emotional adaptive behaviour is today the most important subject when assessing children's capacities which are considered holistic rather than purely mental. In fact the idea of intelligence being the capacity of adaptation has been present from Binet to Sternberg. There are special tools to assess this field: *Adaptative Behaviour Scales* (ABS, Nihira et al., 1974); *Balthazar Scales Adaptative Behaviour* (BSAB, I, II, Balthazar, 1971).

The Baby Tests and Development assessment are the best way to detect early problems in children. The *Minnesota Child Development Inventory* (MCDI, Ireton & Thwing, 1977), the *Neonatal Behavioural Assessment Scale* (NBAS, Brazelton, 1973), *Development Scales* (DS, Gessell & Amatruda, 1940), *Bayley Scales for Infant Development* (BISID, Bayley, 1969) are some of them.

In recent years, neuropsychological assessment of cognition is growing dramatically and it permits to have an independent evaluation of attention; auditory, visual, tactile, verbal, spatial perceptual functions; memory, reading, reasoning, problem solving, cognitive planning and learning. This technique also permits application on infants and handicapped children early and objectively.

Adaptive behaviour is assessed especially in handicapped children. The well-known *Adaptive Behaviour Scale* (ABS, Nihira et al., 1974) covers the 3–69 age group and assesses behavioural and affective problems in mentally retarded people. Today the learning potential and problem solving abilities are included in intelligence assessment tests.

Intelligence assessment has defenders and critics. The former think that knowing the child's capacity will promote the best education for him, the latter consider that testing places the minority in an unfavourable position.

FUTURE PERSPECTIVES AND CONCLUSIONS

To conclude, it is clear that child assessment is a special task. Although its goals and methods are similar to adult assessment, its subject is absolutely different. It needs to take into account development, and tools, techniques and perspectives must conform themselves to such a dimension.

If children are subordinated to their parents and teachers, this does not mean that the psychologist may neglect their privacy and rights.

Finally, it is necessary to emphasize that all clinical assessments must not only diagnose the problem, but also consider its seriousness, its possible solution, design a treatment plan and follow up the subsequent intervention.

Among the questions that remain open to future research we may point to the following ones:

1 The need to reconcile data coming from multiple informants by the OR rule, and to secure the reliability of these different sources (parents, child, teachers, peers, nurses), specially in what relates to emotions and behaviours.
2 To strengthen multicultural assessment, as children need to be assessed in their own cultural contexts, language and social values.
3 To isolate new risk factors for the main disorders, in order to facilitate preventive intervention in those cases.
4 Full prevention is the new goal for the coming future, a task that must be related not only to pathological events, but also to positive dimensions of behaviour, such as autoefficacy, happiness, success, well being, and achievement.

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RELATED ENTRIES

Applied Fields: Clinical, Children with Disabilities, Child Custody, Pre-School Children, Mental Retardation, Learning Disabilities

CHILD CUSTODY

INTRODUCTION

More families go through divorce and break-up than ever before. Parents are faced with critical decisions, and children are influenced by the dramatic changes in their families. In such a crisis, the child's natural support system may not always address his/her best interests. One outcome of this situation is an increasing need for diagnostic and therapeutic involvement, best executed by a multidisciplinary team.

Relevant Facts

The marked increase in the recent rate of divorce has brought about an increase in the number of children being raised in non-traditional families: blended families (Arda, 1994), father-headed households (Cohen, 1995), and families in which unmarried parents raise their children on their own, accompanied by steady or changing partners. Children are being raised within or outside the nucleus family and are impacted by social mobility and immigration. Concomitantly we see a significant decrease in the influence of religion, family values, and social values, resulting in a lack of traditional regulations and guidelines.

General Guidelines for Custody Assessment

The purpose of assessment is to reach a recommendation that will stand in court and serve as a basis for a long-lasting arrangement, taking into account the changing needs of each family member and those of the family as a system. This resulting recommendation may have a deep, sometimes irreversible, effect on the lives of all concerned, especially children. The experts who make these recommendations carry a heavy responsibility.

Despite the variety of opinions, most Western professionals and courts have agreed upon

several criteria regarding child custody (APA, 1994; Miller, 1993; Wall & Amadio, 1994; Goldstein, Freud & Solnit, 1979; Kaslow & Schwartz, 1987). The guiding principle is the best interest of the child, a difficult endeavour when the authentic details are overshadowed by crisis. The following general guidelines should be followed.

Security and Consistency

Preference for an environment that will ensure consistent living conditions, security, and protection.

The Least Harmful Choice

Where there is no optimal solution, select the option least damaging to the child.

The Child's Relationship with the Non-Custodial Parent and his Family

The parent willing to allow this contact is usually considered the preferable choice, as this willingness is regarded as a manifestation of sensitivity and respect to the needs of the child.

These guidelines concur with distinct legal criteria defining relevant legal aspects such as natural guardianship, requisition of the rights of natural guardians (sending the child to a foster home and adoption), economic and physical responsibility, and definition of children at risk.

The court, as the 'client' of the custody assessment, expects recommendations based on accepted and admissible legal tools and data-backed findings. Data gathering must be responsible, professional, and authorized. The recommendations must be adaptable to the changing developmental needs of each individual separately and those of the family as a whole. These recommendations should be long enduring and applicable until the family is able to change the circumstances on its own or with their consent. The recommendations refer to the flexibility and the maturity of each family member and the family as a whole, their ability to change, develop, and be sensitive as well as respect the individual's needs. These widely accepted guidelines serve as a very general framework. Adhering to them enables the experts to work with a certain degree of unity.

BEST INTERESTS OF THE CHILD

This basic principle generally means that where a conflict exists between the needs of the child and the needs of the adult, first priority is given to those of the child.

Legal Aspects

This principle is the foundation of laws legislated to ensure the safety of the child during various crises by enabling, among other things, separate legal representation for children. It also takes precedence over other commonly applied legal principles (e.g. non-disclosure vs. public trial). Decisions have time limits and may be reevaluated – not following the principle of finality of judgement after appeals have been heard. *The Hague Child Abduction Convention* differs on this, and holds legal considerations above the concept of child's best interest (Silberman, 1994).

It is important to note that the child's best interest is not always the sole and foremost issue for the disputing parents, thus raising the need for separate *children's legal representation*.

Developmental Aspects

Children's needs vary according to their developmental stages, a fact that must come to bear on the evaluation (e.g. considerations regarding the separation of a very young child from his/her mother are different than those regarding an adolescent). Religious, cultural and intercultural issues must be taken into account, as should the needs of special populations (e.g. single-parent family, single-gender family, HIV/AIDS and addicted families).

CHILD CUSTODY ASSESSMENT

Diagnostic Process

The main elements of the diagnostic process are:

The Events

The events, individual tests and examinations of the child and relevant family members, as well as interactive meetings, home visits, contact with

appropriate services, and professional discussions among team members.

Intentionally Premeditated Continuous Process

The process is deliberately slow and drawn-out, to enable the team to assess the ability to change and the ability of the child and other significant figures to accept and utilize help and support from the team. The team also provides support and advice.

1 The diagnosis is based on a holistic concept taking into account a wide variety of aspects of the child's life. Material must be collected from various sources (e.g. teachers and doctors). Social relations, extra-curricular activities, hobbies, etc. should also be examined directly.
2 Most Discreet Objectivity. Objectivity is a critical factor, as is discretion, especially in cases where a choice must be made. Each party must feel that it has the impartial opportunity to present itself and its position, and be examined by the team respectfully, objectively and be openly heard without prejudice. The team must transmit reliability, strict confidentiality and privacy of all the information collected.

Observational Techniques

Observational techniques are tools for providing information about details of daily life, emotional climate, and behaviour patterns. The integration of this information with the results of the psychological testing is crucial for obtaining an overall understanding of the family's situation.

Interactions

Interactions are in vivo meetings with all relevant, significant figures in the child's life. The meetings provide an opportunity to observe the relationships in the 'here and now', and reflect the family's behavioural and emotional climate. Although family resistance may prevent these meetings, they should be considered an important asset to any recommendation.

Home Visits

Home visits should provide a first-hand impression of the child's situation: how he lives and with whom, and even what clothes he wears, what toys he has, the physical conditions of his surroundings and other daily, practical information. The alternative living place should also be visited and assessed to reach a fact-based choice.

Psychological Tests

Psychological tests are commonly used and have defined scientifically based norms, validity, and reliability. Tests complete and balance the information gathered from the observational techniques.

The following tests are widely used and accepted evaluation of personality and capability, and therefore are best suited for custody assessment.

The Bender Gestalt Test (BGT)

The Bender Gestalt Test (BGT), originally known as the Bender Visual Motor Gestalt Test (Bender, 1938), using the Hutt (1985) adaptation can be used. The test is a screening instrument for neurological and personality abnormalities, and assesses one type of constructional and memory ability.

The Wechsler Intelligence Scale for Children (WISC-R) and WAIS

The Wechsler Intelligence Scale for Children (WISC-R) and WAIS, for adults, are commonly used for the evaluation of intelligence: Verbal-, Performance- and Total IQ. The results help determine psychological and educational interventions (Wechsler, 1991).

The Rorschach Inkblot Test

The Rorschach Inkblot Test – Exner (1993) and Weiner (1998), the CAT and TAT (Bellak, 1986), MMPI-2 (Greene, 1991) and 'drawing Person', 'House', 'Tree', and 'Family' as projective tests, as well as various Questionnaires (Mullett & Stolberg, 1999; Heflinger et al., 2000).

Recording Special Circumstances

Custody assessment is based on the diagnostic process, on observational techniques, and on psychological tests. In addition, consideration must be given to issues and circumstances that are not quantifiable, but are nonetheless crucial to the assessment. Examples of such issues are new circumstances caused by the remarriage of one parent; choosing between a parent and a member of the extended family as legal guardian; separating siblings; and false allegations by one parent that the other is abusing the child.

MULTIDISCIPLINARY TEAM

In the arena of family disputes courtesy and rules are discarded; a barehanded, cutthroat, war is fought between parties who once shared a life and perhaps love. It is a most demanding, confusing, and absorbing field in which one may easily lose perspective. In this complex atmosphere the family may try to seduce and bribe or threaten and blackmail. The team can help keep clear perspective and focus, help identify and acknowledge the possible bias and neutralize any interference that may undermine the process.

The multidisciplinary team engages with the family, studying every relevant aspect and collecting information from various sources. At the same time it acts as an anchor to the family in crisis. All initiatives of independent expression are encouraged, especially those of children. Members of the team share the burden and the responsibility.

A typical multidisciplinary team for child custody cases consists of the school psychologist, a clinical psychologist, family therapists, and a social worker. For specific cases the team may include an expert in learning disabilities and a psychiatrist. At times legal or religious experts may be called in, as well as dieticians, occupational therapists, or speech therapists. The team usually consists of three people of different disciplines, one of whom is the case-manager (Levi & Romi, 2000).

The usual decision-making process has five stages:

1 Data collection and initial impression
2 Analysis and integration of the diagnostic material
3 Consolidation of findings and defining recommendations for intervention
4 Intervention
5 Follow-up and evaluation of the results of the intervention

Possible criticism of multidisciplinary teams may refer to the cost in terms of time, energy, and funds, and to the difficulty of involving the family with several professionals.

FUTURE PERSPECTIVES AND CONCLUSIONS

Many children are in crisis and lead a complex life as a result of not having a 'natural stable home'. These transitional periods may constitute risk to the child and require active intervention by social services and courts to ensure the safety and best interest of the child.

Despite vast accumulated knowledge, it still seems impossible to reach a common ground for dealing with the variety of situations needing intervention and requiring multidomain thought. Each aspect of the situation must be considered, and using a multidisciplinary team, as detailed here, seems to provide an optimal approach to a complex human issue.

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Shlomo Romi and Nurit Levi

RELATED ENTRIES

Applied Fields: Forensic, Family, Couple Assessment in Clinical Settings

CHILDREN WITH DISABILITIES

INTRODUCTION

There are many types of disabilities that affect children in very different ways. Development, learning processes and individual needs vary according to the nature of the disability. Children are differently affected by the extent, severity and multiplicity of the deficiencies. Assessing children with disabilities requires that aspects which differentiate each case be known and taken account of. It also requires that both resources and support from the surrounding environment be evaluated, since the child's chances of playing a full part in the community often depend on these factors.

In this entry we will refer to key aspects that should be taken into account when assessing children with disabilities. When we talk of children with disabilities we are referring to children with intellectual disabilities (mental retardation), hearing impairments including deafness, speech or language impairments, visual impairments including blindness, serious emotional disturbance, orthopaedic impairments, autism, traumatic brain injury, other health impairments or specific learning disabilities.

Under the category of children with disabilities we currently include groups which were not previously included within this category, this being the case of autistic children and children with traumatic brain injury. In the past, children with these types of disabilities received isolated, specific, and different attention to other children. Without underestimating the need for such attention at certain stages of these children's development, today many of the problems that they have in common with other children of their own age are the ones to be assessed.

Many of the tests and assessment tools used to assess children with disabilities are frequently the same used with other children who have no disability. For this reason, this entry focuses on those aspects which are essential for the assessment of children with disabilities, without embracing other areas specifically related to the subject of assessment, dealt with in other entries of this encyclopedia.

THE EVOLUTION OF ASSESSMENT CRITERIA

Assessment used in schools in the first half of the last century started out with and was characterized by the use of standardized tests which focused on general processes of intelligence, personality and achievement when faced with general tasks. Subsequently, in the 1970s, many specific standardized tests were developed, with great attention paid to students with learning disabilities. At the time, tests such as the Illinois Tests of Psycholinguistic Abilities (Kirk, McCarthy & Kirk, 1968) and the Developmental Test of Visual Perception (Frostig, Lefever & Whittlesey, 1966; Hammill, Pearson & Voress, 1993) acquired great importance. However, in the 1970s, standardized tests suffered from significant limitations with respect to generating useful information about the difficulties that students with deficiencies suffered from.

In the 1980s, schools started to propose alternative strategies to the standardized tests. Informal measures, mainly in curriculum-based measurement, acquired great relevance (Taylor, 1997). And the need to use both types of measurement was raised. While standardized tests are of greater use in diagnosis and the obtaining of general and preliminary information about an individual, informal measurement is of greater relevance when we require useful data for the education process because it concentrates on measuring the progress of the student in the curriculum.

At present, the assessment process in schools – principal setting in which the assessment of children with disabilities is described – varies according to the different purposes it pursues. Education decisions refer not only to the initial screening stage but also to the type of programme that should be employed, as well as the progress of the student in the programmes. The main goals of assessment in schools are (Taylor, 1997): (1) initial identification or screening; (2) determination and evaluation of teaching programmes and strategies; (3) determination of current performance level and educational level; (4) decisions about classification and programme placement; and (5) development of Individualized Educational Programmes (including goals, objectives and evaluation procedures). The nature of the different procedures used in the different situations described is always a result of combining formal and informal assessment procedures. And the responsibility for the assessment process falls on different professionals.

ASSESSMENT OF THE PROGRESS OF STUDENTS IN INCLUSIVE SCHOOLS

Norm-Referenced and Criterion Referenced Testing

Norm-referenced tests provide performance measures, which allow comparisons of scores obtained from students from different grades, regions, ages and settings. Norm-referenced tests are usually used to make a preliminary analysis, like screening tests of student performance, and compare it to that of other students of similar characteristics. Subsequently, a decision is made over whether a more profound analysis of the student's academic performance is needed.

The results of norm-referenced tests are also used to determine whether a student needs to receive special education services, or to determine curricular areas in which the student will need special help, as well as to assess the progress of

the student in education contexts (Salend, 1998). Additionally, these tests usually give adequate information about the reliability and validity they offer.

The main problem with norm-referenced tests is that they do not offer data useful for planning the education process. The data is normally very general, and from an inclusive education point of view they are criticized because the test format can be difficult for many students, biased with respect to curriculum content, and test items and standardization do not reflect a multicultural perspective (Salend, 1998).

Criterion-referenced tests 'relate a student's score on an achievement test to a domain of knowledge rather than to another student's score' (Sax, 1997). The essential aim of criterion-referenced testing is to help to define what to teach, and the determination and evaluation of objectives and teaching strategies. Similarly, they are used to plan and evaluate the progress of the student in the individual's education plan. Although there are many criterion-referenced tests published commercially, it is recommended that the professionals who take part in the diagnosis (especially the teachers) devise their own tests. In this way the choice of content and items is more likely to be relevant to the goals defined.

Curriculum-Based Measurement

Curriculum-based measurement implies assessing classroom learning and content and is centred on practical education applications. Normal curricular material is used to assess the degree of learning, the difficulties and the instruction needs of the students (Tucker, 1985). As an assessment method, importance is placed on direct observation and frequent registry of student curricular performance, information used to take decisions related to the instruction (Deno, 1987). Curriculum-based measurement emphasizes the integration of concepts and applied tools coming from a variety of sources and psycho-pedagogical approaches: applied behavioural analysis, test construction theory, curricular development and assessment and precision teaching (Salvia & Hughes, 1990). Environmental models and education efficiency, along with evidence from instructional and cognitive psychology and the social psychology of education, have also allowed us to understand the progressive movement away from student results and towards the area of teaching–learning (Meyers, Pfeiffer & Erlbaum, 1985).

It is evident that currently both types of assessment, standardized and curriculum-based, have a place, depending on the objectives set. It is also clear that both school psychologists as well as education professionals involved directly in the teaching of students with difficulties (general education teachers, special education teachers, therapists, and others) need to be included in the assessment process, as on many occasions do the parents.

Assessment Alternatives in Education

In recent years, movements of education reform have been proposing substantial changes in school assessment practice. The prejudicial effects of using standardized test in schools, particularly in relation to children from marginal and minority groups and including those families with financial problems, have led to a variety of alternative procedures aimed at fairer assessment. The tests are highly limited when giving information on the school instruction needs of children with disabilities. As a result, different types of procedures have been proposed. The aim is to develop a more flexible and multi-methodological system of school assessment than has previously been used, opening the door to qualitative procedures and making teachers and other education professionals directly responsible for such tasks.

In recent years several models have been proposed to take the place of 'traditional objective assessment procedures', the so-called post-modernist models being especially notable, models which aim to underline the multiplicity of assessment methods as well as emphasizing a different type of relation between the assessor and the assessed (Goodwin, 1997). In this sense, one of the most recent assessment trends in school learning processes, especially appropriate for children with disabilities and other limitations, is the so-called authentic assessment, also called performance or alternative assessment. This kind of procedure, centred on education and improving the professional practice of teachers, is particularly recommendable when

favouring equity and inclusion in schools of students with special needs.

Some of the most important principles or characteristics proposed in order to achieve these changes in school learning assessment practice include (Darling-Hammond & Falk, 1997): (1) basing assessments on standards for learning; (2) representing performances of understanding in authentic ways; (3) embedding assessment in curriculum and instruction; (4) providing multiple forms of evidence about student learning; (5) evaluating standards without unnecessary standardization; and (6) involving local educators in designing and scoring assessments.

Extending responsibility for assessment to teachers and other persons who have direct contact with the student at school is a key factor for improving teaching.

Only by obtaining specific and concrete assessment of classroom learning difficulties can accurate conclusions be reached, in order to adapt and improve the efficacy of learning in students with limitations. However, the aims of assessment in children with disabilities are much wider than the learning assessment in the classroom. As in other contexts, there exist other notable aims of the psychological assessment and the use of tests such as (Meyer et al., 2001): (a) describing current functioning, including cognitive abilities, severity of disturbance, and capacity for independent living; (b) confirming, refuting, or modifying the impressions formed by clinicians through their less structured interactions with patients; (c) identifying therapeutic needs, highlighting issues likely to emerge in treatment, recommending forms of intervention, and offering guidance about likely outcomes; (d) aiding in differential diagnosis of emotional, behavioural and cognitive disorders; or (e) monitoring treatment over time to evaluate the success of interventions or to identify new issues that may require attention as original concerns are resolved.

LABELLING AND CLASSIFICATION

Contrary to previous practice, we no longer only identify children with disabilities in relation to their diagnostic label; neither do we identify them with separate special services in normal schooling. We are currently more interested in identifying education and other special needs of children with limitations or disabilities, prioritizing schools with full inclusion. The label is less important than before. Assessment focuses on observing the child and its surroundings.

The detrimental effects of labelling have been thoroughly described in educational contexts (Verdugo, 1994). Those authors who oppose the use of classifications remark that they (Langone, 1990): (a) exaggerate weaker areas of the subject; (b) are the cause of the so-called self-fulfilling prophecy which explains why students do not improve; (c) give rise to a negative self-concept in the students; and (d) allow teachers to have students outside normal educational programmes. Gallagher (1976) pointed out three negative characteristics of labelling in education, which are especially important and have been barely commented on by other authors: (a) categorizing may lead to a social hierarchy; (b) categorizing or classifying may be regarded by professionals as the end product of the process and would not produce a change; and (c) the classification is a particular treatment which may lead us to ignore complex social and environmental problems that have to be regenerated.

Those authors who propose the use of classifications in education base themselves on the following facts (Langone, 1990; Meyen, 1988): (a) labels allow better funding to be obtained for those categories in which there is a stronger need, given that the lack of a label would mix up data-gathering procedures; (b) non-disabled classmates may accept more easily the behaviour of students labelled as disabled; and (c) professionals may communicate more easily research results when individuals are divided into specific categories. Other reasons determine that categories and labels allow us to establish realistic aims for students or that labelling is required in order to ensure appropriate service delivery (Verdugo, 1994).

The use of labelling and classification has been heavily criticized in recent decades, but it has continued to be used in different ways, mainly in order to establish priorities and obtain special resources for specific students. Even so, labelling should disappear from daily education practice and direct contact with children with disabilities. Labelling should only remain when restricted to those professional and administrative situations

which favour support and resources dedicated to promoting the equal opportunities of children with disabilities.

ACCOMMODATIONS AND MODIFICATIONS WHEN TESTING CHILDREN WITH DISABILITIES

Tests are applied to children with disabilities with different aims in mind, mainly in relation to their education. For example, they are used in decision-making processes to make placements, selection, identify needs, adapt educational programmes, or as a tool for educational accountability. However, standardized tests are frequently designed without taking into account procedures for their application in relation to children with language, sensorial, motor or psychological problems, when such problems do not affect the construct to be measured. In the case of children with disabilities, modifications and accommodations of assessment practices should be made to avoid prejudicing the results of the process as a consequence of characteristics that have nothing to do with what is to be measured (Salvia & Ysseldyke, 1998).

When tests are used with children who show some sort of disability, a series of specific considerations should be kept in mind, which facilitates the application process of the same with the aim of obtaining the most representative score of the individual. The goal is to reduce the influence of certain characteristics of the individual which have nothing to do with the main objective of the assessment, thus allowing valid inferences to be obtained of the construct analysed in the individual. This means that different types of accommodations and modifications need to be taken into account, types clearly synthesized and defined in the *Standards for Educational and Psychological Testing* written by the American Educational Research Association, American Psychological Association, and National Council on Measurement in Education (1999), the essence of which we describe in the following paragraphs.

Accommodation is a general term used to describe any action (contents or administration) which modifies the protocol established in a test in order to apply it to a person with disability, without affecting the construct to be measured. This means that situations exist where it is unnecessary to make accommodations because, precisely, the objective of the assessment is related to discovering the impact of the disability on the individual. Any accommodation should be directly related to the specific needs of the child who takes the test. The very same disability may require accommodation in one case but not in others, or require a different degree or extension in each case. Professional judgement plays a key role in decisions over accommodation.

Test modification can be carried out with respect to presentation format, response format, altering the timing, modifying the setting, using only a portion of the test or using alternative assessments. The professional in charge of the assessment process is the person who should decide in each case or cases what modifications should be made.

A great deal of caution should be taken when interpreting scores obtained after taking decisions related to accommodation of content or test administration procedures. The psychometric qualities of the test may become altered, in which case it may be difficult to compare student scores with scores from the original test. Similarly, decisions taken on modification may have affected the construct measured. For these reasons, the assessment report should always include the modifications which have been carried out in the tests, and should analyse whether these modifications affect the validity of the inferences carried out.

FUTURE PERSPECTIVES AND CONCLUSIONS

There are many different disabilities and each person presents a different situation depending not only on the type of disability, but also its extent, severity and intensity. Furthermore, environmental considerations also determine disability. Assessment should be centred on identifying multidimensional individual needs, but the use of severity labels to designate educational placement will be eliminated. Assessment and diagnosis of disability should lead 'to a profile of individually defined

supports, not to a specific school or educational program placement' (Luckasson et al., 1992: 113).

In this entry we reviewed some of the central issues in assessing children with disabilities: (a) the evolution of assessment criteria, from standardized tests which focused on general processes to a more interdisciplinary approach using formal and informal procedures according to assessment goals; (b) assessment in inclusive schools, based on both standardized tests and curriculum-based measurement; (c) labelling and classification, that must be restricted only to specific professional and administrative situations; and (d) accommodations and modifications when testing any child with disabilities, in order to avoid influences of the individual which are not related to the assessment objective.

In the future, today's perspective of a more flexible and multimethodological system of school assessment will remain and active participation of teachers and other school personnel will increase. Simultaneously, psychologists will develop new methods and techniques to assess specific disabilities, although most of the assessment tools used to assess children with disabilities are the same as those used with other children who have no disability. Specific methods should take into account specific skills (and the lack of these) in each person, and accommodate and modify procedures according to those skills.

There will be psychologists and professionals trained in assessing specific problems or situations related to disabled people; for example, mental health problems in intellectually or sensory disabled people, or ageing in Down syndrome and other intellectually disabled people. Comprehensive bio-psycho-social assessment approaches should be implemented with interdisciplinary teams specialized in specific situations.

The new International Classification of Functioning, Disability and Health (World Health Organization, 2001) will be used to develop new tools and techniques to assess persons in different situations related to a bio-psycho-social rehabilitation. The emphasis on environment of this classification must be followed by new assessment approaches to assess activities (limitations) and participation (restrictions) in each disabled person.

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Miguel Angel Verdugo

RELATED ENTRIES

Mental Retardation, Dynamic Assessment (Learning Potential Testing, Testing the Limits), Learning Disabilities, Applied Fields: Clinical, Applied Fields: Education

CLASSICAL AND MODERN ITEM ANALYSIS

INTRODUCTION

Up until 25 years or so ago, item analysis was straightforward: multiple-choice test items were field-tested on reasonably sized samples of examinees to determine their level of difficulty and discrimination, and distractors were evaluated to determine their effectiveness in attracting examinees who were without the appropriate knowledge required for successfully answering the test items (see Crocker & Algina, 1986; Gulliksen, 1950; Lord & Novick, 1968). Items that were too easy or too hard, or less discriminating than other test items available to the test developer, were less likely to be selected for the final version of a test. In the 1970s, criterion-referenced tests were introduced into the testing field, and item analysis for these tests became less focused on determining levels of item difficulty and discrimination because these item statistics were relatively unimportant in the criterion-referenced test development process. Item congruence with the objectives they were designed to measure became one of the determining factors for item selection. Item difficulties of items measuring the same objective were used to identify potentially flawed items rather than to assess item difficulty per se. Outliers among the item difficulties were helpful in flagging potentially flawed test items. Identifying items with negative or very low item discrimination indices became important but that was about all that was important about item discrimination indices for constructing criterion-referenced tests. Clearly the use of item statistics with criterion-referenced test development was different from norm-referenced test development.

In the 1970s, modern test theory, perhaps better known as 'item response theory (IRT)', was introduced into the testing field and the item statistics of interest were different from the classical item statistics and also depended upon the choice of test model (Hambleton, Swaminathan & Rogers, 1991; Lord, 1980; Wright & Stone, 1979). Even the number of item statistics available to the test developer was dependent on the choice of IRT model. Modern test theory was very much focused at the item level as a strategy for gaining more flexibility in the test development process. At the same time, modern test theory is associated with stronger modelling of the item response data. Advantages, in principle, accrue from such an approach, but these advantages only come when the models being applied fit the data (e.g. the one-, two-, and three-parameter logistic test models). Model-data fit then is a critical element of modern test theory. IRT item statistics have the attractive feature that they are invariant across samples of examinees from the population of examinees for whom the test under construction is intended and this item invariance property is a major advantage to test developers. After statistically adjusting item statistics for differences in examinee samples, item statistics can be compared and contrasted, though the examinee samples on which they were based can be quite different.

One other major change in assessment has taken place that impacts strongly on item analysis practices today. Today, it is common to use performance test items that are scored polytomously. There are no multiple-choice item distractors needing to be evaluated. But, item statistics for assessing difficulty and

discrimination that can be applied to polytomous response data have become important.

The remainder of this entry is divided into three sections: classical item analysis and modern item analysis will be described in the first two sections. References will be used to point to the actual item statistics formulas. Conclusions and future directions will be presented in a final section.

CLASSICAL ITEM ANALYSIS

Perhaps it is useful to restate the purposes of item analysis in norm-referenced test development: to determine flaws in test items, to evaluate the effectiveness of distractors (if the items are in a multiple-choice format), and to determine item statistics for use in subsequent test development work.

Item Difficulty

With dichotomously scored items, item difficulty is defined as the proportion of examinees answering an item correctly. The symbol 'p' is often used to designate item difficulty. As has been noted often, it was unfortunate that this statistic was not called 'item easiness' as this term would have been more descriptive.

Item difficulty statistics answer the question about the proportion of examinees in a sample of examinees who are tested who can answer each test item correctly. This is different from the proportion of examinees who know the correct answer because at least some proportion of examinees answer the item correctly by guessing the correct answer. Thus, the proportion of examinees answering an item correctly is an overestimate of the proportion of examinees who actually know the correct answer. By using the same assumption that is made to derive the correction for guessing formula (see Crocker & Algina, 1986), revised item statistics can be reported reflecting estimates of the proportion of examinees who actually know the correct answer to each test item. This information may be especially important with criterion-referenced test items.

Item difficulty statistics as typically defined in classical test theory have ordinal scale properties. Therefore, they cannot be statistically manipulated. For example, the test developer may want to study the linear relationship between item difficulty statistics and item discrimination indices. This should not be done. One solution is to place item difficulty statistics onto a scale that is considered to have equal intervals. ETS introduced the delta scale (a scale on which ability scores are assumed to be normally distributed with a mean = 13, and a standard deviation = 4). The item difficulty on this new scale (referred to as the 'item delta value') is the point on the delta scale beyond which p% of the examinees would fall in a normal distribution of ability. Thus, for example, an item with a p-value equal to 0.16 would have a corresponding delta value of 17. An item with a p-value of 0.50 would have a delta value of 13. On the delta scale, the transformed p-values are considered to be equal interval measurements and can be averaged, used in correlational analyses, etc.

Item Discrimination

The most obvious statistic to reflect item discrimination with 0–1 item level data is the Pearson product-moment correlation between item score and total test score being used as the criterion. Variations include correlating item level performance with total test scores (excluding the item itself, and the corresponding bias in the correlation) or correlating item scores with a criterion external to the test (a good idea, but rarely convenient). In this special case of the Pearson correlation because one of the variables is dichotomously scored, the correlation is called the 'point biserial correlation'. In many practical test development studies, the goal is to find items with point biserial correlations in excess of 0.20. When content specifications cannot be met, it is common to lower the threshold for acceptable discriminating powers of test items.

The point biserial correlation is very popular in norm-referenced test development because it is helpful in distinguishing the more discriminating from the less discriminating and negatively discriminating items, and it has a simple relationship to the standard deviation of test scores (see, for example, Lord & Novick, 1968). It does tend to be a bit higher for middle difficulty items than easier and harder items because item variability is higher and so to remove the bias that tends to favour middle difficulty items, an assumption can be made that despite the 0–1 scoring, underlying performance on the item is a normal

distribution of ability. With this special assumption, the 'item biserial correlation' can be estimated, and this correlation tends to be more invariant over various samples of examinees that may take the item. This is a good property for an item statistic to have (because the choice of examinee sample in field-testing is less influential). It is easy to show that item biserial correlations tend to be a bit higher than item point biserial correlations (about 0.10 higher), though the calculations are more complicated and the statistic itself is harder to explain to users. Major testing agencies tend to prefer biserial correlations; smaller testing agencies and individual test developers seem more inclined to use point biserial correlations. The impact of this choice though seems minor in practice.

When both the criterion and the item are scored dichotomously, the Pearson product-moment correlation simplifies and is often called a 'phi correlation'. If both the item level and the criterion level variables are dichotomous, and if normality assumptions are made about ability underlying performance on the item and the criterion, the correlation used is called the 'tetrachoric correlation'.

Other item discrimination statistics can be found in Crocker and Algina (1986) including some that are principally used with criterion-referenced tests to describe the power of items to distinguish masters and non-masters. Extensions of these item level statistics to handle polytomously scored items are also emerging. As a starter, the Pearson correlation can easily handle the extension, but there are newer statistics being introduced also that assume a normal distribution of ability underlying item performance when items are scored polytomously.

Effectiveness of Distractors

With multiple-choice items, it is common to determine if the distractors are enhancing the measurement properties of the item, and if not, what changes can be made. First, an analysis is made to see if the distractors are being chosen. When the per cent of examinees choosing a distractor is low (say, less than 5%), and especially when the discriminating power of the test item is not as high as is desired, that distractor is studied to see if a more attractive answer for low-performing examinees can be substituted. Second, an analysis is made of the choice patterns of relatively high and relatively low performing examinees. Relatively popular distractors among the more capable examinees may suggest that there are two correct answers or even that the intended correct answer is not correct.

Role in Test Development

With norm-referenced tests, items are typically selected that maximize test score variability and contribute to content validity. This means that items with middle levels of difficulty and high item discrimination tend to be selected. With criterion-referenced tests, item statistics tend to be less important in test development. Maximizing test score variance would rarely be a criterion in item selection. Still, items with very low or negative discrimination levels would be of minimal value in a criterion-referenced test. On the other hand, items that have difficulty levels that decrease measurement errors for examinees near the performance standards may be of special value in a criterion-referenced test.

MODERN ITEM ANALYSIS

Until recently, among users of modern test theory, it has been common to carry out item analyses with both classical and modern procedures (Hambleton, Swaminathan & Rogers, 1991). In the introduction, a brief discussion of the advantages of IRT item statistics was provided. But classical item analysis remains popular for obtaining some initial views about item quality, even by test developers working in an IRT framework.

The key concept in IRT is that of the 'item characteristic curve' (ICC). This looks like a non-linear regression line (item performance regressed on ability) and provides an estimate of the probability of success on a test item for examinees at different ability levels. More capable examinees always have higher probabilities of success than less capable examinees. The interested reader is referred to the entry on item response theory in this encyclopedia to learn more about item characteristic curves. Estimating these ICCs can be complicated, require complex IRT software, and usually requires larger sample sizes than are needed to do a proper classical item analysis.

Item Difficulty

For harder items the ICCs are shifted to the higher end of the ability scale. Thus, examinees always have lower probabilities of success on harder items than easier items (as it should be). For easier items the ICCs are shifted to the lower end of the ability scale. The special property of ICCs is that they are defined over the ability scale on which items and scores are reported, and are independent of the examinee samples to which they are applied. For a given item and at a particular ability level, the probability of a successful response might be 0.75. All examinees at THAT ability level, regardless of the sample from which they came, have exactly the same probability.

Item Discrimination

The discriminating power of a test item influences the slope of the ICC. More discriminating items have steeper slopes, less discriminating items have lower slopes. The slope of the ICC has a substantial influence on the usefulness of a test item for estimating ability.

Effectiveness of Distractors/ Polytomously Scored Items

With 0–1 scored data, there are IRT models that allow for a full analysis of the distractors (see, for example, the nominal response model). Wainer (1989) provides an excellent discussion of an IRT distractor analysis. With polytomously scored items, there are additional IRT models that permit a full investigation of the effectiveness of each score point for assessing examinee ability. For example, it is possible to determine over what intervals on the ability scale a particular score point is useful for estimating ability.

Role in Test Development

There is one special feature of IRT item statistics, in addition to the property of item parameter invariance. Item statistics and ability scores are reported on the same scale. This feature makes it possible to choose test items that provide maximum information about examinee ability. For example, within a computer adaptive test administration, using the available ability estimate at any point in the test administration process, the best item can be selected to maximize what can be learned about examinee ability. The basic rule is that the items that are discriminating, and where the expected probability of the examinee's correct response is 50%, are the most useful for test administration. Items that are too easy or too hard, or provide modest discriminating power, are less useful in test administration. Of course, item selection is normally constrained by the need to ensure content validity of the total set of administered items, and by the need to limit the exposure of test items.

The amount of information an item provides for estimating ability at each ability level is given by the item information function (see Hambleton, Swaminathan & Rogers, 1991). Largely, the amount of information provided by an item tends to be maximum in the region on the ability continuum where examinees have about a 50% probability of a correct answer, and tends to zero for ability levels far from this point. The information function tends to be higher with more discriminating items. For a full discussion, see Hambleton, Swaminathan and Rogers (1991).

When performance levels are set on the ability continuum for assigning examinees to performance categories (e.g. below basic, basic, proficient, and advanced) it is common to try and minimize errors of measurement for ability scores near these performance levels to maximize both decision consistency and decision accuracy. This is accomplished quite easily within an IRT framework by selecting relatively more items and/or more discriminating items functioning near the performance levels on the ability continuum.

FUTURE PERSPECTIVES AND CONCLUSIONS

The topic of item analysis has developed nicely as changes in test development have taken place. As the testing field has moved from normed-referenced testing to criterion-referenced testing, from dichotomously scored data to polytomously scored data, and from classical to modern test theory models, item analysis procedures have been introduced and/or modified to keep up with the needs of test developers. Wainer (1989) offered some clever suggestions for improving item analysis – these suggestions involve

increased use of graphical procedures, and increased use of complex IRT models for reporting the effectiveness of multiple-choice test item distractors. He also envisioned a dynamic system where test developers have immediate access to item statistical information (literally by pushing a button or touching a screen) and in the course of building a test developer can monitor such statistics as test mean, standard deviation, test information, conditional standard errors, content specifications, etc. Wainer's ideas were sound in 1989, and remain sound today – he has offered some excellent ideas for making item analysis more useful to test developers. Interested readers are referred to Crocker and Algina (1986), Hambleton, Swaminathan, and Rogers (1991), Henrysson (1971), McDonald (1999), Wainer (1989), and Wright and Stone (1979) for follow-up reading on this topic.

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RELATED ENTRIES

Achievement Testing, Item Response Theory: Models and Features

CLASSICAL TEST THEORY

INTRODUCTION

Classical test theory (CTT) embraces a whole set of models and technical procedures designed to provide solutions to the problems involved in measuring psychological variables. When psychologists measure a variable, thus obtaining an empirical score, their interest lies not in the score itself, but in the inferences and interpretations that can be made from it and that can provide information on some aspect of the assessed person's behaviour. Of course, for these interpretations and inferences to be well founded it is necessary to have precise knowledge of the different psychometric properties of the instrument employed. CTT offers such coverage, allowing detailed description of the metric characteristics of the measurement instruments normally used by social scientists and professionals. On labelling this set of knowledge as 'classical' the intention is, on the one hand, to indicate that it is well established, having resisted the erosion of time, and, on the other, to differentiate it from new psychometric models; that is, the so-called item response theory (IRT) models that have emerged since the 1960s, and which reached their most successful period to date in the 1980s and 1990s. For a description of these models see the corresponding IRT entry.

Origins and Development of Classical Test Theory

The initial proposals of what we now refer to under the generic term classical test theory (CTT)

date from the beginning of the twentieth century. The beginnings of this approach were not particularly easy, as the quantitative orientation of psychology was at that time not the dominant paradigm. Nevertheless, it established itself little by little, and soon the majority of universities were including courses on test theory. As Joncich (1968) recounts in his biography of E.L. Thorndike, when the latter sent a copy of his pioneering work on measurement (Thorndike, 1904) to his *maestro* William James, he included a note advising him to oblige his students to read the book, but adding that under no circumstances should James himself even open it, as the figures, curves and formulas it contained would drive him mad. This anecdote serves to indicate the, at best, lukewarm reception to be expected from the psychological establishment for these psychometric issues that were taking their first steps. However, the period that followed was one of great activity and progress for psychometrics. New tests were constructed, psychometric technology was developed, and important advances were made in psychological and psychophysical scaling (Thurstone, 1927, 1928; Thurstone & Chave, 1929).

In 1936, Guilford would attempt to synthesize in his classic work *Psychometric Methods* all the basic developments up to that time in the fields of test theory, psychological scaling, and psychophysical scaling. These three fields share many concepts and models, and at that time it was still possible to treat them jointly, but the development and specialization of each of them has since made it necessary to deal with them separately, the latest edition of Guilford's 1954 book constituting an understandable exception.

At the same time as the test theory corpus of knowledge was becoming consolidated, the first steps were taken toward its institutionalization. The year 1936 saw the formation of the American Psychometric Society, with Thurstone as its president, and whose organ of expression would be the journal *Psychometrika*. Little by little, more and more journals specializing in psychological and educational measurement would appear, and today they are many. In 1947, Thurstone published his classic work *Multiple Factor Analysis*, presenting a multivariate technique with its origins in the psychometric field, and which has made an enormous contribution to the construction, analysis and validation of tests. From the publication of Thurstone's book until today, factor analysis has made gigantic strides, thanks to new methods of extraction and rotation of factors, and thanks above all to the power and speed of calculation afforded by modern computers; nevertheless, it is still gratifying today to re-read Thurstone's book and wonder at the wisdom and psychological substance with which it is imbued. Thurstone was without doubt one of the great pioneers and personalities of classical psychometrics. As my own *maestro*, Mariano Yela, who studied under him in Chicago in the mid-1940s, relates, Thurstone 'was, above all, a creator. ... He always remained the engineer-inventor that as a young man had worked with Edison. He was as clear and incisive as crystal, shy, hard, sarcastic, implacable. With me, he was understanding, tolerant and cordial. He was totally devoted to his specialty, psychology as a rational experimental and quantitative science, and to his photographic interests. Nothing else existed for him' (Yela, 1996).

In parallel to the psychometric proposals of these early years, there was also an intense debate on the theory of measurement, led mainly by physicists somewhat wary of psychological measurement (Campbell, 1928) innovative proposals with regard to measurement scales would give a new direction and renewed momentum to the field, which would oblige psychometrists to review the metric status of the scores obtained in tests. Stevens' proposals for measurement scales (nominal, ordinal, interval and ratio) gave rise to an interesting debate – which is still going on today – on the connections between scales and statistical techniques, with postures ranging between two extremes: those claiming that scales determine the type of statistical techniques to use, and those that consider scales and statistics to be worlds apart, and totally unrelated (Gaito, 1980; Lord, 1953; Michell, 1986; Stine, 1989; Townsend & Ashby, 1984). Although the debate is an interesting one, and from a theoretical point of view there are arguments for defending either position, our humble advice to professionals is that they take a careful account of the scale used for measuring their data on processing them statistically and making inferences, since, while numbers do not know where they come from, researchers and

professionals do indeed know how they were obtained and for what purpose they will be used. From the 1960s, a new perspective within measurement theory appeared on the scene, the axiomatic approach (Coombs, 1964; Krantz et al., 1971; Luce & Narens, 1986; Michell, 1990, 1997; Narens, 1985; Narens & Luce, 1986; Pfanzagl, 1968; Roberts, 1979; Savage & Ehrlich, 1990; Schwager, 1991; Suppes & Zinnes, 1963). This approach, highly formalized and attractive from a theoretical point of view, has had little impact on psychological assessment practice.

Returning to psychometrics, it could be said that the canonical work setting out the essentials of classical test theory developed up to that time was Gulliksen's book (1950) *Theory of Mental Tests*. Gulliksen had been a student of Thurstone, and later his assistant and colleague, and recognized the influence of his mentor, especially that of his book *The Reliability and Validity of Tests* (Thurstone, 1931). But Thurstone's book was already out of print by the time Gulliksen wrote his in 1950. The year 1954 saw the appearance of the first technical recommendations for the use of tests (*Technical Recommendations for Psychological Tests and Diagnostic Techniques*), and since then these recommendations, drawn up jointly by the American Educational Research Association, the American Psychological Association and the National Council on Measurement in Education, have undergone several revisions, the last of them as recently as 1999.

A fundamental text, which establishes a bridge between the classical approach and the new psychometric models, is that of Lord and Novick (1968). This important work, which benefits from the collaboration of Birnbaum, reanalysed the classical perspective and promoted the new item response theory models, which provided solutions to some problems that could not be adequately solved within a classical framework. Apart from the texts cited by Gulliksen and Lord and Novick, there is an abundance of works that offer clear and well-documented expositions of classical test theory, among them Magnuson (1967), Allen and Yen (1979), Thorndike (1982), Crocker and Algina (1986) and Muñiz (1996, 2000).

Below is a chronology detailing some of the milestones of classical test theory, adapted from Muñiz (2000):

Psychometric Chronology

1883	Galton publishes the book *Inquiries into Human Faculty and its Development*
1884	Galton opens the Anthropometric Laboratory in London
1891	J. McKeen Cattell found the Laboratory of Psychology at Columbia University, United States
1894	Kraepelin proposes the use of tests in psychopathology
1896	Ebbinghaus proposes the phrase-completion test
1904	Spearman publishes his two-factor theory of intelligence and the attenuation formulas; E.L. Thorndike publishes the book *An Introduction to the Theory of Mental and Social Measurements*
1905	Binet and Simon publish the first intelligence scale
1907	Krueger and Spearman coin the term *reliability coefficient*
1908	Introduction of the concept of *mental age* in the second edition of the Binet scale
1910	Spearman–Brown formula that relates reliability to the length of tests is published
1912	Stern proposes the concept of intelligence quotient
1916	Terman publishes Stanford's revision of the Binet–Simon scale
1918	Creation of the Army Alpha tests
1921	Publication of the Rorschach test
1931	Thurstone publishes *The Reliability and Validity of Tests*
1935	The Psychometric Society is founded; Buros publishes his first review of tests (*Mental Measurements Yearbook*)
1936	Guilford publishes *Psychometric Methods*; First issue of the journal *Psychometrika*
1937	Kuder and Richardson publish in *Psychometrika* their formulas KR_{20} and KR_{21}

1938 Bender, Raven and PMA tests are published
1939 Wechsler proposes his scale for measuring intelligence
1940 Appearance of the personality questionnaire *Minnesota Multiphasic Personality Inventory* (MMPI)
1946 Stevens proposes his four measurement scales: nominal, ordinal, interval and ratio
1948 Educational Testing Service (ETS) in the United States is established
1950 Gulliksen publishes *Theory of Mental Tests*
1951 Cronbach introduces the coefficient alpha; First edition of *Educational Measurement* is edited by Lindquist
1954 First edition of *Technical Recommendations for Psychological Tests and Diagnostic Techniques* is published
1955 Construct validity is introduced by Cronbach and Meehl
1958 Torgerson publishes *Theory and Methods of Scaling*
1959 Discriminant convergent validity is introduced by Campbell and Fiske
1960 Rasch proposes the one-parameter logistical model
1963 Criterion-referenced testing is introduced by Robert Glaser
1966 Second edition of *Standards for Educational and Psychological Tests* is published
1968 Lord and Novick publish *Statistical Theories of Mental Tests Scores*
1971 Second edition of *Educational Measurement* is published, edited by Thorndike
1974 Third edition of *Standards for Educational and Psychological Tests* is published
1979 BICAL computer program for estimating Rasch model parameters is introduced
1980 Lord publishes *Applications of Item Response Theory to Practical Testing Problems*
1982 The computer program LOGIST, for estimating IRT model parameters, is introduced
1984 The computer program BILOG, for estimating IRT model parameters, is introduced
1985 Fourth edition of *Standards for Educational and Psychological Tests* is published; Hambleton and Swaminathan's book on *Item Response Theory* is published
1989 The third edition of *Educational Measurement*, edited by Linn, is published
1997 Seventh edition of Anastasi's *Psychological Testing* is published; *Handbook of IRT models*, by Van der Linden and Hambleton (1997), is published
1999 Fifth edition of *Standards for Educational and Psychological Tests* is published

Classical Linear Model

The basic body of knowledge covered by the general term *classical test theory* (CTT) derives from the developments of the linear model, which has its origins in the pioneering works of Spearman (1904, 1907, 1913). In this model a person's empirical score from a test (X) is assumed to be made up of two additive components, the true score that actually corresponds to the person assessed in the test (T), and a certain error of measurement (e). Formally, the model can be expressed as:

$$X = T + e$$

where X is the empirical score obtained, T the true score and e the measurement error.

In order to derive the formulas necessary for calculating reliability, the model requires three assumptions and a definition. It is assumed that: (a) a person's true score in a test is that which s/he would obtain on average if the test were administered an infinite number of times ($E(X) = T$), (b) person true score and measurement error are uncorrelated ($\rho_{te} = 0$), and (c) measurement errors across parallel-forms of a test are uncorrelated. In addition, parallel tests are defined as tests that measure the same construct, where an examinee has the same true score on each, and where the sizes of errors in the tests (standard error of measurement) are identical.

From this model, through the corresponding developments, it is possible to arrive at operative formulas for the estimation of errors (e), and person true scores (T). All of these necessary deductions make up the psychometric corpus of classical test theory, whose formulation can be found in the classic texts already mentioned.

Through the corresponding developments the reliability coefficient ($\rho_{xx'}$) is obtained, a coefficient that permits the estimation of the size of the errors committed in the measurement process (see the corresponding entry in this encyclopaedia). Its formula expresses the amount of variance of true measurement ($\sigma^2{}_T$) in the empirical variance ($\sigma^2{}_x$).

The ideal situation is that all the empirical variance is due to true variance, which is what would occur when $\sigma^2{}_T = \sigma^2{}_x$, in which case the reliability is perfect, and the test measures with no error. The empirical calculation of the reliability coefficient value cannot be carried out by means of this formula, which is merely conceptual; empirical estimation can be obtained using various designs, among which are: (a) the correlation between two parallel forms of the test, (b) the correlation between scores on two random halves of the test corrected with the Spearman–Brown formula, and (c) the correlation between two applications of the same test to a sample of examinees. Each one of these procedures has its advantages and disadvantages, and is more appropriate for some situations than for others. In all cases the value obtained is a numerical value between 0 and 1, and the test's precision is greater the closer this value is to 1. Given that this formula is conceptual rather than operative, the psychometric literature offers an abundance of classical formulas for obtaining the empirical value of the reliability coefficient, important among them are those of Rulon (1939), Guttman (1945), Flanagan (1937), the KR_{20} and KR_{21} (Kuder & Richardson, 1937) and the popular alpha coefficient (Cronbach, 1951) that expresses the reliability of the test as a function of its internal consistency. An alternative, though equivalent form of expressing the reliability of tests is through the *standard error of measurement*.

Whichever index is used, and in each case there are technical reasons for using one or another, the important point is that all measurements have an associated degree of precision that is empirically calculable. The most common sources of error in psychological measurement have been widely researched by specialists, who have arrived at a highly detailed classification of all possible error sources (Cronbach, 1947; Schmidt & Hunter, 1996; Stanley, 1971; Thorndike, 1951). In quite simplified terms, we can identify three principal avenues through which random errors infiltrate psychological measurement: (a) the *actual person* assessed, who will arrive at the test situation in a certain mood and with particular attitudes, fears, and anxieties in relation to the test, and who is affected by any type of previous event, all of which may introduce error, (b) the *measurement instrument* used, whose specific characteristics may have a differential influence on those persons assessed (e.g. the questions in the test may be unclear to persons), and (c) the *application, correction and interpretation* made by professionals (Muñiz, 1998).

Variations on the Classical Test Model

The classical linear model permits the estimation of measurement error, but not its particular sources which are assumed to be unknown, and the errors random. Some models, also within the classical framework, have attempted to provide a breakdown of errors, thus offering not only overall reliability, but also reliability as a function of error sources (Bock & Wood, 1971; Novick, 1966; Sutcliffe, 1965). The technical–formal complexity and operative complications introduced by these models, offset against the advantages they offer, has meant that none of them has become popular in practice. Worthy of special mention in this respect is *generalizability theory*, proposed by Cronbach and his colleagues (Cronbach, Rajaratnam & Gleser, 1963; Gleser, Cronbach & Rajaratnam, 1965). Through the use of complex analysis of variance designs, this theory permits estimation of the size of different error sources, considered in the measurement process. In 1972, these authors published an exhaustive treatise (Cronbach, Gleser, Nanda & Rajaratnam, 1972), a veritable bible for the theory; systematic and more accessible accounts can be found in Brennan (1983), Crocker and Algina (1986),

Shavelson and Webb (1991), and Shavelson, Webb, and Rowley (1989).

FUTURE PERSPECTIVES

The simplicity and versatility, it can be used in many different situations, of the Classical Test Theory (CTT) approach will guarantee this psychometric model to be abundantly used in the future, in conjunction with the powerful and psychometrically sophisticated models developed under the framework of the Item Response Theory (IRT). These new models have to be seen as complementary to the Classical approach, never as substitutes of the CTT. Needless to say, most of the psychological tests currently used by professionals have been developed within the framework of the Classical Test Theory.

CONCLUSIONS

Classical Test Theory embraces a set of models and technical procedures designed to provide solutions to the problems involved in measuring psychological variables. After a century of developments, especially during the first half of this century, the Classical Test Theory approach appears as a solid corpus of knowledge giving reasonable solutions to most of the practical problems psychologists face when measuring their variables of interest. New psychometric models, such as Item Response models, have been proposed to overcome some of the problems faced by the classical approach; these models constitute a complementary tool that psychologists can use combined with the classical approach.

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RELATED ENTRIES

Theoretical Perspective: Psychometrics, Item Response Theory: Models and Features, Classical and Modern Item Analysis, Reliability, Validity (General)

CLASSIFICATION (GENERAL, INCLUDING DIAGNOSIS)

INTRODUCTION

This entry treats formal classification procedures, not psychological models of classification behaviour. After specifying the terminology, fundamental concepts of classification are briefly introduced, followed by a short review of the empirical basis of classification. Finally, assignment procedures and the evaluation of a classification system are emphasized.

According to Gordon (1996: 65) classification 'is concerned with the investigation of a set of objects in order to establish whether or not they fall naturally into groups (or classes, or clusters) of objects with the property that objects in the same group are similar to one another and different from objects in other groups'.

Differential and clinical psychology frequently solve problems of classification in several different areas: persons are characterized by typologies, one finds classifications of tasks and situations, intervention procedures are analysed and ordered in this way, and above all diagnosis as the assignment of persons to (nosological) categories is based on classification. Many examples from psychology and the social sciences are provided by and referred to in Reinecke and Tarnai (2000). Several classificatory systems for clinical assessment are found in Baumann and Perrez (1990). These systems are classified as distortion of psychological functions (like learning, memory, sensory-motor skills, sleep, emotion and motivation), distortion of patterns of functions (neuroses, depression, psychosomatic, schizophrenic, distortions specific to children, adolescents and old people), and distortions to interpersonal systems (in school, work organizations or community).

TERMINOLOGY

The *objects* mentioned in Gordon's definition are also called cases, persons, patients, clients, elements, units, exemplars, specimens or items. This reflects the interdisciplinary research tradition of the field. Physics provides in the table of elements a well known example, and biology can be seen as an ongoing struggle to give a systematic, i.e. taxonomic, overview of all living beings. In clinical psychology and psychiatry, DSM (Diagnostic and Statistical Manual of Mental Disorders) as well as ICD (International Classification of Diseases) are used extensively.

What Gordon calls 'groups' is usually called *classes* or, more formally, sets and partitions, or a taxon in biology. In the behavioural and social sciences, quite often neither the kind nor the number of classes are known in advance and have to be determined in the process of establishing a classificatory system. They are the target of permanent revision to incorporate the increasing knowledge in a subject area.

Searching for classes means analysing the relationships between objects. Two fundamentally different though not mutually exclusive bases exist for this analysis: either judgements of similarity are studied, or patterns of features describing the objects are compared.

Similarity may be either based directly on judgements, expert opinions etc. on likeness or of belonging together, or on confusion frequency or other behavioural observations. Or the similarities may be derived from co-occurrence patterns or correlations between properties. A large variety of coefficients exists to derive similarity measures on which procedures like cluster analysis or multidimensional scaling might be based.

The objects may be characterized by *properties*, traits, characteristics, symptoms, features or variables. They describe the variability between the objects by categories. These categories exist in at least two values (states, labels). The variables may be qualitative or quantitative, discrete or continuous, and of any scale level. Within the context of classification, it is useful to consider *sets* of variables, also called profiles, vectors, syndromes, or feature patterns.

THE CONCEPTUAL BASIS OF CLASSIFICATION

To solve all major parts of a classification task, we have to find predictors, delimit the classes, and specify the relationship between predictors and classes. Here, we briefly discuss some class concepts, mention approaches to prediction and comment on a specific way to identify class membership, the diagnostic key.

What defines a class? Several quite different conceptions exist:

1. Each object with a specific, 'essential' property belongs to a class. e.g., when a certain genetic anomaly exists, the child is diagnosed as showing the 'Down Syndrome'. The assumption that (a few) necessary properties decide about class membership characterizes the *monothetic position* (Sutcliffe, 1993).
2. There exist some properties to be used for classification, and the observation of some of these properties in an object (but not necessarily the same for every object) is necessary and sufficient to be a member of a specified class. This is the *polythetic* contraposition to definition (1) (Gyllenberg & Koski, 1996).
3. A variant of position (1) refers to a 'nosological unit', a syndrome, as genetically determined dyslexia. The identification of a few symptoms are essential.
4. A variant of position (2) refers to *prototypes*, relatively well known members conceived as the 'centre' of a class. A member of the same class must be similar to the prototype.
5. Classes are more or less identical with *clusters*. A cluster is a formal representation of several objects and of the relations between these objects. The relations may be similarities represented usually by distances, or may be vectors of properties. Data reveal clustering if – to a significant extent – the objects can be sorted into sets so that they are (a) more similar to each other if they are members of the same set (compactness), and (b) more dissimilar to objects in other sets (isolation), or both.

   With more than 200 procedures designed to find clusters, the various cluster concepts have to be classified themselves. The procedures vary with the emphasis they give to compactness or isolation. Some fundamental distinctions between cluster concepts are: all clusters are on the same level vs. there exists a hierarchical structure among the clusters, and an element may be a member in only one vs. in more than one cluster (*disjunct or overlapping membership*).
6. Most cluster concepts refer only to contingencies of the first order, i.e. to relationships between two variables, but not three or more. Several notable exceptions exist, such as Configural Frequency Analysis (Krauth & Lienert, 1973), Pattern-Analytic Clustering (McQuitty, 1987) and Hierarchical Classes (HICLAS; Rosenberg, Van Mechelen & De Boeck, 1996); for a theoretical overview, see Feger and Brehm (2001).

Classification is that special case of *prediction* (see 'Prediction (General)' entry) in which at the start of the analytical process it may be unknown, as also how many and which categories of the dependent variable exist. The dependent variable here is equivalent with the set of classes called the 'criterion'. All ideas available to perform prediction in general can in principle be applied in classification to bridge the gap between predictors and this criterion. The most common formal prediction models – prediction rules, correlational approaches, regression, discriminant analysis – are briefly discussed in the entry 'prediction'. Here comments are given only on the old procedure of building and using a diagnostic key which is becoming more popular recently.

Dunn and Everitt (1982: 106) distinguish between two main approaches to formal classification. 'In the first one employs characters in a *sequence* (as in a *diagnostic key*). Here possible alternatives are successively eliminated by considering more and more characters until only one possibility remains.' In the second approach all features are considered simultaneously in a kind of 'matching'. In this process, all information about the new case is compared to the template provided by every class. A diagnostic key is like performing a series of tests in a fixed order. The results of a test may determine which test or other procedure should be applied next. If errors

cannot be corrected, the first tests should be very reliable. The earlier in the diagnostic process a test is given, the more serious a mistake in the identification procedure may turn out.

A diagnostic key is often graphically represented as a (rooted) tree and then called a 'dendrogram'. Every test is a node in this graph. Two tests are connected by an edge if they constitute a part of a possible sequence of tests to be applied. Depending on the result of the test, a different path – a different branch of the tree – may be followed. An end node or 'leaf' represents the class of the assignment technique.

Working with a diagnostic key vs. using all predictors simultaneously also reflects the dispute between the monothetic and polythetic position and the question whether to use only contingencies of the first or of higher orders. If essential variables are found – perhaps the causes of a syndrome or unique properties of members of a certain class – the essential variables will be used unless they are ethically dubious, or it is dangerous to obtain this information, or very expensive. Working with more variables one might be able to exploit different relationships between predictors and criterion. In some predictors, a direct association exists between predictor and criterion, perhaps of different aspects in different predictors. Some predictors serve to suppress the error in other predictors (suppressor variables) or function as moderator variables (see 'Prediction (General)'). In a diagnostic key, the first item is related to the criterion by a contingency of the first order. Later items in the key imply all previous items. Thus the feature pattern on which the decision is based becomes longer and longer, and the order of the contingency increases. Furthermore, the number of cases on which the construction of the later parts of the tree is based becomes increasingly smaller. Also considering cost of obtaining information and of possible misclassifications may lead to the strategy to use many but relatively short rules (see Breiman, Friedman, Olshen & Stone, 1993).

ESTABLISHING A CLASSIFICATORY SYSTEM

When developing a classificatory system, some decisions have to be made; only a few are mentioned here. How should the field be defined from which to select, perhaps even to *sample*, cases? Preferably, this *extension* of a classification is defined explicitly. The same is true for the *intension* of a system, i.e. the list of the properties to characterize the cases as strictly as possible. The two lists implicitly take a basic tenet of classification for granted: variables or relations like similarity have the same meaning even when applied to different objects. If properties are to be used, the question of their 'usefulness' arises, including considerations of differential weighting, transformations, and costs (see Pankhurst, 1991).

If the decision is to investigate similarities between objects to find classes, one faces the next decision: should experts or clients define the 'similarity in the eye of the subjects' or should the researcher calculate similarity coefficients from properties and thus determine the 'similarity in the mind of the researcher'? For both procedures inherent problems exist which can not be treated here.

EVALUATION OF A CLASSIFICATION PROCEDURE

The prototypes of classificatory systems in physics and biology are successful because they satisfy some criteria:

1. They are founded by and contribute to substantial theories.
2. The assignment of elements to classes uses only a small part of the available, usually quite reliable information and can be performed objectively.
3. The system allocates all elements, each in just one class, and does not use a class with many unidentifiable objects.
4. There exists order between the classes and among the properties allowing prediction of 'missing elements' and their properties.
5. The system is open for permanent extension and revision.

All steps bringing a classificatory system closer to satisfying these criteria will increase its theoretical and practical importance. DSM and ICD, to mention the most popular approaches to clinical assessment, do not satisfy all of these criteria. They are the result of professional

experience, convention and sometimes even political compromise.

All parts of the classification system should be evaluated, (1) the conceptualization of the classes, especially if the classes are derived from clustering, (2) the predictive success, and (3) the selection of predictors.

First, all popular clustering algorithms lead always to a result, a set of clusters. To find clusters is not an *empirical* result but an exercise in calculation. Therefore, inferential statistics has to secure that the degree of compactness or isolation in the data is significant (Bock, 1996; Milligan, 1996). Second, predictive success in one study may capitalize on chance. Replication with different samples and methods and at various circumstances is essential, especially in the form of *cross validation*. The principle of cross validation is to use two comparable samples, either the old and a new one, or a random split of the one and only sample available if its number of cases is large enough. Then the prediction rules derived from one sample are applied in the other sample. Ideally, the predictive success in the replication is not lower than before. Even the previous determination of the classes may be tested in this way (Everitt, 1993). Third, the selection of predictors might be a topic of continuous evaluation. Their reliability and validity is not necessarily constant. It is quite likely that a revision of a test or questionnaire changes the properties of these instruments as predictors. The *a priori* frequencies (base rates) of how the cases are distributed over the categories of the variables may also change with time and from institution to institution. Therefore, it is not surprising to find dozens of publications every year concerned with the development of new and the modification of already existing classifications.

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RELATED ENTRIES

Diagnosis of Mental and Behavioural Disorders, Explanation, Prediction (General)

CLINICAL JUDGEMENT

INTRODUCTION

'Clinical judgement' refers generally to the result of a set of cognitive activities that aim to: (a) classify an observed behavioural pattern into a nosological system category (*diagnostic judgement*); (b) predict the development of an observed behavioural pattern under a given treatment, or under particular environmental conditions (*predictive judgement*, or *prognosis*); (c) estimate the degree of severity of a disorder (*severity judgement*); and (d) make an informed decision about the best treatment (*treatment judgement*).

Many published works describe how diagnostic and prognostic judgements are made. Some propose theoretical models to represent diagnostic and prognostic judgements, but little has been published about severity- and treatment-judgements.

A clinical judgement is the result of three main complex activities: data collection, data evaluation, and information integration. Because these activities are sequential, clinical-judgement making is often considered a process and, in this case, each activity might be considered a process stage. Usually, at the conclusion of the last stage, the judgement is communicated externally as a formal 'clinical report' or 'diagnostic report'.

Many psychological models of judgement-making only focus on one or two stages of the internal cognitive process, not all three, and none includes the clinical report stage.

PSYCHOLOGICAL STUDY OF CLINICAL JUDGEMENT

The empirical study of clinical judgement was stimulated by the so called clinical–statistical controversy (see entry *Prediction: Clinical vs. Statistical*). From the beginning these studies revealed that statistical predictions are more accurate than the intuitive predictions of clinicians, and two research strategies evolved. One describes professional judgements empirically and develops theoretical models to improve clinical training and judgement performance. The other aims to develop expert systems and computerized support systems to help clinicians to solve clinical problems. Computerized strategies helped develop artificial intelligence that, although closely associated with cognitive psychology, lies beyond the scope of this entry.

Lineal Models

Early and important methods for the study of clinical judgement were the lens and the policy-capturing models.

Hoffman's *policy-capturing* research strategy (1960) uses regression equations to simulate clinical-judgement making. It aims to discover the subjective relative importance the clinician gives to the several data elements used to make the final judgement. In regression equations the relative importance of the same data elements is expressed objectively by 'regression weights'. In addition, the researchers in this type of study take into account the different strategies the clinicians use when they integrate this information to make their judgement. Several important conclusions have emerged from policy-capturing research:

(a) clinicians generally use only a few cues to make a clinical judgement;
(b) the subjective importance that clinicians give to their data often does not agree with the regression weights of the same data;
(c) the disparities between objective and subjective 'weights' suggests that most clinicians are unaware of the subjective importance they attribute to their data;
(d) although lineal regression equations often represent and predict very well how clinicians make clinical judgements, most clinicians believe that they use configurational and non-lineal reasoning;
(e) configurational modelling of clinical judgement (by using: analysis of variance;

interaction-effects in the regression equations; or one of several other analytical procedures) does not depict or predict clinicians' judgements better than lineal modelling;

(f) configurational modelling does not improve judgement accuracy. Nevertheless, the configurational-reasoning idea strongly influenced clinical judgement studies and contributed to the development of Anderson's information-integration theory (Anderson, 1981).

The *lens model* is based on original work by Brunswik. Hammond (1955) adapted it for use in the field of clinical judgement. This theoretical approach proved highly effective to depict the relationships between intuitive judgement and an objective criterion. The lens model also depicts:

(a) the interrelationship between available data (information redundancy);
(b) the relationships between data and criterion (ecological validity of available data);
(c) between data and clinician's judgement (validity of clinician's inferences);
(d) between clinical judgement and criterion (judgement validity);
(e) between objective judgement and predicted judgement (judgement predictability, or cognitive control);
(f) between the objective- and predicted-criterion values (environment predictability, or task predictability); and
(g) between the predicted judgement and the predicted criterion value (knowledge of the nature of the clinical task).

Some important results from research carried out with lineal models of clinical judgement are:

(a) judgements formed by intuition can be precisely represented by mathematical expressions like regression equations, analysis of variance, or conjoint measures;
(b) clinicians' judgements can be accurately predicted;
(c) several task-related factors strongly influence judgements: the amount of data collected, the order in which data items are collected or dealt with, the coherence of data elements, the different types of data-presentation to subject, the subject-response formats, and the constraints imposed by limited time;
(d) an important result that contradicted widely accepted ideas in psychological assessment is that when low-validity data elements are added to high-validity data, judgement validity decreases. Consequently, and surprisingly, the more data of the same type the clinician has (information redundancy), the lower is judgement validity and predictability, and the clinician not only tends to show overconfidence but, paradoxically, abundant data often induces the clinician to overlook inconsistent data.

Decision-Making Theories

Decision-making theories represent a great advance in the study of clinical judgement, especially in medicine. The main subjects of this theoretical approach in psychological assessment are described in the entry about decisions. It is sufficient to say that clinical-judgement research uses several established decision-making theories to study the ways clinicians select a final decision from an array of potential decisions (options) by taking into account their objective probabilities and subjective 'attractiveness' for the decision-maker. The accumulated conclusions of decision-making research suggest that clinicians' judgements are often subjectively biased (Dowie & Elstein, 1988).

Problem-Solving Theories

Elstein, Shulman and Sprafka (1978) propose a model of clinical judgement based on problem-solving theories that has stimulated much new research and is now widely accepted by other authors in the field of clinical judgement. Their research model employs *process-tracing* methods and the concepts used are very different to those of the statistical theories like 'policy-capturing' and 'lens' models. Elstein, Shulman and Sprafka consider clinical-judgement making as a four-step process, namely: limited data collection; formation of orientative hypotheses; data evaluation; and finally, testing to select one hypothesis. In the first step, data collection, the clinicians assemble a number of data items concerning the motive for consulting: this step

usually lasts a few minutes and then the clinicians pass quickly to the activity of generating several hypotheses that might explain some of the accumulated data. When these hypotheses have been made, the significance of each element of the remaining data is evaluated again in the light of each hypothesis being considered and only those data elements that fit that hypothesis are considered relevant. When required, clinicians assemble new data elements to test hypotheses. In the fourth and final step, the hypothesis that best fits the available data is accepted as the final clinical judgement.

The book by Elstein, Shulman and Sprafka (1978) presents several important findings about the four steps of clinical-judgement process and their research helps enormously trainer clinicians to show their trainees how to make clinical assessments. Although this research refers mainly to diagnostic judgements, it applies equally to treatment judgements.

TRAINING FOR CLINICAL JUDGEMENT-MAKING

The policy capturing, lens, or decision-making models do not take into account data gathering, the first phase of the judgement process. They assume that data are available at the beginning of the process. Consequently, these models merely exploit data available at a given time, but they do not represent or prescribe what types of data are desirable. The problem-solving model does represent the phase of data collection. Interestingly, no published psychological model of clinical judgement takes into account judgement expression, the last step of the process. Consequently, they limit prescriptions and suggestions about how to form clinical judgements to the previous steps: data gathering, data appraisal, data integration, hypothesis generation, and hypothesis evaluation.

One proven policy-capturing strategy to enhance judgement accuracy (the so-called 'bootstrapping') is for a clinician to make his judgements conform strictly to the regression equation that represents his or her previous reliable performances (nevertheless, in theory, we could simply substitute the clinician by using this regression equation).

The lens model is useful to enhance the validity of clinical judgement. Hammond and associates suggested three general ways to enhance judgement quality:

(a) gather more data relevant to the task, use more valid data, or increase the independence between data, and so increase criterion predictability;
(b) increase the clinician's knowledge of the task structure by helping the clinician to learn to adjust his or her usual judgement-forming strategy to the objective weights of each data element and to the curve of the mathematical function that best associates the data elements with the criterion; and
(c) increase the clinician's cognitive control to consistently fine-tune actual judgements to conform to his or her usual judgement-making strategy. Other theoretical models include (a) above (increase criterion predictability) and (b) (to fit the clinician's strategy to the regression equation). However, only the lens model suggests that clinical judgement may be improved by increasing cognitive control.

Elstein, Shulman and Sprafka (1978) offer also important insights and conclusions with great value in clinical training:

(a) Quality of clinical judgement depends on the amount, nature, and structure of the clinician's expert knowledge. Consequently, the training of clinicians must include knowledge of basic disciplines. Furthermore, isolated knowledge of heuristics and procedural rules of information integration (e.g. regression equations or the Bayes' Theorem) do not ensure that clinicians will always make accurate judgements. The rules of information-integration are invaluable for clinical judgement making, but equally important is basic knowledge of the nature and the appropriateness of the data to be integrated.
(b) Because specialized knowledge is fundamentally important to solve clinical problems, the types of clinical cases used to train novice clinicians must be carefully selected for the particular clinical speciality. The range of cases chosen

for training must include all the professional tasks undertaken by the specialists because the information-gathering and data-integration strategies are highly task dependent.

(c) Most clinicians appear to use the hypothetical-deductive method.

(d) Interpretation of information is not a simple process in which knowledge recovered from memory is applied mechanically to any available data: the skills needed to propound hypotheses that might guide the subsequent steps (activities) of the assessment process must be learned.

(e) Judgement quality suffers more from misinterpretations made while data elements are appraised and from the errors and mistakes made while they are integrated into the final judgement than from an insufficient collection of data.

(f) Many errors and omissions that might lead to erroneous or distorted final clinical judgements disappear or are reduced when the clinician generates as many hypotheses as available data permit.

FUTURE PERSPECTIVES

Judgement formation, decision making and problem solving are the three classical approaches to the study of clinical judgement. However, in the future, clinical judgement research will take into account some new theories of cognitive psychology such as 'categorization by prototypes' (Cantor, Smith, French & Mezzich, 1980), pattern matching (Kassirer, Kuipers & Gorry, 1982), 'mental scripts' (Feltovich & Barrows, 1984; Boshuizen & Schmidt, 1992), situational models (Patel, Evans & Groen, 1989), semantic structures (Lemieux & Bordage, 1992), a diagnostic cycle derived from De Groot's scientific cycle (De Bruyn, 1992), a special case of the application of scientific explanations (Westmeyer & Hageböck, 1992), and parallel processing of information (Berrios & Chen, 1993). The researchers who use some of these approaches are highly productive and their works have great potential to influence many other workers in this field.

CONCLUSIONS

Some important conclusions from the research about clinical judgement are:

(a) Clinical intuitive judgement-making can be theoretically and mathematically represented, and the clinician's judgements accurately predicted.

(b) The research of clinical judgement has produced promising computerized support systems for clinical judgement, as well as a great amount of knowledge and procedural guidelines for clinical training and clinical judgement-making.

(c) Emerging trends in clinical-judgement research are contributing not only to our understanding of clinical judgement, but also to the development of the psychology of judgement, decision making, problem solving, and categorization.

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Antonio Godoy

RELATED ENTRIES

Applied Fields: Clinical, Assessor's Bias, Case Formulation, Prediction: Clinical vs. Statistical, Assessment Process

COACHING CANDIDATES TO SCORE HIGHER ON TESTS

INTRODUCTION

Applicants for higher education, jobs, etc. are usually required to take aptitude tests for selection and sometimes for placement. Applicants strive for high scores to increase their chances in the selection or placement process. To achieve such scores, examinees may utilize various forms of coaching. Coaching was defined by Cole (1982) as a 'wide variety of test preparation activities undertaken by individuals in an attempt to improve test scores'. These may range from solving some items to extensive courses.

Today most testing institutions offer free (or inexpensive) explanations of test instructions, a multitude of practice items and tests, and test-taking strategies. These provide fundamental coaching to examinees and facilitate practice with 'official material'.

After a brief historical review, we shall describe coaching – its components, the various forms it can take, and its prevalence. This will be followed by a review of studies that have attempted to evaluate the coaching effect – the size of the score gain. A separate section will deal with social and test validity issues associated with coaching.

HISTORICAL BACKGROUND

Coaching is as old as testing. The earliest example can be found in China, where coaching for civil service examinations has been in existence for some 3000 years. In the modern testing era, coaching research began with the Binet intelligence tests in France. Binet and Simon (1916) discovered that test scores improved in the second administration of intelligence tests to 9-year-old pupils. The gain was attributed to several factors, including familiarity with the test content. In England, studies were conducted on coaching for the eleven-plus examinations, which were used extensively for pupil selection after primary school. Yates (1953) and others showed that coaching for these examinations can improve scores. However, their studies were not methodologically sound, therefore limiting generalization from these findings.

The question of whether aptitude test scores are affected by coaching has been extensively discussed (e.g. Bond, 1989). Until about 1970, the commonly held view was that improvement due to coaching was very small, if not negligible. This view is clearly demonstrated by the following typical quote from the publication of ETS (Educational Testing Service, which is responsible for several of the largest testing programmes in the world): 'The magnitude of the gains resulting from coaching vary slightly but they are always small regardless of the coaching method used or the differences in the students coached' (ETS, 1965: 4).

Later, as data accumulated, views of coaching effectiveness changed. Today, educational

researchers agree that coaching usually results in small score gains, and the question to be addressed is no longer 'Does coaching help?' but 'How much does coaching help?'

COACHING COMPONENTS, FORMS AND PREVALENCE

Components

Coaching for a test involves three interrelated components (Allalouf & Ben-Shakhar, 1998): acquiring familiarity with the test, reviewing relevant material and acquiring testwiseness:

1. Acquiring familiarity with the test – becoming acquainted with the test instructions, item types, time limits, and the answer sheet format. This can be achieved by answering questions similar to the test questions under conditions as similar as possible to those encountered during the actual test administration.
2. Reviewing relevant material – reviewing the academic material included in the test, such as reviewing mathematics when the test contains mathematical reasoning.
3. Acquiring testwiseness (TW) – improving the 'subject capacity to utilize the characteristics and formats of the test and/or the test-taking situation to receive a high score' (Millman, Bishop & Ebel, 1965: 707). The following TW strategies, independent of test content or purpose, were identified by Millman et al. (1965): efficient use of available time, error avoidance and intelligent guessing. In addition, they found test-specific testwiseness – elements dependent upon specific flaws and clues in a particular test.

Those who construct aptitude tests should be aware of these coaching components. This awareness will enable them to: (1) formulate clear test instructions, (2) make the test less dependent upon scholastic knowledge, and (3) avoid including clues which might help the sophisticated examinee.

It should be noted that in some studies (e.g. Cole, 1982), coaching includes a cheating component, where examinees have access to test items, and even to the correct answers, before the test. In this entry, cheating is not regarded as a component of coaching. It also should be noted that one of the purposes of coaching is to decrease anxiety resulting from an unfamiliar test.

Forms

Different forms of coaching can be characterized by five variables: (1) amount of material: from a small number of items to very detailed guides, (2) institution/company responsible: commercial or non-commercial, (3) method of learning: self-study or instructed, (4) medium: books or computerized, and (5) amount of time devoted: from several hours to over a hundred hours. Examinees choose the form of coaching most suitable to them, based on availability, financial considerations and even fashion.

Prevalence

Special preparation for scholastic aptitude entrance exams to institutions of higher learning and for other high-stakes tests is very common. The following two examples deal with scholastic aptitude tests for admission to higher education. In the United States, according to a survey conducted by Powers and Rock (1999) on the Scholastic Assessment Tests (SAT), 97% of students engaged in some form of preparation before taking the test, with a median of 11 hours of preparation. 12% of the SAT examinees participated in out-of-school coaching programmes, 18% participated in in-school coaching programmes, 58% used the official booklet, and 81% took the Preliminary SAT beforehand. In Israel, 83% (!) of examinees participated in coaching courses for the Inter-University Psychometric Entrance Test (PET) in the year 2000 and 63% used the official booklet.

STUDIES ON COACHING EFFECT

A major coaching issue is its effect. Many studies have dealt with the effect of coaching on the performance on test scores. Some studies were done on the differential effect of coaching on specific item types.

Score Gains Due to Coaching

Examinees and the public are often exposed to rumours and extreme individual examples of large score gains following coaching. This information sometimes is disseminated by the large commercial coaching companies which have financial interest in advertising themselves. A different picture is obtained from objective information based on scientifically controlled studies: score gains do occur, but they are generally small, especially when compared to the claims made by the commercial companies.

Since the early 1970s, many studies focusing on the effects of preparation on scholastic aptitude tests have been conducted. These studies estimated the coaching effect beyond the gain achieved due to retesting. Recent meta-analyses of many studies (Messick, 1981; Powers, 1993) have demonstrated that scores on scholastic aptitude tests can be improved by focused preparation. The expected gain in an examinee's score following several weeks of coaching is generally small, and the mean gain on the SAT, according to these meta-analyses, is approximately one fifth of a standard deviation (beyond the gain that would be expected as a result of retesting only, which, according to Donlon, 1984, is about one seventh of a standard deviation). Similar results were obtained for the American College Testing (ACT) Assessment (McCoy, 1999) and the Israeli PET (Oren, 1993).

Differential Effect

Studies show that coaching is more effective for mathematical items than for verbal items. The effect depends on the time devoted to coaching. According to Messick (1981), the improvement resulting from the first 20 hours of coaching for the SAT is about 20% of a standard deviation in the mathematical subtest, and about 12.5% of a standard deviation in the verbal subtest. They estimate that 120 hours are needed to double these gains in the mathematical subtest and 250 hours in the verbal subtest. Figure 1 (based on Messick, 1981), who performed a logarithmic interpolation on the basis of the studies included in his meta-analysis) presents the marginal gains in the mathematical and verbal aptitudes.

Coaching has a differential effect on different item types. For example, Swinton and Powers (1983) found that in the analytic part of the Graduate Record Examinations (GRE), the performance on two item types (analysis of explanations and logical diagrams) was greatly affected by coaching. As a result, these item types were removed from the test.

SOCIAL AND VALIDITY CONSIDERATIONS

Tests are administered in order to offer all candidates the same fair chance to succeed.

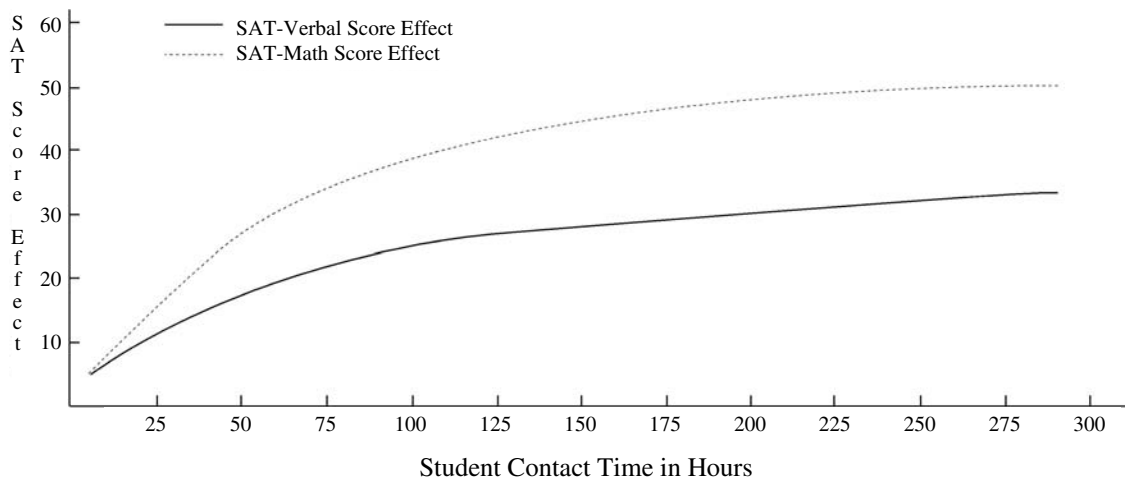

Figure 1. Expected score effects associated with the amount of examinees' contact time for verbal and math subtests (based on Messick, 1981).

However, it can be argued that coaching works against equity: since not everyone prepares for a test, fairness may be impaired.

Social Considerations

Not every applicant can afford expensive commercial courses. Moreover, the 'prestigious coaching courses' are usually given in wealthy neighbourhoods. As Cole (1982) noted, if those who can afford expensive courses gain an advantage, then testing becomes linked to economic status – which is completely counter to the testing goal of offering equal opportunity for all. The solution to this threat to fairness is, of course, to expose every candidate to coaching at a reasonable price.

Validity Considerations

Some critics believe that if you can coach for an aptitude test, something is wrong with the test, and it cannot be valid. These critics believe (actually, they have the illusion) that somewhere an 'ideal test' exists that cannot be coached for. Reality proves otherwise. The disclosure policy characterizing today's testing, whereby examinees are provided with coaching material, makes this 'ideal' even less realizable.

Other critics of scholastic aptitude tests typically claim that preparation improves scores on these tests by teaching examinees special techniques for solving multiple choice items, thus lowering test validity. Many researchers, among them Anastasi (1981) and Bond (1989), have raised the question of the possible detrimental effects of coaching on test validity. Bond (1989: 440) wrote: 'A continuing concern on the part of testing specialists, admissions officers, and others is that coaching, if highly effective, could adversely affect predictive validity and could, in fact, call into question the very concept of aptitude.' However, in contrast to the concern raised by Bond, most studies indicate that coaching in fact leads to slight improvement in the predictive validity of aptitude tests (see Allalouf & Ben-Shakhar, 1998). This may be explained by the improvement, resulting from coaching, in inaccurately low scores that are due to poor test-taking skills. Coaching may also have a small influence on the cognitive skills necessary for success in meeting specific criteria (e.g. achievement in higher education).

FUTURE PERSPECTIVES AND CONCLUSIONS

As long as tests are used, coaching issues will remain a matter of public concern. The public and the examinees should realize that score gains due to coaching are usually small, and large gains are very rare. Institutions that require or administer aptitude tests should provide examinees with inexpensive coaching material. It should be remembered that coaching tends to improve general skills, such as verbal and mathematical skills, and this improvement is beneficial for every applicant. Of course, if coaching does not impair predictive validity and fairness, and even increases the predictive validity of the test (especially when everyone is coached to a similar extent), coaching is desirable.

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Avi Allalouf

RELATED ENTRIES

Applied Fields: Education, Achievement Testing

COGNITIVE ABILITY: *g* FACTOR

INTRODUCTION

There is an unlimited variety of human mental abilities, defined as any form of information processing capability that can be assessed objectively and quantitatively by means of psychometric tests or various laboratory apparatuses. Information processing includes diverse cognitive functions such as stimulus apprehension, attention, perception, sensory discrimination, generalization, conditioning, learning, short-term and long-term memory, recall, learning-set acquisition, concept formation, thinking, reasoning, inference, problem solving, planning, invention, and use of language. Quantitative assessments of such information processing functions by objective means typically show a wide distribution of individual differences. It is well established in psychometrics that individual differences in a wide variety of cognitive tasks, however diverse in specific knowledge content and required skills, are all positively correlated in the general population. This phenomenon of all-positive correlations among measures of individual differences in cognitive abilities is the basis of the theoretical construct of general *ability*, or *g*.

FACTOR ANALYSIS OF MENTAL TESTS

The *g* factor is conceived technically as a *latent variable* that accounts for the empirical fact of all-positive correlations among diverse cognitive tests. By means of *factor analysis* one can determine the *g factor loadings* of various tests, i.e. their degree of correlation with the one factor that is common to a number of different cognitive tests, and from which *g factor scores* of individuals can be estimated.

'General Ability' and 'Ability in General'

It is important to distinguish between *general ability* (or the *g* factor), on the one hand, and what can be called *ability in general*, on the other. The latter refers to the sum (or average) of the scores on a collection of different subtests, such as the Stanford–Binet and the Wechsler batteries, and many other heterogeneous tests of 'intelligence'. The total score or Full Scale IQ on such tests is based on an arbitrary selection of a number of diverse tests. The *g* factor, however, in a linear decomposition of the total variance into uncorrelated components or factors, reflects only the source of variance that is common to all of the different ability measures represented by the various subtests of a cognitive test battery. Hence the *simple sum* of the subtest standardized scores on a test battery and the factor scores obtained from the *g loadings* of various subtests are not necessarily the same and may even be quite different. Typically, however, in the most widely used and broadly valid standardized test batteries

the sum of the subtest scores (e.g. the full scale IQ) and the *g* factor scores are very highly correlated. Therefore the labour of calculating factor scores has little justification for the practical use of tests; the total standardized score, or IQ, is a fair substitute for the estimated *g* factor score.

Test Construction for the Measurement of *g*

The psychometric procedures for constructing an IQ test are intended to yield high practical validity for predicting many different outcomes involving cognitive abilities, such as scholastic achievement, college grade-point average, job performance, occupational level, and success in various armed services training programmes. This aim of IQ test construction and the psychometric means for achieving it inevitably results in the production of highly *g* loaded IQ scores, even when factor analysis is not used and the test designers have no interest in maximizing the test's overall *g* saturation per se.

Psychometrics of *g*

It has proved absolutely impossible to devise various tests involving information processing of any kind that, within a broad range of talent, are not positively correlated with each other. The more such diverse tests that are included in a battery, the greater is the proportion of the common factor variance (CFV) and, generally, the larger is the proportion of CFV consisting of *g*. The total variance, V_T, of any test composed of a number, n, of parts (i.e. items or subtests), i and j, consists of the sum of the item variances plus twice the sum of the item covariances: $V_T = \sum V_i + 2\sum \mathrm{Cov}_{ij}$. The first term in this equation ($\sum V_i$) increases linearly as a function of n, while the second term ($2\sum \mathrm{Cov}_{ij}$) increases exponentially, such that in most ability tests consisting of many parts (items or subtests), the second term typically constitutes some eight to ten times more of the total variance than does the first term. Hence most of a test's total variance is contributed by the item covariances, rather than by the item variances. In a factor analysis, the total variance is partitioned into two parts: (1) the *common factor* variance (i.e. the total *communality*, composed of the sum of all the items' loadings on *g* and on one or more *group factors*, if any) and (2) the items' unshared or *specific* variance (i.e. item *specificity*) and *measurement error*. In a test composed of sufficiently diverse subtests or very heterogeneous items, *g* is typically larger than any group factor independent of *g* and can even be larger (in terms of the proportion of variance accounted for) than all of the group factors (independent of *g*) combined. This is true even for test batteries that were not expressly designed to maximize *g*.

Practical Validity of *g*

The *g* factor itself contributes more to a test's practical validity than any of the group factors used alone or in combination independently of *g* (Jensen, 1998, Chapter 9; Schmidt & Hunter, 1998). The most highly *g* loaded tests are the highest in *validity generalization* (i.e. a test's validity across many different predictive criteria), although certain group factors in addition to *g* (e.g. verbal, numerical, spatial, mechanical, and clerical speed/accuracy) may increase a test's validity for predicting a specific criterion.

Research on the Nature of Intelligence

The *g* factor per se is mainly of importance in research on the biological basis of intelligence, rather than in clinical assessment of individuals. Research on the properties of *g* itself has shown it to be more highly correlated with various genetic, anatomic, and physiological brain variables than are the major group factors or other psychometric variables after *g* is statistically removed. The chief focus in such research is on the correlation of *g* with various non-psychometric variables, such as brain size, brain evoked potentials, brain glucose metabolic rate, nerve conduction velocity, tests' heritability coefficients, and the like (Jensen, 1998). For such purposes, it is unnecessary to obtain *g* factor scores for individuals, as the factor loadings of the biological variables of interest can be obtained directly by factor analysing them within a suitable correlation matrix of psychometric tests that strongly identify *g*.

Clinical Assessment of *g*

Factor scores on *g* (or other factors) are seldom called for in clinical assessment. The global IQ derived from one of the standard IQ tests, such as the Wechsler Intelligence Scales, the Kaufman Assessment Battery for Children, the Woodcock–Johnson Tests of Cognitive Ability, and the British Ability Scales (which provides conversion tables for *g* factor scores), is generally an adequate indicator of mental level, and extreme deviations in the profile of subtest scores may occasionally cue the examiner of the need for other, more specialized tests. If, however, it is important to assess individuals' relative level of *g* as uncontaminated as possible by other ability factors, *g* factor scores can be obtained, given a proper factor analysis or components analysis of the battery on a large enough group of individuals to ensure high reliability of the tests' *g* factor loadings.

Assessment of *g* in Individuals

It is axiomatic that no single test can yield a pure measure of *g*. Although every cognitive test contains *g* variance, every test also has its own specificity variance and often reflects one or more group factors as well. Therefore, *g* factor scores of individuals can be estimated only by a special mathematical treatment of the data. There are several methods for calculating factor scores, the detailed methodology for which is beyond the scope of this entry (see Harman, 1976, Chapter 16). The method of factor analysis or principal components analysis used for extracting the *g* factor from a suitable test battery usually makes little difference in the end result (Jensen & Weng, 1994). The three main choices are between (1) the first factor in a principal factor analysis, (2) the first principal component in a components analysis, and (3) the highest-order factor in an orthogonalized hierarchical factor analysis. Although it makes little practical difference, the choice here depends on quite technical psychometric considerations discussed in the above references. The presently preferred method for statistically estimating factor scores is by multiple regression, in which all of the subtests' intercorrelations and the tests' *g* factor loadings, in addition to the individuals' standardized scores on each subtest, are used to calculate each individual's *g* factor score. This procedure is described in most modern textbooks on factor analysis and, fortunately, is now available in statistical computer programs.

Spearman's 'Law of Diminishing Returns'

A seldom recognized problem in the estimation of *g* factor scores arises from a phenomenon first discovered by Spearman, which he termed the *law of diminishing returns* (Jensen, 1998, Appendix A). This seemingly paradoxical effect, which has been well established in several recent studies, consists of the fact that tests' *g* loadings are smaller, on average, for individuals of higher general ability. If we divide the bell-curve distribution of IQ at the median (IQ 100) and extract the *g* factor separately from the upper-half and the lower-half of the distribution, we find that *g* accounts for significantly less of the total variance in the upper-half than in the lower-half. For instance, in the Wechsler scales (both for adults and for children) the *g* variance is about one and a half times greater for the distribution of IQ below 100 than for that of IQ above 100. In general, the higher the Full Scale IQ score, the less it reflects *g*. A corollary is that the various subtests are less highly correlated with each other at the higher levels of IQ. The cognitively more able subjects have more highly differentiated abilities. Relatively more of their individual difference variance exists in the group factors and test specificity. But it is also a fact that the subtests with the larger *g* loadings manifest this effect by far the least; it is almost entirely attributable to those tests with the smaller *g* loadings. This implies that in constructing a test battery that comes as close as possible to measuring *g* equally well across the full range of ability, all of the subtests in the battery should have as large and as nearly equal *g* loadings as possible. Also every subtest's *g* loading should greatly exceed its loadings on any group factors. Then the total standardized scores on such a test, assuming it also meets all the usual psychometric desiderata, should provide a defensible estimate of *g*. The total scores would scarcely differ from the optimal *g* factor scores.

FUTURE PERSPECTIVES

Both in research and in applied assessment, the most promising future trends in the measurement

of *g*, as well as of other ability factors, will take advantage of recent advances in the methods of *computerized adaptive testing* (CAT), *item response theory* (IRT), and *mental chronometry* (MC), which, used in combination, would optimize mental testing. CAT greatly increases the efficiency of test-taking by quickly zeroing-in on the level of item difficulty that is most reliably discriminating of an individual's level of ability. Scaling item difficulty by IRT and the use of the item characteristic curve permits more unidimensional item selection for CAT-administered subscales. A composite score based on chronometric measures of the time required to perform various elementary cognitive tasks (ECT) are *g*-loaded and yet performance on ECTs has minimal dependence on prior acquired knowledge and skills, thereby minimizing the cultural loading of the cognitive ability measures.

CONCLUSIONS

It should not be forgotten that any psychometric estimate of *g* is just an approximation of a latent variable or hypothetical construct. The best derived *g* factor scores are an ordinal scale, which, without additional theoretical assumptions, can only rank individuals with respect to the estimate of *g* derived from a particular battery of tests.

It should also be recognized that every psychometric test, however well designed it is to measure a particular factor (especially *g*), always has some 'excess baggage', or test specificity. The specific knowledge and cognitive skills sampled by a test battery do not themselves represent *g*, but are merely vehicles for estimating the latent variable *g*, which can be achieved with diverse test batteries calling for different knowledge and skills. In testing individuals or groups, one must always question whether a test score is reflecting mainly the latent variable *g* or mainly the specificities of the vehicles used to estimate *g*. Despite its metrical limitations, the *g* factor is related both to more individually and socially important variables and to more possibly causal biological variables than is any other construct in psychology (Gottfredson, 1997; Jensen, 1998).

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Arthur R. Jensen

RELATED ENTRIES

Intelligence Assessment (General), Cognitive Ability: Multiple Cognitive Abilities, Cognitive/Mental Abilities in Work and Organizational Settings

COGNITIVE ABILITY: MULTIPLE COGNITIVE ABILITIES

INTRODUCTION

There are some theories supporting the view of intelligence as a collection of separate cognitive abilities (Gardner, 1993; Guilford and Hoepfner, 1971). Those theories follow the often-called 'Thurstone tradition' (Gustafsson, 1984). Guilford's Structure-of-Intellect (SOI) model postulates 180 separate abilities resulting from the combination of three cognitive facets: operations, contents, and products. Cattell's Gf-Gc theory distinguishes culture-reduced (Gf) and culture-specific (Gc) abilities (Cattell, 1987). Horn expanded Gf-Gc theory to include other abilities

like Gv (visualization capacity), Gps (general perceptual speed), Gm (general memory capacity), and Gr (general retrieval capacity) (Horn, 1994). Although the Gf-Gc theory can be considered as a hierarchical model covering many domains of intelligence, it does not provide a higher order factor (*g*) to account for correlations among the identified (second-order) general cognitive abilities. Gardner's theory postulates several independent intelligences (spatial, musical, verbal, and so forth) (Gardner, 1993). Sternberg's triarchic theory distinguishes analytic, practical, and creative intelligence (Sternberg, 1985). What all these theories have in common is that group abilities are thought to be more prominent than the *g* factor.

However, it must be said at the outset that there is no conflict between group or specific cognitive abilities and *g* (Brody, 1992; Carroll, 1993; Jensen, 1998). Thurstone recognized that his primary cognitive abilities were correlated, admitting the possible existence of Spearman's general factor (*g*) at the second order of analysis. The Thurstone model is not really different from the Spearman model: there are group factors and a general cognitive ability (*g*). Guilford SOI abilities are in fact correlated: the near-zero correlations he found in his data were the result of sampling error, restriction of range, measurement error, and the inclusion of tests of divergent production (Carroll, 1993). When proper corrections are made for restriction of range and attenuation, all the correlations are above zero, with a mean of + 0.45. Therefore, there is no empirical evidence in the SOI model that contradicts a hierarchical picture of intelligence with *g* at the apex: all cognitive tests are positively correlated (Colom & Andrés-Pueyo, 2000; Jensen, 1998). Gustafsson suggested an expansion of Gf-Gc theory: the HILI model (Hierarchical Lisrel). The HILI model proposes that the *g* factor subsumes Gf, Gc and Gv. Moreover, *g* is supposed to be identical to Gf. Therefore, there is no contradiction between the Gf-Gc view of intelligence and *g* (Gustafsson, 1984).

Sternberg and Gardner cannot be included within this framework so easily, because they both go far beyond. This is what they usually claim, although one can have some reasonable reservations. First, the specific measurements of analytical, practical and creative abilities taken through the Sternberg Triarchic Abilities Test (STAT) correlate higher than + 0.6. Correlations of this magnitude are telling a familiar story within the abilities domain: the positive manifold of the currently known measures. Second, there are some sample problems: university undergraduates or creative people are not the best samples to test the likelihood of the *g* factor (in addition to the non-questioned specific cognitive abilities). These samples represent the top 10% of the intelligence distribution in the entire population, and, therefore, there is a considerable restriction of range. Third, practical and creative intelligences in Sternberg's theory can be viewed as achievement variables reflecting how *g* is invested in activities as affected by opportunities, motivation, personality, and interests. The triarchic theory 'itself' is not the opposite of *g*, although separate abilities are considered more prominent in Sternberg's view of intelligence. Finally, Gardner's taxonomy is arbitrary and without empirical foundation. His view can have some interest in contexts like education, but there is nothing in the literature that gives an empirical foundation for Gardner's theory contradicting a hierarchical picture of intelligence with *g* at the apex.

Carroll supports that intelligence has a hierarchical structure in his famous survey of factor analytic studies (Carroll, 1993; Mackintosh, 1998). There is strong evidence for a factor representing *general* intelligence (*g*) located at the apex of the hierarchy (stratum III) and representing the level of difficulty that can be handled in performing induction, reasoning, visualization, and language comprehension tests. At a lower order in the hierarchy (stratum II) several broad ability factors are distinguished: fluid intelligence, crystallized intelligence, general memory, visual perception, auditory perception, retrieval, and cognitive speediness. Finally, the stratum I abilities are dominated by stratum II abilities. Stratum I includes narrow abilities, stratum II broad abilities, and stratum III the general ability (*g*) (Figure 1).

Any cognitive ability refers to variations in performance on some defined class of tasks (Jensen, 1980; Neisser et al., 1996). Abilities reflect observable differences in individuals' performance of certain tests. However, a given task involves a variety of abilities: 'verbal ability', for instance, can be regarded as an inexact concept that has no scientific meaning unless it is referred to the structure of abilities that compose it. The problem of defining intelligence is the problem of defining the factorial constructs that underlie it and specifying their structure.

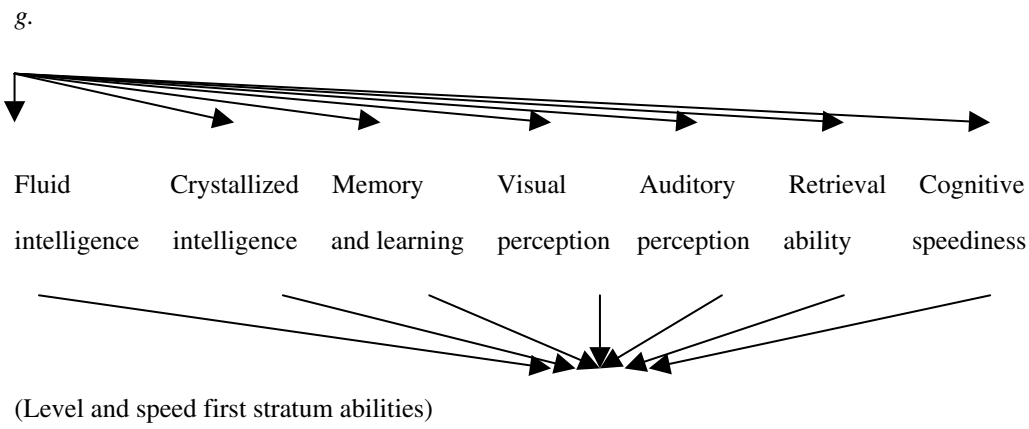

Figure 1. A simplified picture of the three-stratum theory. The general three-stratum factor (*g*), broad second stratum abilities, and narrow first stratum abilities are located within the hierarchical structure representing the concept of intelligence.

Carroll reanalysed various datasets from several countries through a method of hierarchical factor analysis known as the Schmid–Leiman transformation (Loehlin, 1992): the higher order factors are allowed to account for as much of the correlation among the observed variables as they can, while the lower order factors are reduced to residual factors uncorrelated with each other and with the higher order factors. Therefore, each factor represents the independent contribution of the factor in question. Two main findings emerge from the analyses: (a) the *g* factor constitutes more than half of the total common factor variance in a cognitive test, and (b) various specific cognitive abilities can be identified in the domains of language, memory and learning, visual perception, information processing, knowledge and so forth, indicating certain generalizations of abilities; there are more than sixty specific abilities, although not all of them are equal in importance. Cognitive abilities are analogous to the elements in the periodic table: some, like fluid intelligence, are as important as carbon or oxygen, while others are more like the rare earth elements whose importance has not become apparent (Carroll, 1993).

'VEHICLES' OF COGNITIVE ABILITIES

Cognitive abilities can be elicited in many different ways. They are sources of variance evidenced by the correlations among several diverse tests, each of which reflects *g*, specific abilities, and test specificity. Tests are 'vehicles' used to elicit the cognitive abilities. The vehicle is not the ability and the ability is not the vehicle: two tests with quite different item contents can each be a good vehicle of a given cognitive ability.

There are several batteries that yield a profile of test scores in a set of separate cognitive abilities identified through factor-analytic research. Some examples follow: the Chicago Tests of Primary Mental Abilities (PMA), the Differential Aptitude Test (DAT), the Guilford–Zimmerman Aptitude Survey (GZAS), the Comprehensive Ability Battery (CAB), the British Ability Scales (BAS), the Woodcock–Johnson Psycho-Educational Battery (WJ-R), the Armed Services Vocational Aptitude Battery (ASVAB) and the General Aptitude Test Battery (GATB). Only the PMA, the DAT, and the WJ-R are briefly described.

The Chicago Tests of Primary Mental Abilities (PMA)

They represent the first effort to construct a multiple aptitude battery. The PMA can be administered from 10 years of age to late adulthood.

The PMA include five timed subtests:

- Verbal (V): composed by vocabulary items.
- Number (N): speed and accuracy of simple arithmetic computations.
- Spatial (S): changed positions or transformations must be visualized.

- Reasoning (R): a rule must be found (letter series completion).
- Fluency (F): produce words beginning with a given letter.

The split-half reliabilities are in the 0.90s. A global score can also be obtained through the next formula: $1.5\times V + S + 2\times R + N + F$. The PMA provide gross measures of their intended abilities.

The Differential Aptitude Test (DAT)

It is one of the most widely used multiple aptitude batteries. The DAT was originally designed for use in the educational and career counselling of students in Grades 8 and 12. The administration is timed, but most of the subtests are measures of the level the person can reach.

The DAT measures follow:

- Verbal reasoning (VR): based on the relationships among word meanings, it is a typical analogies test.
- Numerical ability (NA): a numerical reasoning test, not based in the ability to make computations.
- Abstract reasoning (AR): ability to reason with figures and geometric shapes. A rule underlies an array of figures.
- Clerical speed and accuracy (PSA): ability to quickly compare printed documents.
- Mechanical reasoning (MR): based on basic mechanical principles.
- Space relations (SR): ability to visualize an object in three dimensions. The object must be folded and then rotated to compare it with several alternatives.
- Spelling (SP): ability to spell common words.
- Language usage (LU): assesses typical syntactic mistakes.

The split-half reliabilities are in the 0.90s. There is evidence of a large general factor underlying performance in the DAT (correlations range from +0.2 to +0.8). VR + NA index was introduced as an estimation of scholastic aptitude. This index correlates in the 0.70s and 0.80s with composite criteria of academic achievement.

The last version (DAT-5) includes level 1 and level 2 batteries. The DAT-5 level 1 is adapted for grades 7–9, while the DAT-5 level 2 is adapted for 10–12 grades.

The Woodcock–Johnson Psycho-Educational Battery (WJ-R)

The WJ-R battery can test individuals from ages 2 to 90 years and includes a cognitive and an achievement section.

The WJ-R cognitive section assesses:

- Fluid reasoning (Gf): solving of new problems not facilitated by one's acculturation.
- Comprehension-knowledge (Gc): breadth and depth of one's education-related knowledge of a culture.
- Long-term retrieval (Glr): retrieval of information stored minutes or a couple of days earlier measured with paired-associate learning tasks.
- Short-term memory (Gsm): storage and retrieval of auditory information, measured by tasks requiring the recall of sentences, words, and numbers in their reversed sequence.
- Visual processing (Gv): ability in perceiving patterns, rotating objects in space, and retaining visual images.
- Auditory processing (Ga): ability to perceive patterns fluently among auditory stimuli.
- Processing speed (Gs): working quickly on clerical, visual-motor tasks.

Quantitative ability is assessed by several subtests of the achievement section.

Each ability score yields standard scores with a mean of 100 and a standard deviation of 15. A global score (*g*) is also provided. One psychometric grouping of selected subtests permits the detection of possible disabilities in specific areas.

The internal consistency values for ages 2 to 79 ranged from 0.69 to 0.93. The *g* composite score yields a median internal consistency coefficient of 0.94. Factor analytic support for the measured cognitive abilities is robust. The measured abilities closely resemble the broad abilities identified in Carroll's survey.

Comment

There are specific measures in different countries. That is why a theoretical background to group cognitive tests is heavily recommended: try to refer the specific measure to any given cognitive ability within the hierarchical structure of

intelligence. Remember that you must go from the gross anatomy (broad) to the microscope (narrow) within the rich world of multiple cognitive abilities (Carroll, 1993).

FUTURE PERSPECTIVES AND CONCLUSIONS

Cognitive tests need to be redesigned with two main purposes in mind: (a) to improve the construct validity of the testing materials and the procedures of administration, by considering what aspects of cognitive performance are tapped by the tests, and (b) to better appraise and differentiate the speed and the level aspects of cognitive abilities.

There are some questions related with the problem of raising intelligence and cognitive abilities. To what extent are cognitive abilities malleable? It is important to know how to measure the cognitive abilities that we are trying to improve. Remember that the measure is not the ability; the measure is only a 'vehicle' of the ability. A related question is, what are the effects of schooling? There are many gaps in what we know about this topic. Changes in the contrast between spatial and verbal abilities are related to the type of education and occupational experiences of the people. Therefore, there can be some important questions that the measurement of specific cognitive abilities could help to answer.

There is an important topic yet addressed in the literature, but that will probably be revisited in the future: the configuration of abilities in human groups (sex, ethnicity, and so forth) (Colom et al., 2000, 2001; Loehlin, 2000; Deary et al., 1996). Some recent handbooks of intelligence note the problem of the configuration of cognitive abilities in several social groups, because of its relevance for many psychological assessment purposes.

Although there are some multiscore cognitive batteries not explicitly guided by factor analytic research, most of them are inspired by it. However, more confidence should rely on batteries derived from the factor analytic approach. Statistical techniques are especially fitted to answer questions related to the ability that is tapped by any specific cognitive test. Most of the available tests measure general intelligence (*g*) in addition to several cognitive abilities and specific skills. We know now how to separate these influences on performance. There are some measures highly *g*-loaded, while others are less *g*-loaded. Moreover, the same measure loads differently in general and specific cognitive factors depending on the sample analysed. Thus, for instance, the letter–number series test of the WAIS-III has a *g*-loading of +0.84 in people with basic studies, but a *g*-loading of +0.59 in people with university studies (Colom et al., 2002).

The measurement of specific cognitive abilities is important for some psychological assessment purposes. Most of them are in the domain of individual clinical counselling as well as educational and vocational guidance. The profiles that derive from the administration of a multi-score cognitive battery are informative of the strengths and weaknesses of a given person. And this information is vital for the counsellor. However, specific abilities are usually seen as less germane for personnel selection, because *g* is the ability mostly responsible for the validity indices associated with cognitive measures. Make your choice, but do it with wisdom.

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Roberto Colom

RELATED ENTRIES

Intelligence Assessment (General), Cognitive/Mental Abilities in Work and Organizational Settings, Fluid and Crystallized Intelligence, Theoretical Perspective: Cognitive, Theoretical Perspective: Psychometrics, Cognitive Abilities: *g* Factor.

COGNITIVE DECLINE/ IMPAIRMENT

Cognitive decline is defined as a negative change in cognitive status over time that can be a function of normal ageing, brain injury, dementing brain pathology (e.g. Alzheimer's disease), or other mechanisms. There are two major areas in which assessment of cognitive decline is important: (1) research on the nature of ageing and how it affects cognitive processes and mechanisms, and (2) individual assessment, in which cognitive testing is used to determine whether a specific individual has undergone cognitive decline, possibly due to age-related disease processes, such as Alzheimer's disease or stroke. Assessment of normative age-related change often involves use of panel designs, in which a large sample of individuals are given a set of cognitive tests and tasks. Prototypic examples of this kind of research are the Seattle Longitudinal Study (Schaie, 1996), the Berlin Aging Study (Baltes & Mayer, 1999), and the Victoria Longitudinal Study (Hultsch, Hertzog, Dixon & Small, 1998). These kinds of studies focus on characterizing the normative patterns of cognitive decline, and also on assessing individual differences in rates of cognitive decline. In order to address the latter question, it is important that the same persons are followed over time in a longitudinal design, so that individual differences in rates of cognitive change can be estimated (Baltes, Reese & Nesselroade, 1988). When the goal is assessment of individuals with respect to cognitive decline, change is often assessed indirectly. That is, the typical neuropsychological assessment of decline is made through norm-referenced evaluation – low performance relative to same-aged peers. However, it is also possible to follow individuals over time for purposes of assessment, as we discuss further.

One of the challenges with assessing cognitive decline in adulthood is that there are a large number of different types of cognitive abilities (Carroll, 1993). Research on cognitive decline must allow for the possibility that different abilities may be affected in different ways by the ageing process (Dixon & Hertzog, 1996). It is well known, for example, that tests of recognition vocabulary (knowledge of word meanings) show relatively little decline until late in the lifespan, whereas tests of inductive reasoning (the ability to observe patterns or regularities in phenomena) or deductive reasoning show earlier decline (Salthouse, 1991). Another challenge to assessing cognitive decline is that changes are often slow and gradual (occurring over years or decades, in the absence of significant pathology in the central nervous system). Hence researchers often use cross-sectional designs, in which persons of different ages are tested at a single point in time, and age differences within the sample are used to estimate magnitudes of average age-related declines. Although this approach probably provides accurate general information about

abilities that are influenced by age, generational (or cohort) differences can lead to overestimation of the magnitude of decline. Moreover, cross-sectional data cannot be used to evaluate individual differences in rates of cognitive change. Cross-sectional studies allow quick assessment of possible cognitive decline, but the inferences in such cases should be validated with longitudinal data as rapidly as possible (Hertzog, 1996).

A critical issue for research on cognitive decline is whether tests are prone to measurement bias in the evaluation of older adults. This issue can be understood as one of assuming measurement equivalence (Baltes et al., 1988) at different points in the adult lifespan. Does a test measure the same construct with the same measurement properties (e.g. reliability, validity) for persons of different ages? Psychometric techniques, such as item-response theory (Embretson & Reise, 2000), can be used to evaluate measurement equivalence of tests for persons of different ages, although they have rarely been used in age-comparative studies. Factor analysis of test batteries and items has been more widely used to assess measurement equivalence of cognitive tests, and the evidence is mixed. In some cases, test batteries show invariant factor structures (Brickley, Keith & Wolfle, 1995); in other cases, it appears that tests show at least some change in measurement properties in assessing older adults (Schaie, Maitland, Willis & Intrieri, 1998). Moreover, there is at least some evidence that tests can be constructed in ways that unintentionally penalize the performance of older adults. It is well known that ageing causes slowing in the speed of cognitive processes (Salthouse, 1996). Hence, tests that are highly speeded (where the total score depends more on the number of items answered correctly, rather than the difficulty of items answered correctly; see Anastasi, 1988) can become poor measures of a target construct in older populations because older adults are unduly penalized by slow response latencies. For example, Hertzog (1989) showed that the test of vocabulary used in the Seattle Longitudinal Study showed early decline that could be attributed to the processing speed requirements of the test, not to the decline of verbal ability (see also Hertzog & Bleckley, 2001). Recent results indicate that tests explicitly designed to cover a wide range of item difficulty, such as the Woodcock–Johnson, may provide better assessment of adult cognitive performance. Table 1 lists several widely used intelligence tests that are appropriate for research with older adults (for an excellent set of test reviews, see Flanagan, Genshaft & Harrison, 1997). Despite recent progress in our understanding of tests appropriate for assessment of adults, continuing work is needed that focuses on the issue of construct validity of tests in older populations.

Another important measurement issue is that standardized tests, even when well-designed, may not cover important aspects of cognitive function. For example, working memory, defined as the ability to hold information in an active state while analysing it (e.g. mentally summing four two-digit numbers), is a critical construct in contemporary cognitive psychology. Indeed, some scientists argue that age changes in working memory capacity account for age changes in a variety of complex psychological tasks, including tests of reasoning (Salthouse, 1991; Hultsch et al., 1998). Often, however, standardized psychometric test batteries do not measure new constructs deriving from contemporary cognitive psychology. If the goal is characterizing age-related changes in cognition, then individuals may wish to use newly developed tests or experimental tasks that are not commonly used for norm-referenced psychological assessment, rather than the standardized tests cited in Table 1.

Assessment of cognitive change in an individual is often done using standardized tests, evaluating an individual's test performance against age-graded population norms. Poor performance, relative to the norm, is taken as presumptive evidence of decline. However, this approach cannot rule out stable, low levels of performance, and it presumes the reliability and validity of an assessment of cognitive function at a single point in time. As such it does not address the possibility of transient fluctuations in test performance. Pathological change may also be associated with increased variability in performance – a person could be relatively intact on one day and relatively impaired on the next day. An alternative approach to norm-referenced assessment is to directly measure change by assessing individuals repeatedly over time, as in a longitudinal research design. Despite potential problems such as positive bias due to practice

Table 1. Cognitive tests measuring multiple abilities appropriate for use with older adults

Test name[a]	Publisher	Group/Individual testing	Comments
Das–Naglieri (CAS)	The Riverside Publishing Co.	Individual	Based on little-known information-processing theory; unique ability structure
ETS Factor Reference Kit	Educational Testing Service	Group	Excellent coverage of different ability; poor graphics; many speeded tests;
STAMAT	Consulting Psychologists Press, Inc.	Group	Revision of Thurstone tests; low item difficulty level; highly speeded
WAIS III		Individual	Widely used in clinical ability assessment; factorially complex, limited ability sampling;
WMS III	The Psychological Corp.	Individual	Widely used in clinical ability assessment; norms available
Woodcock–Johnson III	The Riverside Publishing Co.	Individual	Based on fluid/crystallized theory of intelligence; excellent ability/item sampling

[a]Tests are listed in alphabetical order.

effects, direct estimates of change through repeated assessments may produce more valid inferences about whether an individual is declining. Longitudinal studies of persons initially diagnosed with possible Alzheimer's disease have proved valuable in charting the progression of the cognitive consequences of the disease (e.g. Rubin et al., 1998).

Recent statistical advances in the techniques for estimating individual change functions have had an important impact on scientific studies of age-related changes in cognition and other variables. Longitudinal data on memory decline suggest that there are reliable individual differences in cognitive change late in life (Hultsch et al., 1998). Some individuals decline more than others. In at least some cases, these individual differences have been shown to be associated with risk factors for Alzheimer's disease, even prior to the diagnosis of the disease itself. Other factors, such as cardiovascular disease or life styles that do not provide adequate intellectual stimulation (Schooler, Mulatu, & Oates, 1999), may also affect cognitive change in adulthood. Thus, repeated testing may be an important way of identifying individuals who are showing greater cognitive decline than would be expected.

The approach of repeated testing of individuals can be applied to individual assessment. What is needed is a set of cognitive tests that are resistant to distortion due to repeated testing and that can be administered frequently. In one example of this approach, Hertzog, Dixon, and Hultsch (1992) used a set of 25 stories to assess long-term memory for text information. The stories were constructed to be highly similar in their narrative structure, even though the specific content of the stories was different. A small group of older adults were assessed on text recall once a week for about two years. The older individuals all showed variability in test performance from week to week, suggesting that transient variability in performance might have a greater impact on the reliability of norm-referenced assessment than has been generally believed. More importantly, the older adults showed different patterns of average changes across the two-year period. A few individuals declined in text recall, a few individuals remained stable, and a few individuals improved their performance. The declining individuals may have been experiencing pathological late-life decline prior to death, or what is referred to as terminal decline (Berg, 1996). The advantage of the repeated assessment of change was that enough data points were collected on each person so that one could compute a standard deviation of scores for each individual. This statistic could then be used to estimate a standard error of estimate for the observed change over the two-year period, eliminating the need for a comparison to norms as a way of inferring reliable change.

To date, repeated testing of individuals has had little impact on neuropsychological assessment practices. A number of practical problems need to be solved. For example, to be practically meaningful, individuals would need to have regular test assessments prior to the development of any pathology, so that a baseline pattern of change could be established, as with attempts to estimate premorbid intelligence for norm-referenced assessment. This approach is analogous to routine medical testing (e.g. blood tests for cholesterol or blood pressure assessment) to establish a measured patient history on critical physiological functions. Routine and regular cognitive testing of individuals could provide a more valid baseline against which to assess the possibility of cognitive change.

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RELATED ENTRIES

Applied Fields: Gerontology, Fluid and Crystallized Intelligence, Cognitive Plasticity, Intelligence Assessment through Cohort and Time

COGNITIVE MAPS

INTRODUCTION

This entry discusses cognitive maps and the methodologies used to define them. The concept is traced from its emergence in psychology through attempts to operationalize it and use it in disciplines such as planning, behavioural geography, artificial intelligence, and computer science. Assessment tasks include sketch mapping, written and verbal descriptions, orientation and direction estimation, interpoint distance estimation, establishing frames of reference, establishing configurational or layout knowledge using trilateration or non-metric multidimensional scaling, and completion of navigation or wayfinding tasks. Future research directions involve more work on spatial cognition and spatial abilities, research at macrospatial scales, evaluation of potential contribution of virtual environments, and investigation of the neurobiology of place cells.

DEFINITION OF TERMS AND BACKGROUND

Although cognitive maps have been used for environmental knowing and wayfinding throughout the entirety of human history, they have only become a matter of scientific experimentation and analysis since the advent of Tolman's place learning theory (Tolman, 1948). This theory suggests that a *cognitive map* develops in the long-term memory of humans and other animals. Continuing multidisciplinary efforts have been made to examine the content, validity, and reliability of these internal representations.

Defined as *one's internal representation of the experienced world*, the concept of a cognitive map has spread among many disciplines. Beyond the original work in psychology, the first application of a 'cognitive map' was made by planner Kevin Lynch (1960). He examined what people knew about environments, suggesting that knowledge

depended on environmental legibility. Legibility was defined as the ease with which an environment could be perceived, comprehended, and used. To determine what people knew about environments, Lynch asked them to externalize their knowledge (of selected cities) by producing 'sketch maps'. These were examined to find which features (landmarks and other reference points, paths and boundaries, and neighbourhoods or districts) were included. Using the sketches made by many individuals, he produced (for specific cities) a composite sketch (or 'city image') of those locational, path, and district features that were represented by the majority of the participants.

Following Lynch's efforts, geographers became interested in the cognitive map concept. Initially termed 'mental maps' (Gould, 1966), these were cartographic representations of the rank orders of stated preferences for living in places. The rank orders were aggregated, and a cartographic isoline map of the places – or a map represented as a continuous surface using lines of uniform preference value – was constructed. Remarkable regional differences in preferences were found, and the results were often interpreted as a regionalized 'view of the world' – such as 'a Californian view of the US'.

Piaget and Inhelder (1967) provided both a theoretical structure and empirical evidence that cognitive maps develop over time as age and intellectual maturity advanced. Their developmental theory of knowledge acquisition was made explicitly spatial by Hart and Moore (1973) and Siegel and White (1975), who argued that there was a continuous transformation of spatial knowledge from an egocentric structure that dominated the first two years of infancy and was epitomized by a projective form of representation, to a topological knowledge structure as children advanced to pre-operational learning stages, to a semi-metric and metric understanding as children passed through concrete operational and abstract stages of thinking and reasoning. In recent years, Montello (1998) vigorously challenged these ideas, not for their relevance to the spatial knowledge acquisition of children as they age, but in terms of adult learning about new environments. His argument suggests that adult humans have the ability to reason abstractly about space and to represent it metrically, and, thus, would not need to go through the earlier stages outlined in developmental theories.

Moore and Golledge (1976) had distinguished between the cognitive map as an *internal representation* of sensed environmental phenomena and the *externalization* of that knowledge in the form of sketches, verbal descriptions, artistic renderings, or other spatial products. Research interest in the construction, organization, and use of cognitive mapping information stimulated multidisciplinary research in spatial cognition. In psychology, attention was focused on how environments are perceived, and theories of imagery speculated about how spatial information was stored in the brain and recalled into working memory. Focusing on the use of cognitive maps in wayfinding and navigation, mathematicians and computer scientists interested in artificial intelligence, and, in particular, robotic modelling, have also developed a research agenda focusing on cognitive maps and cognitive mapping. Kuipers (1978) produced a specific artificial intelligence-based model (TOUR) of wayfinding that emphasized the process of route-based learning and cognitive map development. During the 1970s and 1980s, efforts were made to produce various computational models that embedded the idea of cognitive maps and their use in navigational processes. All these models were based on cognitive mapping and environmental learning. Knowledge accumulation was modelled as a production process using ⟨ 'if ____, then ____' ⟩ rules that could anchor a software package designed to guide a mechanical or human traveller through an unfamiliar environment.

RELEVANT METHODOLOGIES

Currently, to know the contents of a cognitive map requires an external representation. The most common methodologies include: (i) sketch mapping; (ii) verbal or written descriptions; (iii) completion of orientation and direction tasks; (iv) interpoint distance estimation; (v) recovering latent structure using non-metric multidimensional scaling; and (vi) conducting wayfinding and navigation tasks.

Sketch Mapping. Originally, subjects were simply given a standard sheet of paper and asked to draw (to the best of their ability in a given time) a sketch 'map' of a given environment. The results were interpreted in terms of five dominant features: landmarks, nodes, paths, boundaries, and districts. All these are obvious except for 'node'; this

represented minor features, less important cues, or unnamed road intersections or other point features. Later attempts to produce sketch maps provided a standard reference location (usually centred on the page) and, sometimes, a north line and a scale on the drawing surface. A scale was used to provide metric information from the sketch, while the north line was to give common orientation and direction that would help interpret angularity between sketch features. Sometimes, information was simply aggregated and the results transferred to a cartographic map on which was plotted the relative importance of map features (Milgram & Jodelet, 1976). Research by psychologist Blades (1990) showed that similar sketch maps would be repeatedly produced by the same individual at different time periods, thus giving a semblance of reliability and validity to this methodology. *But* there was consistent criticism that, because of the absence of scales and north lines, spatial concepts such as distance, angular direction, configural layout, and orientation could not be reliably extracted from these products. While the sketches provided a useful inventory of environmental knowledge, they did not necessarily contain the spatial relations that would make them map-like. Sketch mapping is now used as part of a bundle of tasks for defining a person's environmental knowledge structure.

Verbal or Written Description. Verbal or written products offset graphicacy skills required for sketch mapping. Content analysis of the material so produced is used to compile lists of features (usually classified according to Lynch's five categories of phenomena). Both verbal and written descriptions are often heavily laced with fuzzy spatial prepositions such as 'close to', 'near', 'behind', or 'to the left of' which are spatially inexact (Landau & Jackendoff, 1993). This linguistic problem inhibited the creation of reasonably accurate map-like representations of the spatial content of such expositions. While this problem has spawned multidisciplinary interest in spatial linguistics, naïve geography, and natural language software programming in computer science, the task of extracting accurate spatial information from verbal and written descriptions is still a taxing one. When used in conjunction with other tasks, however, they do provide useful insights into a person's spatial knowledge structure.

Orientation and Direction. Establishing the orientation and directional features of a person's cognitive map relies on finding the frame of reference being used. In the cognitive domain, relative location (e.g. tied to a street system rather than a global frame) and idiosyncratic frames of reference are common. Cardinal directions (north, south, east, and west) are infrequently used in comparison to frames tied to local knowledge. The frame of reference used to encode, locate, and recall spatialized information stored in long-term memory can be projective (related to a dominant landmark such as a home or workplace), locally metric (related to a street network or numbering system), or egocentrically arbitrary (with respect to the relative positions of self or dominant natural or built environmental features). Orientation is of critical importance in aligning cognitive maps with the real world (Tversky, 1981).

One traditional way of determining knowledge of angularity between environmental features is *to point* in the direction of the particular feature, either from current location or from some imaginary location. A compass can be used to measure the pointing angle and, if the frame of reference is known, a matching of pointing with the idiosyncratic reference-base can be obtained. Pointing has been a common form of indicating directional knowledge throughout human history. It is a simple task that is often used in experiments when attempting to discover layout knowledge in real, imaginary, or virtual environments.

Interpoint Distance Estimation. Distance measurements are usually obtained between specific pairs of points alone or in sequence (as along a route). Multidisciplinary work on psychological distance (or *subjective distance*) estimation has shown: (i) distances are often perceived asymmetrically ($A \rightarrow B \neq B \rightarrow A$); (ii) shorter distances are usually overestimated while longer distances are usually underestimated (regression toward the mean); (iii) distances uphill are perceived to be different to distances downhill; and (iv) distances along curved lines or along traces with multiple turn angles are perceived to be longer than equivalent straight line distances. Layouts of points (spatial configurations) can be constructed using a matrix of interpoint distance estimates. The methodology is known as *trilateration* and manipulates the interpoint distances in a multidimensional space until a feasible layout is constructed. If actual distances were used (such as an interpoint distance matrix from

a road atlas), trilateration would closely reproduce the actual layout of towns in an environment. When perceived distances are used, trilateration produces a configuration that represents the interpoint distance knowledge stored in a person's long term memory after sensory bias and error have been taken into consideration. Since many individuals have different concepts of components of distance (yards, miles, etc.), Golledge and Rushton (1972) suggested that a less formal measure (proximity) could be used to construct the interpoint distance matrix. Using a nine-point scale anchored at each end by the perceived shortest and longest distance, the scaled proximities are input to a non-metric multidimensional scaling procedure (KYST or other procedures found in many standard statistical software packages) to produce a minimum dimensional configuration of the proximity information. These can be matched against a real world configuration using indexes of Stress (Badness of Fit) or using cross-correlation matrices. Thus, with either direct or indirect interpoint measurements among known places, a layout representation or configurational structure of latent spatial knowledge contained in long term memory can be obtained. Once obtained, the different distortions and errors in one's cognitive map can be highlighted.

Wayfinding and Navigation. Wayfinding or navigation tasks include: (i) walking a specified distance (to examine distance estimation and veering tendencies); (ii) following simple paths with a minimal number of turns; (iii) undertaking triangle completion (shortcutting, homing, or path integration tasks); (iv) examining different route following strategies including route chunking and rote memorization of paths; and (v) conducting post-hoc tasks to examine the effects of different reinforcing techniques such as: during travel, estimating interpoint distances or directions; after route completion, giving verbal or written descriptions of the course just completed such that another person could follow the same path; and construction of maps or models of the route just followed. Research tasks have varied in scale from triangle completion in small laboratory settings (using path legs of three, six, and nine metres), to wayfinding in institutional settings (universities, hospitals, and airports), to larger scale wayfinding in suburban neighbourhoods.

FUTURE PERSPECTIVES

Further research on cognitive maps is dependent on further research on the nature of spatial cognition. Future research will need to concentrate on (i) problems of mental rotation, (ii) cognitive alignment problems, (iii) frame of reference concerns, and (iv) distance and directional estimations. This research can take place in (i) real geographic environments, (ii) imaginary environments, and (iii) virtual environments. Although the bulk of the latter are visual virtual spaces, some work has been undertaken in virtual auditory environments (Loomis, Golledge & Klatzky, 1999). As a complement to this virtual domain research, there is an increasing interest in assessing human spatial abilities. Over time, a significant number of spatial tests have been developed and evaluated (see Eliot & Smith, 1983). Specific test scores derived from tests designed to measure the three dominant psychometric factors (visualization, speeded rotation, and orientation) do not predict real world behaviours at various scales.

Other areas for future research include:

- Simple tests to assess the variety of spatial skills ranging from distance and direction estimation to spatial rotation, spatial alignment, spatial orientation, defining appropriate reference frames, wayfinding, producing different spatial products, and comprehending spatial relations such as geographic association, spatial autocorrelation, spatial sequence, scale transformation, transforming among different dimensionalities and reversing those transformations, overlaying or dissolving different information layers, and many others.
- Defining tests to evaluate if people have the skills needed for using spatial databases, georeferenced systems, and spatialization metaphors in Internet search engines.
- Systematic examination of the process of spatial knowledge acquisition.
- Determination of the relevance of developmental theory and its competitors in the area of spatial knowledge acquisition over time and with increasing age.
- Investigation of how spatial information is encoded in 'place cells' (Nadel, 1999). The use of MRIs, CT scans, and PET scans has

indicated that spatial information is more generally distributed than just in the hippocampus, but the exact pattern of concentration or dispersion of place cells is as yet poorly known. It is likely that assessment tasks will focus in the near future on brain damaged individuals to help determine if specific spatial knowledge is highly localized in the brain.

FUTURE PERSPECTIVES AND CONCLUSIONS

Overall, a cognitive map is a useful tool for educating about spatial knowledge acquisition, for examining wayfinding and navigation behaviours, for assessing individual differences in spatial abilities and spatial skills, for investigating the possibility of sex-based differences in spatial cognition and the use of cognized spatial information, and for providing a schemata for investigating environmental knowledge acquisition at scales ranging from micro to macro. Societal needs for well-trained participants for a future workforce have emphasized the need to understand and use cognitive maps and spatial knowledge acquisition principles. Cognitive map construction and development depends on spatial abilities and, in particular, the abilities to think and reason in a spatial manner. Cognitive mapping research is still in its relative infancy, and determination of ways to assess and use cognitive mapping ability in different task domains still remains as a primary focus of future research.

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Reginald G. Golledge

RELATED ENTRIES

Cognitive Processes: Current Status, Cognitive Styles, Theoretical Perspective: Cognitive

COGNITIVE/MENTAL ABILITIES IN WORK AND ORGANIZATIONAL SETTINGS

INTRODUCTION

Cognitive processing of information is a critical requirement of many jobs in the workplace. There have been many changes in the nature of work and organizations with regard to the amount and nature of information, which must be dealt with by those working in organizations, as well as in the speed with which this information must be processed and applied. Thus the assessment of individual differences in those cognitive abilities relevant to effective performance in the workplace has become especially critical. This entry deals with the definition and organization of cognitive abilities, presents examples of standardized, diagnostic, and reliable measures for assessing these cognitive abilities, and provides examples of jobs and tasks requiring each of these abilities.

Some Definitions

Both Carroll (1993) and Fleishman (1972) define abilities as relatively enduring attributes of an individual's capability for performing a particular range of different tasks; however, these abilities may develop over time and with exposure to multiple situations (Snow & Lohman, 1984).

Recently, the term 'competencies' has come into use to describe individual attributes related to quality of work performance (see e.g. McClelland, 1973). A competency has been defined as an 'underlying characteristic of an individual which is causally related to effective or superior performance in a job' (Boyatzis, 1982). This definition is, of course, consistent with our definition of ability. However, lists of competencies often contain a mixture of knowledges, skills, abilities, motivation, beliefs, values, and interests.

The distinction between 'abilities' and 'skills' is often made (see e.g. Fleishman, 1966, 1972); where an ability is a general trait of an individual that is inferred from the relationships among performances of individuals observed across a range of different tasks, skills are more dependent on learning and represent the product of training in particular tasks. The development of a given skill (e.g. airplane piloting) is predicated, in part, on the individual's possession of relevant underlying abilities (e.g. spatial orientation, multi-limb coordination). These underlying abilities are related to the rate of acquisition and final levels of performance that a person can achieve in particular skills (see Ackerman, 1988; Fleishman, 1972).

Fleishman (1982) and Fleishman and Quaintance (1984) have described the different conceptual bases for defining 'tasks'. Wheaton (1973) proposed that a task reflects an organized set of responses to a specified stimulus situation intended to bring about the attainment of a goal state. This definition of a task is similar to one proposed by Hackman (1968) and McCormick (1976) and, more recently, by Carroll (1993), who defines a task as 'an activity in which a person engages in order to achieve a specified objective or result'.

Tasks can be described in terms of the abilities required to perform them (Fleishman, 1972). Tasks requiring the same ability or a similar group of abilities would be placed in the same category. The use of empirical information on the relationships among performances of individuals performing different tasks allows us to identify the basic underlying abilities (Fleishman, 1972; Carroll, 1993).

STRUCTURE OF HUMAN ABILITIES

Critical questions have concerned the generality of the constructs used to describe individual differences in human abilities. Elsewhere,

constructs such as 'mental abilities', 'motor abilities', 'problem solving ability', 'decision making ability', and 'agility' have turned out to be too broad; the tasks required by such broad categories are too diverse to yield high correlations between performances of these tasks. Factor analyses of the correlations among performances within these domains typically yield somewhat more narrowly defined abilities. Similarly, expressions like 'athletic ability' and 'musical ability' are often used, but it is known that there are a number of separate constructs that better define several different abilities involved in the tasks comprising these broad activities. However, characterizing an individual as having the ability to 'lift barbells of a given weight' or to 'solve quadratic equations of a given complexity' yields information that is too specific and not very descriptive of an ability that extends to performance in a variety of tasks requiring the same underlying ability.

It is recognized that the study of human abilities has a long history and that a number of alternative factor analytic models and theories regarding the structure of human cognitive abilities have been proposed (Sternberg & Detterman, 1986). Carroll (1993) has recently reviewed these models and other historical developments in the factor analysis of human cognitive abilities. Structural issues often involve the presence and nature of 'general cognitive ability', the importance of ability factors found among sub-groups of performances relative to such a general ability, and the existence and nature of hierarchical structures that relate general and more narrow ability categories. Thus, Spearman's (1923) hierarchy emphasized a general factor ('g'); Cattell and Horn's (1978) work stressed broader group factors (e.g. fluid and crystallized intelligence); and the work of Thurstone (1947) and Guilford (1985) emphasized a larger number of more narrowly defined abilities spanning a more limited range of performances (e.g. numerical and verbal abilities, inductive reasoning).

Hierarchical models investigated in previous work have been largely confined to performance in the cognitive areas of human performance. Carroll's (1993) review has proposed a hierarchical theory of cognitive abilities recognizing abilities classified at three strata: (a) numerous, narrow first-stratum factors; (b) a smaller number of broader, second-order factors; and (c) a single general factor at stratum three. He has also shown the difficulties and limitations in designing and carrying out hierarchical factor analysis studies to adequately name and define general and second-order factors and in matching these factors across studies.

COGNITIVE ABILITIES TAXONOMY

The ability taxonomy developed by Fleishman and his associates (e.g. Fleishman, 1975; Fleishman & Quaintance, 1984) falls into the first stratum of Carroll's system. The abilities in the taxonomy cover a broad spectrum of performances likely to be found in the world of work and include cognitive, psychomotor, physical, and sensory-perceptual abilities. Most of the abilities at this level have been identified in programmatic research and replicated across many studies. Furthermore, operational definitions of each of these abilities have been developed, linkages of job tasks with each ability have been established, and a methodology has been developed for evaluating jobs in terms of their requirements for these abilities (Fleishman, 1992; Fleishman & Reilly, 1992).

Table 1 presents the 21 cognitive abilities in the taxonomy with brief definitions of each ability. These abilities are organized into a hierarchy of seven broader categories. More detailed definitions can be found elsewhere in Fleishman and Reilly (1992).

MEASURES FOR ASSESSING COGNITIVE ABILITIES

Table 2 provides examples of tests available to measure each of the abilities described in Table 1. Tests have been chosen, based on an extensive review (Fleishman & Reilly, 1992). For most of these abilities, there are many more tests available. For the most part, tests listed have been shown to have relatively high reliabilities, normative data, and manuals describing conditions of administration, validity and normative information. Fleishman and Reilly (1992) include many more tests for each ability, including publishers' addresses. The tests they include are classified by ability measured.

Table 1. Cognitive abilities and their definitions: Fleishman's Taxonomy of Human Abilities

Verbal Abilities	
Oral Comprehension	The ability to listen and to understand information and ideas presented through spoken words and sentences.
Written Comprehension	The ability to read and understand information and ideas presented in writing.
Oral Expression	The ability to communicate information and ideas in speaking so others will understand.
Written Expression	The ability to communicate information and ideas in writing so others will understand.
Idea Generation and Reasoning Abilities	
Fluency of Ideas	The ability to generate a number of ideas about a given topic. It concerns the number of ideas produced and not the quality of the ideas.
Originality	The ability to come up with unusual or clever ideas about a given topic or situation, or to develop creative ways to solve a problem.
Problem Sensitivity	The ability to tell when something is wrong or likely to go wrong. It does not involve solving the problem, only recognizing there is a problem.
Deductive Reasoning	The ability to apply general rules to specific problems to come up with logical answers. It involves deciding if an answer makes sense.
Inductive Reasoning	The ability to combine separate pieces of information, or specific answers to problems, to form general rules or conclusions. It includes coming up with a logical explanation for why a series of seemingly unrelated events occur together.
Information Ordering	The ability to correctly follow a given rule or set of rules in order to arrange things or actions in a certain order. The things or actions can include numbers, letters, words, pictures, procedures, sentences, and mathematical or logical operations.
Category Flexibility	The ability to produce many rules so that each rule tells how to group (or combine) a set of things in a different way.
Quantitative Abilities	
Mathematical Reasoning	The ability to understand and organize a problem and then to select a mathematical method or formula to solve the problem.
Number Facility	The ability to add, subtract, multiply, or divide quickly and correctly.
Memory	
Memorization	The ability to remember information such as words, numbers, pictures, and procedures.
Perceptual Abilities	
Speed of Closure	The ability to quickly make sense of information that seems to be without meaning or organization. It involves quickly combining and organizing different pieces of information into a meaningful pattern.
Flexibility of Closure	The ability to identify or detect a known pattern (a figure, object, word, or sound) that is hidden in other distracting material.
Perceptual Speed	The ability to quickly and accurately compare letters, numbers, objects, pictures, or patterns. The things to be compared may be presented at the same time or one after the other. This ability also includes comparing a presented object with a remembered object.
Spatial Abilities	
Spatial Organization	The ability to know one's location in relation to the environment, or to know where other objects are in relation to one's self.
Visualization	The ability to imagine how something will look after it is moved around or when its parts are moved or rearranged.
Attentiveness	
Selective Attention	The ability to concentrate and not be distracted while performing a task over a period of time.
Time Sharing	The ability to efficiently shift back and forth between two or more activities or sources of information (such as speech, sounds, touch, or other sources).

Source: Adapted from Fleishman (1992), Fleishman and Quaintance (1984), Fleishman and Reilly (1992), Fleishman, Costanza, and Marshall-Mies (1999). The complete taxonomy also covers psychomotor, physical and sensory-perceptual abilities.

Table 2. Example of tests available to measure each cognitive ability

Ability	Tests
Oral Comprehension	The PSI Basic Skills Tests: Following Oral Directions, Psychological Services, Inc.
	Watson–Barker Listening Test, SPECTRA Communication Associates
Written Comprehension	Guilford–Zimmerman Aptitude Survey: Verbal Comprehension, Consulting Psychologists Press
	Nelson–Denny Reading Test: Forms E & F-1, The Riverside Publishing Co.
Oral Expression	No standard tests of oral expression were identified.
Written Expression	Expressional Fluency, Consulting Psychologists Press
	Ideational Fluency, Consulting Psychologists Press
	Employee Aptitude Survey Test # 8 – Word Fluency (EAS #8), Psychological Services, Inc.
Fluency of Ideas	Ideational Fluency, Consulting Psychologists Press
	Topic Tests – F-1, Educational Testing Services
Originality	Consequences, Consulting Psychologists Press
	Flanagan Aptitude Classification Tests (FACT): Ingenuity, Science Research Associates
Memorization	The PSI Basic Skills Tests: Memory, Science Research Associates
	Flanagan Aptitude Classification Tests: Memory, Science Research Associates
Problem Sensitivity	No standard tests of problem sensitivity were identified.
Mathematical Reasoning	Guilford–Zimmerman Aptitude Survey: General Reasoning, Consulting Psychologists Press
	Flanagan Industrial Tests (FIT): Mathematics and Reasoning, Science Research Associates
Number Facility	Comprehensive Ability Battery: Numerical Ability, Institute for Personality & Ability Testing, Inc.
	Differential Aptitude Test: Numeric Ability, The Psychological Corporation
Deductive Reasoning	Nonsense Syllogisms – RL-1, Educational Testing Service
	The PSI Basic Skills Tests for Business: Decision Making, Psychological Services, Inc.
Inductive Reasoning	Letter Sets – 1, Educational Testing Services
	Critical Reasoning Test Battery, Saville & Holdsworth, Ltd.
Information Ordering	Calendar Test, Educational Testing Services
	Following Directions, Educational Testing Services
Category Flexibility	Making Groups – (XU-3), Educational Testing Services
	Halstead Category Test, Precision People, Inc.
Speed of Closure	Gestalt Completion Test – (CS-1), Educational Testing Services
	Closure Speed (Gestalt Completion), London House Press
Flexibility of Closure	Comprehensive Ability Battery: Hidden Shapes, Institute for Personality & Ability Testing, Inc.
	Closure Flexibility (Concealed Figures), London House Press
Spatial Orientation	Guilford–Zimmerman Aptitude Survey: Spatial Orientation, Consulting Psychologists Press
	Right–Left Orientation, Oxford Press University
Visualization	Minnesota Spatial Relations Test, American Guidance Service
	Guilford–Zimmerman Aptitude Survey: Spatial Visualization, Consulting Psychologists Press
Perceptual Speed	Guilford–Zimmerman Aptitude Survey: Perceptual Speed, Consulting Psychologists Press
	Minnesota Clerical, The Psychological Corporation
Selective Attention	No standard tests of selective attention were identified.
Time Sharing	No standard tests of time sharing were identified.

Source: Extracted from the more comprehensive definitions, test specifications and publisher listings in Fleishman & Reilly (1992). Reprinted with permission.

RELATING THE COGNITIVE ABILITIES TO JOB REQUIREMENTS

The cognitive ability constructs described, and their definitions, provide a framework for thinking about the abilities required for the performance of many different job tasks. These 21 cognitive ability factors have been included as part of a more comprehensive taxonomy of human abilities, which also include cognitive, psychomotor, and sensory-perceptual abilities (Fleishman, 1975; Fleishman & Quaintance, 1984; Fleishman & Reilly, 1992). A methodology has been developed for describing the ability requirements of jobs and job tasks in terms of the complete taxonomy of 52 abilities (Fleishman, 1975, 1992; Fleishman & Mumford, 1991). The Fleishman–Job Analysis Survey (F-JAS) (Fleishman, 1992) provides the job analysis method for linking the cognitive ability constructs described here to the requirements of occupational tasks.

In this job analysis methodology, each of the carefully defined ability definitions are presented, each with a corresponding seven-point rating scale containing empirically derived task anchors at high, middle, and low points on each scale (see Fleishman, 1992). Respondents (job incumbents, supervisors, or job analysts) rate the level of each ability required for particular jobs or job tasks on ability rating scales, providing a profile of the job's ability requirements.

Using these and related methods, the cognitive ability requirements of thousands of jobs have been determined, including computer programmers, high level executives, accountants, building inspectors, fire fighters, medical personnel, telephone repair workers, police, administrators, attorneys, automotive mechanics, sales personnel, refinery workers, and many military specialities. Table 3 provides examples of jobs likely to require each of these cognitive abilities.

Interrater reliabilities obtained from use of the F-JAS to describe the ability requirements of jobs are high and there is very high agreement between profiles of ability requirements obtained from incumbents, supervisors, and job analysts. It is important to note that the methodology recognizes the centrality of the notion of 'level' of ability requirements. Thus jobs requiring a particular ability may require different levels of that ability. For example, oral comprehension is important for secretaries and lawyers, but a higher level of oral comprehension is required for most lawyers than for most secretaries in terms of task requirements.

FUTURE PERSPECTIVES AND CONCLUSIONS

A taxonomy of cognitive abilities was presented to provide a framework for describing the

Table 3. Examples of jobs requiring each ability

Oral Comprehension:	executive, interpreter, counsellor
Written Comprehension:	lawyer, book editor, translator
Oral Expression:	politician, actor, college professor
Written Expression:	judge, reporter, author
Fluency of Ideas:	advertising executive, song writer, interior designer
Originality:	artist, choreographer, inventor
Memorization:	actor, concert pianist, scientist
Problem Sensitivity:	medical doctor, air traffic controller, mathematician
Mathematical Reasoning:	engineer, statistician, physicist
Number Facility:	accountant, cashier, mortgage banker
Deductive Reasoning:	auto mechanic, pathologist, computer programmer
Inductive Reasoning:	statistician, meteorologist, psychologist
Information Ordering:	librarian, astronaut, file clerk
Category Flexibility:	archivist, biology taxonomist, museum contractor
Speed of Closure:	meteorologist, cryptographer, navigator
Flexibility of Closure:	microbiologist, radar operator, radiologist
Spatial Orientation:	cartographer, surveyor, pilot
Visualization:	architect, engineer, dentist
Perceptual Speed:	maintenance troubleshooter, inspector, proofreader
Selective Attention:	radar monitor, lifeguard, early warning system monitor
Time Sharing:	air traffic controller, athletics coach, helicopter pilot

Source: From Fleishman & Reilly (1992). Reprinted with permission.

requirements of jobs on the workplace. The 21 ability definitions, arranged in an hierarchy of seven broader categories of cognitive functioning, provide distinctions between the abilities and indicate their limits and generality across different kinds of human tasks. Tests were identified that reliably assess each cognitive ability. A job analysis methodology was described to identify the extent to which the tasks in particular jobs require the different cognitive abilities. These methods have resulted in the selection of tests to assist in matching individuals with jobs requiring different abilities.

Recent research has examined newer methods of assessing cognitive abilities, especially those involved in highly demanding complex organizational environments. Leadership, at high levels of management, for example, can be seen as involving complex problem solving, and decision-making, in ill defined, changing, and other novel organizational domains (Fleishman et al., 1999). A number of investigations have emphasized the importance of metacognitive skills in this context, to guide the problem solving process. Recently, Marshall-Mies, Fleishman, Martin, Zaccaro, Baughman, and McGee (2000) have shown how novel computer interactive assessments can be developed to identify these skills and have demonstrated the validity of such measures in predictor performance of high level organizational leaders. Future research should be directed at delineating the relations between such cognitive abilities and performance, using more flexible and adaptive assessment methods.

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RELATED ENTRIES

Applied Fields: Work and Industry, Intelligence Assessment (General), Cognitive Ability: *g* Factor, Cognitive Ability: Multiple Cognitive Abilities, Personnel Selection, Assessment in, Cognitive/Mental Abilities in Work and Organizational Settings

COGNITIVE PLASTICITY

INTRODUCTION

Cognitive functions are typically assessed with psychometric tests in a single test session. Usually this type of assessment does not provide direct information about an individual's learning potential given suitable instructional and social settings; it may provide this information only indirectly via predictive correlations with external criteria. Such predictability, however, is difficult to obtain because static measurements are influenced by numerous other factors such as specific school education, experience with test taking, or disruptive and supportive conditions in the individual's social setting. 'Cognitive plasticity assessment' represents alternative concepts to such state-oriented measurement. They directly assess the change in performance in response to educational practices or theory-guided cognitive interventions. We describe three approaches to cognitive plasticity assessment (Learning Potential Assessment, Learning Tests, and Cognitive Engineering) to exemplify the broad range of perspectives on this topic. Our conceptualization of 'cognitive plasticity assessment' corresponds roughly to 'dynamic assessment' in the sense of Grigorenko and Sternberg (1998); Lidz and Elliot (2000) summarize learning potential assessment and learning tests under 'dynamic assessment'. Table 1 highlights differences between the approaches in disciplinary origin as well as their primary thematic, theoretical and methodological orientations. In general, however, the commonalities between them probably outweigh their differences.

LEARNING POTENTIAL ASSESSMENT

Probably the best known assessment of cognitive plasticity derives from Vygotsky's (1962) determination of the zone of proximal development. According to Vygotsky, learning is to be structured so that a higher state of intellectual

Table 1. Three approaches to cognitive plasticity assessment

Approach	Learning potential assessment	Learning tests	Cognitive engineering
Origin	Educational psychology	Differential psychology	Cognitive psychology
Focus	Remediation of specific learning deficits	Dynamic assessment of psychometric intelligence	Acquisition of expertise in narrowly defined skill
Theory	Zone of proximal development, direct and mediated learning	Zone of proximal development, complexity of information	Skill assembly, deliberate practice, tailored learning
Method	Psychometric tests	(Psychometric) Learning tests	Laboratory experiments
References	Feuerstein (1979) F.-Ballesteros & Calero (2000)	Budoff (1987) Guthke & Wiedl (1996)	Kliegl & Baltes (1987) Kliegl et al. (2000)

potential is reached, a further development of the child is initiated from the point of current ability (i.e. zone of actual development) to a state that encompasses skills not in the current cognitive repertoire but within reach, given an appropriate instructional and social setting (i.e. zone of proximal development). Such a change in cognitive structures causes not only a performance increase at the time when the programme is administered but facilitates also future cognitive development. In the end, children and adolescents should be enabled to initiate and control their own learning activities; they should learn to learn. This thought set up a line of research exemplified by Feuerstein's (1979) learning potential assessment device (LPAD) and, in a methodologically refined way, Fernández-Ballesteros and Calero's (2000) 'Evaluación del Potencial de Aprendizaje' (EPA). Development and modification of cognitive structures are determined by two types of learning (aside from physiological preconditions): direct and mediated learning experience (MLE). MLE is critical for the modification of cognitive structures. Mediators (e.g. parents and/or especially teachers) orient and organize the child's phenomenological world by selecting, structuring and focusing learning experiences and by providing feedback.

The LPAD was applied primarily to identify and overcome specific learning disabilities in children and adolescents; the EPA has been applied to persons ranging in age from 12 to 90 years and varying widely in psychometric intelligence. Starting point of an intervention is the determination of the objective state and of the causes of learning deficits with the help of psychometric tests such as WISC-R or Raven. Subsequently, a set of tasks is assembled in a standardized training programme that is adjusted to the individual child's strengths and weaknesses. The intervention starts with simple tasks derived from psychometric tests and in the course of practice tasks of increasing complexity and novelty are introduced. Feuerstein assumed that practice with verbal, numerical, figural, and spatial tasks leads to an improvement in basic cognitive processes (e.g. analogical reasoning, categorization, deductive thinking). The effectiveness of LPAD has been claimed repeatedly for children with learning disabilities and deaf children but various authors have criticized the eclectic, non-theoretic construction of tasks. EPA training significantly improves Raven scores and appears to be stable over time.

LEARNING TESTS

Proponents of learning tests (Budoff, 1987; Guthke & Wiedl, 1996) focus the psychometric quality of learning-test indicators to establish the added value of direct observation in learning tests over the indirectly inferred contribution of state measures. Furthermore, they are trying to link individual learning potential to the effects of standardized learning cues. Theoretically, the learning-test concept can also be traced to Vygotsky's (1962) theory about a zone of proximal development.

Learning tests are implemented in a pretest–instruction/practice–post-test design. During the first phase of a long-term learning test (e.g. Raven Learning Potential Test, RLPT, Budoff, 1987) baseline performance is determined with an intelligence test. During post-test either the pretest tasks are repeated or a parallel form is administered. Variations of test items are used to check transfer gradients. Post-test results are interpreted as the outcome of learning potential testing. Learning tests differ in the extent of the instruction/practice phase which can be quite extensive, including coaching to higher levels of performance with examples, explanations, demonstration of solution strategies or metacognitive cues. Obviously, such long-term learning tests may not be economical enough for practical settings. Consequently, much effort has been invested in the development of short-term learning tests in which the instruction and practice phase is embedded in the test procedure with the aim to extract indicators of learning potential within a single session. Accordingly, the tester still povides simple feedback and solution cues and varies item difficulty as required by the subject's performance.

There have been some encouraging results from the learning test approach compared to standard IQ tests. Construct validity is indicated by a reduction of individual differences in children that are linked to their social and ethnic backgrounds and of the influence of qualitative differences in school settings. Also emotional–motivational stress is lower in learning tests. With an adaptive computer-based intelligence learning test battery

(Guthke et al., 1995) it is possible to monitor and document not only progress by learning but also the learning process itself (i.e. individual learning trajectories, individual strengths and weaknesses). Moreover, this approach goes beyond earlier diagnostic procedures because (1) test construction was guided by a theory of information complexity, (2) a description of the inherent processing demands is available for the complete battery, and (3) item selection is graded by difficulty leading from simple to complex items. Finally, a systematic process of the learner is promoted by continuous feedback and error-related cues.

COGNITIVE ENGINEERING

The third approach to cognitive plasticity assessment, cognitive engineering, originates in developmental and cognitive learning theory (Baltes & Kliegl, 1992; Kliegl & Baltes, 1987; Kliegl et al., 2000). The guiding idea of this approach has been that the best estimate of learning potential in a narrowly defined cognitive skill (e.g. memory for digits) is reflected in the performance of experts (i.e. mnemonists). Such expert performances are well understood in the context of cognitive learning theory; the required declarative and procedural knowledge can be developed and practised under laboratory conditions. Using these performance levels as benchmarks one can check to what degree 'normal' individuals can approximate such expert levels of performance. Moreover, acquisition of cognitive skills follows the power law of practice. Therefore individual differences in asymptotic performance of a skill can be used as indicators of limits of learning potential relative to a given theory-based implementation of the cognitive skill in question. Unfortunately, there have been only a few cognitive engineering studies. These studies compared young and old adults with respect to various mnemonic skills for digits, words, or face–name associations. They have led to very clear evidence documenting the learning potential of healthy and mentally fit older adults (e.g. a 70-year-old woman remembering well over 100 random digits; Kliegl & Baltes, 1987) as well as a remarkable inability of the same type of older adults to improve on learning new face–name associations (Kliegl et al., 2000). Laboratory-based acquisition of cognitive skill is referred to as cognitive engineering and comprises three major components: skill assembly, deliberate practice, and tailored learning.

Skill assembly. Skill assembly refers to the programme part where a qualitatively different organization of behaviour is implemented, that is one that allows to circumvent general constraints of cognition or intelligence (e.g. using mental imagery rather than rehearsal to memorize verbal information). Consequently, according to this perspective, expertise is not primarily a function of normal intelligence and cannot be achieved by practising and automatizing the normal routines already available in the behavioural repertoire. This perspective is also compatible with limited transfer to tasks outside the domain of expertise.

Deliberate practice. The need for deliberate practice as an essential component of a skill acquisition programme recognizes that high levels of performance are tied to specific training schedules with attention to effort, intensity, and motivation (Ericsson et al., 1993). Effort can be quantified as the number of hours devoted to skill acquisition. Intensity aspects (i.e. focus and concentration) are operationalized in detailed feedback, ideally provided by a master coach in individualized training regimes. Finally, a high level of motivation is a precondition to subject oneself to strenuous training regimes required for achieving expert-like performance levels.

Tailored learning. The question as to how one can sustain the high level of motivation is critically tied up with the implementation and features of practice programmes. In general, the goal must be to avoid both boredom, due to lack of challenge, and frustration, due to task conditions that are simply too difficult for a given level of the skill to be acquired. Most of these problems can be handled with computerized training programs that keep track of the learning progress and adapt to the individual's level of performance. Interestingly, once established, testing a skill *beyond* its functional limits tends to induce compensatory strategies that allow the expert to maintain his or her high level of performance (Kliegl & Baltes, 1987). Such extension of an expertise is quite reminiscent of real-life examples where experts often exhibit a tendency to test the limits of their skill by extending it to new domains.

FUTURE PERSPECTIVES AND CONCLUSIONS

Dynamic testing and cognitive plasticity assessment have much appeal because they focus the highly attractive concept of learning potential. Unfortunately, neither have learning potential and learning test research so far convincingly demonstrated that they account for unique variance relative to static assessments (Grigorenko & Sternberg, 1998), nor has cognitive engineering been applied to a sufficiently large number of content domains to warrant an unqualified endorsement. Moreover, these approaches originate at very different conceptual starting points (i.e. the concept of psychometric intelligence and cognitive skill acquisition theory) and so far concern themselves with very different persons: children with learning disorders on the one hand and highly motivated, mentally very fit older adults on the other. Nevertheless, a future convergence of these approaches might be useful, if only because thinking about learning disorders from the perspective of cognitive expertise could open a new window on some old remediational problems.

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RELATED ENTRIES

Dynamic Assessment (Learning Potential Testing, Testing the Limits), Cognitive Plasticity, Cognitive Decline/Impairment

COGNITIVE PROCESSES: CURRENT STATUS

INTRODUCTION

Cognitive process assessment is not a specific, universally agreed upon approach to assessment, but rather refers to a general orientation concerning mostly what kinds of knowledge, skills, and abilities ought to be assessed, and to a lesser extent perhaps, to how they ought to be assessed. Cognitive process assessment is often defined at least partly by what it is not – it is not 'behaviourism' and it is not 'psychometrics'. It is not behaviourism, because behaviourist

approaches focus on observable behaviour, which can be recorded on checklists. In contrast, cognitive process approaches focus on internal thoughts, feelings, strategies, orientations, predispositions, and other attributes that can only be inferred, based on patterns of behaviour. It is not psychometrics, because psychometric approaches are typically driven by correlational findings rather than by theory. Psychometric approaches are characterized as primarily empirical, involving the administration of a variety of tests, followed by an exploratory factor analysis to identify test clusters, the analysis of which might reveal common processes underlying test performance. In comparison, cognitive processes assessment is said to be more theoretical based on our understanding from cognitive and brain science of how the mind works. These characterizations are, of course, often overstated and, in practice, the distinction between the approaches is frequently blurred, but there are differences in emphases.

COGNITIVE PROCESSING FRAMEWORKS

There are many models and theories of cognitive processes, but one useful distinction might be made between macro- and micro-theories, or between cognitive architectures (a macro-theory) and models of cognitive tasks (micro-theories). Much of the cognitive process work originated as micro-theories of particular tasks, such as the kinds of tasks that routinely appear in intelligence tests. For example, analyses have been conducted on inductive and deductive reasoning tasks, spatial relations tests, vocabulary tests, and so on. From this work, important concepts and distinctions emerged. Some examples are the differentiation between short-term, or working, memory and long-term memory, the distinction between declarative and procedural memory, the concept of automaticity, the distinction between imaginal and verbal processing, the delineation of stages of processing (e.g. apprehension, encoding, retrieval, decision, etc.). Other examples are the identification of task-specific strategies, the positing of metacognitive skills, such as planning, self-monitoring, and self-regulation, and many more. Also, from this work, we now know how to manipulate item difficulty levels on some tasks, particularly the more arid ones found on intelligence tests. Such a capability has implications for item design and automatic item generation (see Irvine & Kyllonen, 2002; Kyllonen, 2002).

However, it was recognized, early on, that the micro-theory approach was severely limited, and that real progress would only be made when grander theories were attempted that incorporated what we know about cognition. Consequently, there have been several macro-theories of cognitive processes, formulated along these lines, including ACT-R (Anderson, 1993), SOAR (Newell, 1990), and EPIC (Kieras & Meyer, 1994). It is useful to note that these all contain some common elements. An important distinction, for example, in all is the one between the current focus of thought, and long-term memory, the current focus of thought usually being called 'working memory'. Another characteristic is the simultaneous-sequential distinction, in which some processes, such as vision, and memory retrieval, are assumed to be simultaneous, while others, such as problem solving, are assumed to be more deliberative, and sequential.

There have been some attempts to incorporate these grand cognitive architectures into theories of individual differences in cognition. For example, in the Cognitive Abilities Measurement (CAM) framework (e.g. Chaiken, Kyllonen & Tirre, 2000; Kyllonen, 1994), cognitive processing factors, such as working memory, processing speed, temporal processing, and declarative and procedural knowledge, and declarative and procedural learning, are crossed with verbal, spatial, and quantitative content to create a wide variety of cognitive processing tests. However, no operational intelligence test is actually based on the cognitive architectures. Instead, it seems that distinctions made in these theoretical frameworks, and in the micro-theories that have been developed, are reflected in particular item types appearing either in the research literature, or even in intelligence tests. For example, Sternberg et al. (2000) take advantage of the distinction made in the cognitive processing literature between explicit or declarative knowledge, and tacit or procedural knowledge, in their discussion of 'Practical intelligence' from which they have developed several experimental assessments.

There has been some merging of traditional conceptions of intelligence, based on

factor-analytic studies, with the cognitive processes framework. The prototypical example is Carroll's (1993) taxonomy, which summarizes much of what is known about the structure of intelligence, from the correlational literature, based on a reanalysis of all known published studies of both conventional and cognitive process measures. Based on his findings, Carroll posited a three-stratum hierarchy, with a general factor at the top. Below this, at the second-stratum, are eight intermediate factors – fluid and crystallized ability, memory and learning, visual perception, auditory reception, retrieval ability, cognitive speediness, and decision speed. In turn, these second-stratum concepts are defined by more specific primary abilities, such as simple and choice reaction time, mental comparison time, and semantic processing speed. Importantly, several of the intermediate factors, and many of the specific abilities, such as the reaction time ones just listed, are essentially cognitive processing abilities.

COGNITIVE PROCESSING FRAMEWORKS AND PSYCHOLOGICAL ASSESSMENT

Perhaps the first intelligence test battery, suggested by Sir Francis Galton and later realized by the pioneer of the mental testing movement, James McKeen Cattell, might today be called a 'cognitive processing' battery. It was based on an idea of basic information-processing elements, and consisted of tests of discrimination, sensory judgement, memory, and reaction time. Interestingly, this approach was abandoned, in favour of Binet's alternative framework of sampling more complex tasks from the school curriculum, such as reading and problem solving. It is commonly thought that Galton's basic processes approach was a failure, yielding uncorrelated measures with poor reliabilities, in contrast with Binet's approach, which yielded tests with high validity against school outcomes. Recent re-analyses suggest that this may not have been a fair characterization of findings obtained under the Galtonian framework (Jensen, 1998). Nevertheless, Binet's approach was considered more fruitful, and traditional intelligence test batteries, such as the Wechsler, Kaufman, and Stanford–Binet scales, have worked primarily within the Binet tradition, inserting some modifications, such as the distinction between verbal and performance IQ, to provide additional practical and clinical utility.

However, several contemporary intelligence tests have embraced cognitive processing notions. One example is Das, Naglieri, and Kirby's (1994) Cognitive Assessment System (CAS), based on their Planning, Attention, Simultaneous, Successive (PASS) theory. The CAS battery consists of tests of each of the PASS factors, planning (e.g. find two numbers that are the same), attention (e.g. underline pairs that match), simultaneous processing (e.g. figure memory), and successive processing (e.g. repeat strings of words in order). The theoretical underpinning of the battery may be superfluous, or even wrong (Kranzler & Keith, 1999), but at least the intention behind the battery is to use tasks to identify cognitive processes.

Another contemporary intelligence test that has done so is the Woodcock–Johnson III (WJIII; Woodcock, McGrew & Mather, 2001). This test battery has the additional virtue of being neatly aligned with the contemporary consensus view of the hierarchical structure of the intellect, as exemplified by the Carroll (1993) taxonomy, noted above. The WJIII consists of numerous tests of cognitive processes, including attention, working memory, and executive processes. In addition, it measures fluid and crystallized intelligence, and many of the higher-order (or second-stratum) factors of the Carroll (and closely related Horn–Cattell) framework, such as processing speed, short-term memory, long-term retrieval, and auditory processing, use tests such as visual matching, decision speed, auditory working memory, retrieval fluency, and so forth.

FUTURE PERSPECTIVES

Current intelligence tests are paper-and-pencil measures. The precise measurement of many cognitive processes, enacted within fractions of a second, is virtually impossible. For this reason, perhaps, the range of commercially available, standardized intelligence tests attempting to assess disparate cognitive processing constructs has been restricted. Intelligence testing is likely to move toward assessment of cognitive processing constructs both for improved construct validity,

and for more potentially meaningful diagnosis and re-mediation of cognitive impairments. Measuring an increased range of cognitive processes is possible through the implementation of computer and web technologies, more automated, real-time data capture and analyses, item-generative procedures, and advances in statistical techniques such as item-response theory and structural equation modelling.

Attempts to measure some cognitive processing constructs using paper-and-pencil methodologies are likely to be not very accurate. The correlation between paper-and-pencil measures of processing speed and speed of response in a computerized test has often been found to be low (Van de Vijver & Harsveld, 1994). And parameters other than total response time, such variability, slope, and intercept – which are impossible to measure with paper-and-pencil – may be important (Jensen, 1998). Paper-and-pencil attempts to measure processing speed may include a host of extraneous variables (e.g. handwriting speed, memory for stimuli, reading speed), which may be reduced, measured, or otherwise eliminated under the controlled conditions afforded through computerized testing.

A cognitive processes approach also promises to identify new forms of intelligence that have proven difficult to assess using traditional psychometric procedures. For example, the concept of emotional intelligence (EI), which reflects the individual's propensity for perceiving, assimilating, understanding, and managing one's own (and others') emotions, to date, has been assessed using either self-report or consensual techniques. Both procedures are problematic (see Matthews, Zeidner & Roberts, 2003). However, a number of experimental paradigms assess the basic cognitive processing routines associated with stimuli that provoke emotions. For example, the Emotional Stroop task measures diversion of attention from naming the ink-colour of words onto the emotional meanings of the words. No systematic attempts have yet been made to use these particularly sensitive instruments in the research on EI. Cognitive processing tasks of this nature provide an opportunity for the development of objective indices of various factors of emotional intelligence and a robust construct validation methodology. Moreover, these types of task may provide precisely controlled conditions whereby explanatory models of EI may be tested, refined, or otherwise developed.

CONCLUSIONS

Cognitive processes assessment has its roots in Galton's basic process ideas, but its more recent revival in the last decades of the twentieth century might be seen as a reaction to the predominant behavioural and psychometric approaches to assessment in education, industry, and clinical practice. Initially, cognitive processes assessment was seen as a stark alternative to the dominance of psychometric frameworks. But with the publication of Carroll's (1993) taxonomy, which placed cognitive processes within a hierarchical model of abilities, a synthesis between the schools of thought has emerged. The widespread acceptance of Carroll's framework, at least in a general sense, within the field of intelligence research, suggests that cognitive processes assessment is now part of the mainstream. Attempts to follow this model in the development of commercially available intelligence test batteries, as seen currently in the Woodcock–Johnson III battery, are likely to continue. In addition, advances in technology, such as computerized and web testing, and the extension of cognitive processing notions into the realm of social and emotional behaviour, promise significant expansion and development in cognitive processes assessment.

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RELATED ENTRIES

Cognitive Processes: Historical Perspective, Cognitive Styles, Theoretical Perspective: Cognitive

COGNITIVE PROCESSES: HISTORICAL PERSPECTIVE

INTRODUCTION

Cognitive processes range from the most basic (such as simple reaction time, choice reaction time, letter comparisons, and so on) to the most complex forms of human cognition (such as planning, attention, reasoning, and memory). Numerous attempts have been made to operationalize measurement of cognitive processes – indeed, process measures are prominent among the individual scales of most omnibus intellectual ability tests. However, the identification of individual differences in specific cognitive processes has been fraught with difficulties, due to two major factors. The first factor is that tests of cognitive processes tend to be correlated with one another. The second factor is that the content of the test items also determines individual differences in test performance, sometimes to a much greater degree than the underlying processes. The history of cognitive process assessment is described, and a brief review of contemporary issues and problems is presented.

In the hundred or so years of modern psychological assessment, there has been substantial interest in the efficient, reliable, and valid assessment of cognitive processes. The list of cognitive processes considered for assessment range from the most basic sensory and perceptual activities (such as brightness discrimination, and differential weight judgements) through to the most complex activities (such as analogical reasoning and creativity). A comprehensive list of cognitive processes studied through individual-differences assessments would include nearly all of the tasks studied by experimental psychologists concerned with discovering fundamental building blocks for mental life, and additional processes that are mostly of interest to differential psychologists.

EARLY ASSESSMENTS OF COGNITIVE PROCESSES

In a classic *Manual of Mental and Physical Tests*, Whipple (1910/1914) divided the range of mental assessments into two broad categories, simpler processes and complex processes. For the simpler tests, Whipple listed sensory tests (e.g. colour blindness, discrimination of pitch, discrimination of lifted weights), and tests of attention and perception. Some of these tests were apparatus tests, while others were the kinds of paper and pencil tests familiar to modern psychologists. Measurement of 'visual apprehension' – that is, how many objects can be perceived in a brief presentation – was administered with a tachistoscope, an

instrument that could be adjusted to provide only the briefest exposure of the stimuli to the examinee. Tests of attention included cancellation tests (of which the modern Symbol–Digit test is an exemplar), simultaneous adding, and counting dots. Complex tests described by Whipple included tests of description, association, suggestibility, imagination, and intellectual ability. While one might argue that intellectual ability is not a cognitive 'process' per se, Binet's method for assessment of intellect was specifically predicated on an amalgamation of several different cognitive processes, such as recognition and recall forms of memory, visual and tactile judgements, and spatial visualization, among other processes (e.g. see Binet–Simon, 1905/1973). Even though the Binet–Simon scales are themselves measures of cognitive processes, people traditionally think of the Binet–Simon and more recent tests as intelligence tests, mainly because the Binet–Simon test yields a single amalgamated score (Mental Age), even though it is possible to examine the individual cognitive processes scale scores.

The Binet–Simon scales illustrate one of the most important characteristics of cognitive processes assessments. This characteristic is called 'positive manifold' – and it refers to the nearly universal property of mental assessments that they are positively intercorrelated. That is, in any large sample of examinees and cognitive process measures, an intercorrelation matrix of the measures will show positive correlations throughout the matrix. In simple terms, this means that all cognitive assessments tend to share some variance – individuals who perform well on one cognitive process assessment will also tend to perform better than average on another cognitive process assessment, *even though the measures may seem to assess theoretically and practically different cognitive processes*. This property of cognitive process assessments made it possible for Binet and Simon to develop a coherent and comprehensive assessment of intelligence. Because the individual cognitive process scales were themselves positively and often substantially correlated, aggregation of the separate measures resulted in a diminution of scale-specific variance contributions, and an accentuation of the general intellectual ability, common to the specific process measures. The result was a robust measure that could be well-replicated with a wide variety of instruments, as long as there was a broad sampling of the underlying cognitive processes assessed.

This positive manifold characteristic of cognitive process assessments was also one of the major justifications for Spearman's (1904) theory of general intelligence. In Spearman's formulation, the positive correlations among cognitive assessments were said to be a result of their shared loading on a general factor of intelligence, called *g*. This *g* factor was proposed to be involved in determining individual differences in all cognitive assessments, though to a greater or lesser degree in each assessment, depending on the specific cognitive processes tapped by the assessment instrument. Later developments in theory and in statistical procedures from the 1910s to the 1950s resulted in suggestions that something more than a single general (*g*) factor was responsible for the common variance among cognitive process measures. In addition to a general factor, several investigators found broad content factors, which represent the type of material used in the assessments – such as spatial (or figural), verbal, and numerical contents. Assessment instruments that share the same item content tend to have higher correlations with one another than instruments with different item content. This finding holds sometimes even when instruments are believed to assess the same underlying cognitive processes. Thus, a test of verbal reasoning may have a higher correlation with a test of vocabulary than it does with a test of spatial reasoning. Such a result substantially complicates the identification of a test as assessing a single kind of cognitive processing, because the content may make a larger contribution than the process to the rank ordering of individuals in their test performance.

COGNITIVE PROCESSES AND DIFFERENTIAL APTITUDE ASSESSMENTS

From the late 1930s to the early 1970s, substantial effort was devoted toward the development of cognitive assessments that were diagnostic of particular cognitive processes. For example, Thurstone's (1938) theory of Primary Mental Abilities included assessments of the cognitive processes of Memory, Inductive Reasoning, Perception, Space, Verbal Meaning, Word Fluency, and Perceptual Speed. The hope for measures based on this theory was that a battery of such scales could reveal the relative strengths and

weaknesses of an individual's cognitive processes. By extending Thurstone's framework, Guilford's (1967) taxonomy of 120 different abilities was perhaps the first explicit representation of a wide array of cognitive processes that were believed to constitute intelligence. Guilford identified operations of: cognition, memory, divergent production (prominent in creative activity), convergent production, and evaluation, along with describing a variety of different contents and products. Exploration of cognitive process assessments by Guilford and his colleagues found mixed success. In the area of creativity, many specific instruments were created that assessed divergent production processes with particular combinations of item contents and item products. However, many of these and other cognitive process tests developed by these investigators remain useful mostly for research purposes, and have generally failed to demonstrate substantial validity for application purposes, such as selection, training, and counselling (that is, over and above general cognitive/intellectual ability batteries).

INFORMATION PROCESSING AND INDIVIDUAL DIFFERENCES ASSESSMENTS

Until the 1970s most attempts to develop assessment instruments for cognitive processes were undertaken by a rational approach (such as Guilford's). Starting in the mid-1970s with work by Hunt, Frost and Lunneborg (1973), several investigators attempted to assess individual differences in tasks designed by experimental psychologists of basic information processing. From an experimental psychology perspective, such tasks were viewed as powerful paradigms for identification of the building blocks of cognitive processes. Tasks such as memory scanning, letter matching, colour naming, and others were used for testing competing models of memory, inhibition, lexical access, and other cognitive processes. Similarly, tests inspired by the Donders' subtraction technique (simple reaction time and choice reaction time) were examined to determine whether efficient, reliable and valid assessments of individual differences could be obtained. Carroll (1980; see also Carroll, 1993), for example, prepared a taxonomic representation of basic information processing tasks. Throughout the late 1970s and 1980s, many studies were conducted in this framework, yielding a variety of claims that the fundamental cognitive processes underlying intelligence could be identified and measured. Some investigators, such as Jensen (1998), claimed that assessments of individual differences in the rate of information acquisition (measured as the slope of an equation relating reaction time to the number of bits of information in a display) were substantially related to general intelligence. Other investigators focused on tasks like the inspection time paradigm (which involves line-length judgements with very brief stimulus presentations).

A few of these basic information processing tasks, however, have made it into the realm of operational assessments. One notable exception is the framework by Das, Naglieri, and their colleagues and his colleagues, called PASS for planning, attention, simultaneous, and successive processing. Their framework has been incorporated into a testing instrument, called the Das–Naglieri Cognitive Assessment Systems (for a description, see Naglieri, 1997). Although the test is a recently developed product, there are several sources of empirical data on the validity of the individual scales and the omnibus intelligence scale from the test. There is considerable disagreement in the academic and practice community, however, as to whether these scales provide sufficiently differential diagnostic information (i.e. that requires low intercorrelations among the scales), or that the information obtained from the scales is demonstrably different from that obtained from the traditional Binet and Wechsler scales. Substantial correlations appear to be obtained from the aggregated scales and the traditional IQ measures, a finding that is consistent with the discussion above regarding the positive manifold found in cognitive process assessments.

FUTURE PERSPECTIVES AND CONCLUSIONS

Assessment of cognitive processes is a tradition that stretches back to the early days of modern assessment. The intelligence scales developed by Binet and his colleagues were themselves predicated on both theoretical and empirical foundations. Research conducted in the subsequent decades has demonstrated that such process measures are an integral part of any broad intellectual ability assessment system. Nonetheless, attempts at developing assessments of cognitive processes, in

isolation, have largely failed to be useful for applications purposes, partly because of substantial common variance with assessments of other cognitive processes (i.e. positive manifold), and partly because the content of the assessment instruments (such as verbal, spatial, or numerical content) play a much larger role in determining the rank ordering of individuals than do the underlying theoretical cognitive processes. For most intents and purposes, psychometric instruments that sample widely among numerous processes and contents have been found to have greater validity for real-world applications. Cognitive process assessments have found utility mostly in the domain of laboratory research, and only limited success in those environments. Future investigations might usefully focus on those abilities that show reliable and valid assessments, but that are generally distant from general intelligence. Most prominent among such cognitive process assessments are perceptual speed abilities, such as scanning, memory, and pattern recognition (Ackerman & Cianciolo, 2000). Such process assessments tend to correlate much less with the general and content abilities, partly because they use simple or uniform stimuli, rather than complex stimuli. In addition, such measures have been found to be useful predictors of skilled performance, especially for tasks that have substantial demands on speed of processing for high levels of performance.

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Phillip L. Ackerman

RELATED ENTRIES

COGNITIVE PROCESSES: CURRENT STATUS, COGNITIVE STYLES, THEORETICAL PERSPECTIVE: COGNITIVE

COGNITIVE PSYCHOLOGY AND ASSESSMENT PRACTICES

INTRODUCTION

An assessment is a tool designed to observe a person's behaviour and produce data that can be used to draw inferences concerning some characteristic of that person, such as what the person knows, or feels, or believes (the 'construct'). This process of reasoning from evidence

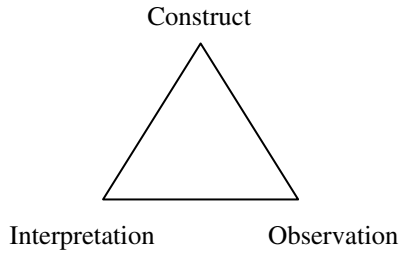

Figure 1. The assessment triangle.

(i.e. the data) can be portrayed as an *assessment triangle*. As shown in Figure 1, the vertices of the triangle represent the three key elements underlying any assessment: (a) a model of the *person construct*; (b) a set of beliefs about the kinds of *observations* that will provide evidence about the construct; and (c) an *interpretation* process for making sense of the evidence (NRC, 2001). An assessment cannot be designed and implemented without some consideration of each of these three elements. The three are represented as vertices of a triangle because each is connected to and dependent on the other two. Thus, for an assessment to be effective, the three elements must be in synchrony. The assessment triangle provides a useful framework for analysing current assessments or designing future assessments.

Given this framework then, the essential relationship between cognitive psychology and assessment is that, for many of the constructs that we wish to assess, the source of that construct will be a theory from the area of cognitive psychology. Moreover, the research that was the basis for that theory will oftentimes include instrument development that will also be the basis for the design of the assessment items. Unfortunately, there are constructs of a cognitive nature that one might like to assess that have not been thoroughly investigated within cognitive psychology. In that case, the assessment instrument developer must take on the role of cognitive psychologist as part of instrument development.

The following paragraphs are structured as: (a) a survey of recent advances in cognitive psychology, (b) commentary on their relevance to assessment, (c) a discussion of the situative perspective on cognitive psychology and its implications for assessment, and finally (d), as a conclusion, a discussion of future perspectives.

THE COGNITIVE PERSPECTIVE

The theories of cognitive psychology are built up to explain how people develop knowledge structures, such as the ideas associated with a certain domain of knowledge or a subject matter discipline, and ways of reasoning and problem-solving. The discipline of cognitive psychology seeks to understand how knowledge is encoded, stored, organized, and retrieved, and how different types of internal representations are created as people learn about a concept (NRC, 1999). One major principle of cognitive theory is that learners actively construct their understanding by trying to connect new data with their existing knowledge.

To cognitive psychologists, *knowing* is not merely the accumulation of factual information and routine procedures. Knowing means being able to combine knowledge, skills, and procedures in ways that are useful for interpreting new situations and solving problems. Thus, assessment of cognitive constructs should not overemphasize basic information and skills – these should be seen as resources for more meaningful activities. As Wiggins (1989) points out, children learn a sport not just by practising the component skills (e.g. in soccer, dribbling, passing, and shooting), but also by actually playing the sport.

While the earlier differential (Carroll, 1993) and behaviourist (Skinner, 1938) approaches focused on the extent of knowledge possessed by a person, cognitive theory has emphasized what sort of knowledge a person has. Thus, from a cognitive perspective, one must not only assess *how much* people know, but also assess how, when, and whether they *use* what they know. From this perspective, traditional tests, which usually record how many items examinees answer correctly or incorrectly, fall short. What is needed is data about how they reach those answers and/or how well they understand the underlying concepts. For this, more complex tasks are required that reveal information about thinking strategies, and growth in understanding over time.

IMPLICATIONS FOR ASSESSMENT

Cognitive psychology theories focus on the way knowledge is represented, organized, and

processed in the mind (NRC, 1999). Consideration is also given to social dimensions of learning, including social and participatory practices that support knowing and understanding (Anderson et al., 2000). The implication is that assessment practices need to include the more complex aspects of cognition as well as component skills and discrete bits of knowledge.

The mind's cognitive structure includes short-term (or working) memory, a very limited system, and long-term memory, an almost limitless store of knowledge (Baddeley, 1986). In many contexts, what is most important is how well the person can utilize the knowledge stored in long-term memory and use it to reason efficiently about current information and problems. The contents of long-term memory include both general and specific knowledge, but much of what a person knows is domain- and task-specific and is organized into structures known as schemas (e.g. Cheng & Holyoak, 1985). Thus, assessments should evaluate what schemas an individual has and under what circumstances the person regards the information as important. This evaluation should include how a person organizes acquired information, encompassing both strategies for problem-solving and ways of chunking relevant information into workable units.

Studies of expert–novice differences in subject domains illuminate critical features of knowledge structures that should be the targets for assessment. Experts in a subject domain typically organize factual and procedural knowledge into schemas that support pattern recognition and the rapid retrieval and application of knowledge (Chi et al., 1982).

Metacognition – the process of reflecting on and directing one's own thinking – is one of the most important aspects of cognition (Newell, 1990). It is crucial to effective thinking and problem solving and is one of the principal features of expertise in specific areas of knowledge and skill. Experts use metacognitive strategies for monitoring understanding during problem-solving and for performing self-correction (Hatano, 1990). The implication here is that assessments should seek to determine whether an individual has good metacognitive skills.

People learn in different ways and follow different paths to mastery. The growth process is not a uniform progression, nor is there invariant change from erroneous to optimal solution strategies – but, a person's problem-solving strategies do become more effective over time and with practice (Siegler, 1998). The implication of this is that assessments should focus on identifying the range of strategies that are being used for problem solving, giving particular consideration to where those strategies fall on a developmental continuum of efficiency and suitability for a particular domain of knowledge and skill.

People have rich intuitive knowledge of their world that undergoes significant alteration as they mature and change. Learning entails the transformation of naïve understanding into more complete and accurate comprehension, and assessment can be used as a tool to facilitate this process (Case, 1992). Thus, assessments should focus on making people's thinking visible to both the assessor and, where appropriate, to the person under assessment. This way useful strategies can be selected to support an appropriate course for future growth.

Practice and feedback are crucial aspects of the development of skills and expertise (Rosenbloom & Newell, 1987). Thus, timely and informative feedback to a person during instruction and learning is one of the most important roles for assessment, ensuring that their practice of a skill and its subsequent acquisition will be effective and efficient.

Knowledge often develops in a highly contextualized and inflexible form, and hence does not transfer very effectively. The possibility of transfer is dependent on the development of an explicit understanding of when to apply what has been learned (Bassok & Holyoak, 1989). When assessing achievement, then, the assessor needs to consider the pre-requisite knowledge and skills needed to answer a question or solve a problem, including the context in which it is presented, and whether an assessment task or situation is functioning as a test of near, far, or zero transfer.

THE SITUATIVE PERSPECTIVE AND ITS IMPLICATIONS FOR ASSESSMENT

The situative, or sociocultural, perspective was, in part, prompted by concerns with the cognitive

perspective's almost exclusive focus on the thinking of the individual. Instead, the situative perspective describes behaviour at a different level of analysis, one oriented toward practical activity and context. Here, 'context' refers to engagement in particular forms of practice within particular communities. (A community can be any purposeful group, large or small, from the global society of professional archaeologists to a local swimming club or classroom.) In these accounts, the fundamental unit of analysis is *mediated activity*, a person or group's activity mediated by cultural artefacts, like tools and language (Wertsch, 1998). In this view, one learns to participate in the practices, goals, and habits of mind of a particular community.

One of the prime features of this approach is attention to the artefacts generated and used by people to shape the nature of cognitive activity. From a traditional cognitive perspective, physics is a particular knowledge structure – from the situative perspective of mediated activity, working in a physics laboratory is also strongly dependent on the participants' abilities to collaborate in such activities as formulating and understanding questions and problems (Ochs et al., 1994).

The situated perspective proposes that every assessment is, at least in part, a measure of the degree to which one can participate in a form of practice. From this perspective, filling in a Likert scale is a form of practice. There will be some students who, by virtue of their histories, inclinations, or simple interests, will be better prepared than others to participate effectively in this practice. Hence, simple assumptions about these or any other forms of assessment as indicators of knowledge must be examined.

Discourse and interaction with others is the basis of much of what humans learn. Thus, knowledge is often embedded in particular social and cultural contexts, including the context of the assessments themselves, and it encompasses understandings about the meaning of specific practices such as question asking and answering. The implication is that assessments need to examine how well students engage in communicative practices appropriate to a domain of knowledge and skill, what they understand about those practices, and how well they use the tools appropriate to that domain.

FUTURE PERSPECTIVES AND CONCLUSIONS

From the perspective outlined above, one can see that models of cognition and learning provide a basis for the design and implementation of theory-driven assessment practices. Such programmes and practices already exist and have been used productively in certain areas (e.g. Hunt & Minstrell, 1996; Marshall, 1995; White & Frederiksen, 1998; Wilson & Sloane, 2000). However, the vast majority of what is known has yet to be applied to the design of assessments for classroom or external evaluation purposes, and there are many subject areas where the cognitive foundations are not yet established. Therefore, further work is needed to utilize what is already known within cognitive science in assessment practice, as well as to develop additional cognitive analyses of domain-specific knowledge and expertise.

Many highly effective tools exist for probing and modelling a person's knowledge and for examining the contents and contexts of learning (such as reaction-time studies, computational modelling, analysis of protocols, microgenetic analysis, and ethnographic analysis – see NRC, 2001). The methods used in cognitive science to design tasks, observe and analyse cognition, and draw inferences about what a person knows are applicable to many of the challenges of designing effective assessments.

Contemporary assessment practices are, in general, not in concert with the situative perspective. There is good evidence to expect that someone's performance in an abstract assessment situation will not accurately reflect how well they would participate in organized, cumulative activities that may hold greater meaning for them. From the situative standpoint, assessment means observing and analysing how students use knowledge, skills, and processes to participate in the real work of a community. For example, to assess performance in science, one might look at how productively students find and use information resources; how clearly they formulate and support arguments and hypotheses; how well they initiate, explain, and discuss in a group; and whether they apply their conceptual knowledge and skills according to the standards of the discipline.

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Mark Wilson

RELATED ENTRIES

Applied Fields: Education, Theoretical Perspective: Cognitive, Achievement Testing

COGNITIVE STYLES

INTRODUCTION

This entry is structured in five sections. In the first section the concept of 'cognitive styles' (CS) is defined and the evolution of how CS have been theorized and assessed is briefly outlined. In the second section an overall picture of the kinds of instruments and procedures employed to measure CS is given. In the third section some main CS are reported together with the description of the

corresponding testing tools. In the fourth section future directions concerning CS assessment are discussed. Finally, a perspective about the integration of different CS is proposed.

WHAT ARE COGNITIVE STYLES?

A Definition

CS refer to a person's habitual, prevalent, or preferred mode of perceiving, memorizing, learning, judging, decision-making, problem-solving. Individual differences about how people carry out tasks involving these functions may constitute a style if they appear to be:

- pervasive; that is, they emerge consistently in different contexts, independently of the particular features of situation;
- stable; that is, they are always the same at different times.

CS induce persons to adopt similar attitudes and behaviours in a variety of domains; they concern in fact general approaches in mental functioning, irrespective of the incidental demands of specific cases.

CS differ from abilities because the latter are measured in terms of *level* of performance whereas the former in terms of *manner* of performance. Abilities are uni-polar dimensions while styles are bi- or multi-polar. Finally most styles, but not abilities, are neutral in terms of value and desirability (a style cannot be absolutely 'good'; its relevance depends on the features of the situation and on the individual's goals).

CS can be conceptualized as a cross-road of thinking, personality, and motivation. In fact they concern the kind of strategies which an individual tends to apply when he/she faces a situation or the preferred way of processing information. CS are also grounded in the deep psychological structure of a person and in his/her basic orientation and affective disposition toward reality. Furthermore, CS are linked to the kind of purposes and expectations which people develop in their life.

Historical Trends

Research on CS began in the 1950s at the Menninger Foundation and concerned the topic of 'cognitive control', a construct which deals with mediation between the ego and the demands of inner needs. Seven profiles were identified: tolerance for unrealistic experience, conceptual differentiation, constricted–flexible control, levelling–sharpening, scanning, contrast reactivity, field articulation. These early styles – as well as field dependence–independence (see below) which was proposed at about the same period – were measured prevalently by means of perceptual probes and by considering the outcomes of the cognitive process. Observation of behaviour during tasks and analysis of how subjects performed tasks were introduced in the 1960s; styles – such as tolerant–intolerant, complexity–simplicity, risk taking–caution – went beyond cognition and were related to personality. In the 1970s and 1980s a variety of bi-polar styles emerged; the tendency was to identify styles integrating differences in thinking processes and in attitudes, emotions, and interpersonal relationships and to use quick measures such as those provided by self-administered questionnaires. Finally, in the 1990s doubts were raised about the bi-polarity of styles and complex, multi-dimensional constructs were proposed. For instance, Sternberg (1997) analysed styles in terms of function (legislative, executive, or judicial), form (monarchic, hierarchic, oligarchic, or anarchic), level (global or local), scope (internal or external), use (producing or consuming), and leaning (conservative or progressive). The combination of these dimensions produces fifteen different styles.

HOW ARE COGNITIVE STYLES ASSESSED?

A Taxonomy

Three main kinds of data can be employed to measure CS: behavioural, self-report, and physiological (see Table 1).

Behavioural data can be obtained by recording the final result of a given task or the procedure followed in performing the task. The task may consist in filling out a paper-and-pencil test or a sorting test, in carrying out trials by means of an experimental apparatus, or in interacting with the computer within an ad-hoc designed virtual environment.

Table 1. A taxonomy of methods to assess cognitive styles with examples of procedures and/or instruments

Method	Cognitive style	Examples of procedures and/or instruments
Behavioural		
Paper-and-pencil tests	Field Dependence–Independence	Embedded Figure Test
Sorting tasks	Categorization style	Classification tasks
Experimental apparatus	Impulsivity–Reflectivity	Speed–accuracy trials
Computer interaction	Analytic–Global	Conversational analysis
Self-report		
Introspection	Verbalizer–Visualizer	Strategies of Thinking Retrospective Report
Checking personal features	Adaptation–Innovation	Kirton Adaptation–Innovation Inventory
Statement endorsement	Left–Right	Your Style of Learning and Thinking
Physiological	Verbalizer–Visualizer	LEMs Breathing patterns

Self-reports require that people evaluate themselves by describing introspectively the way in which they performed tasks, by checking personal habits or preferences, or by endorsing statements about what they think of themselves. This may be done by asking subjects to keep a diary of what occurred to them during a period of their life, by interviewing them, or by administering questionnaires.

Finally, some physiological measures can be interpreted as indices of particular cognitive preferences in processing stimuli.

An Example

In order to exemplify the procedures described above, we can consider the case of the visualizer–verbalizer style (for references of this section see Antonietti & Giorgetti, 1998). Various cognitive tasks may be performed by means of operations which require either the use of visual or of abstract and verbal representations and processes. Though it is likely that most people can switch strategies according to the nature of the task, there are some persons who appear to be heavily dependent upon one or other of the two strategies because of their different promptness to employ visual or verbal mental operations. The tendency to privilege visual or verbal functioning has been conceptualized as a cognitive style.

Behavioural Data

To assess whether a person is a visualizer or a verbalizer, it is possible to present him/her with tasks which can be performed through both visual and verbal–abstract strategies and to record the extent to which each of the two kinds of procedures has been followed. For instance, subjects can be asked to solve categorical syllogistic problems and then can be classified according to the representational strategy they used: 'elemental' if they used several concrete figures, 'diagrammatic' if they used diagrams (for example Venn's diagrams) representing the logical relations, and 'verbal' if they thought intuitively on the basis of verbal expressions of premises.

Self-Reports

In order to understand how much an individual tends to visualize, he/she can be requested to keep a record of the times in which he/she has experienced imagery during the day. Information of this kind may be derived also through questionnaires in which people are asked to rate how frequently they create and process various kinds of mental images. These instruments incite subjects to consider their habitual modes of thinking as they emerge in the complete range of mental activities and to assess the occurrence of visual images in different tasks, domains, contexts, and so on. Finally, introspective judgements are involved in instruments where subjects are asked to describe the cognitive strategy (visual vs. verbal/abstract) previously employed in answering questions (for example 'Albert is taller than Bob; Charles is taller than Albert; who is the tallest?', 'List five parts of the human body') that can be answered by means of either a visual or a verbal–abstract strategy.

Physiological Measures

Observations have indicated that when someone is asked a question requiring a little thought the eyes make an initial movement to the left or right. Since it was argued that the right cerebral hemisphere is associated with the processing of visual information and that the spontaneous lateral eye movements (LEMs) are under the control of the counter-lateral hemisphere, it was claimed that the presentation of a visual-spatial question produces the activation of the right hemisphere and, consequently, left LEMs. However, verbalizers should turn their eyes consistently to the right and visualizers to the left, whatever the kind of question. Thus, it has been suggested to use LEMs as a criterion to assess the preference for either a visual or a verbal processing. Furthermore, it was hypothesized that implicit laryngeal and tongue movements accompany or precede verbal thinking, so that the individual's regular breathing rhythm is disrupted. Under this assumption, it is possible to detect whether the silent reasoning that a person accomplishes while he/she is answering a question is visual or verbal by recording his/her breathing pattern. According to these conjectures, it was found that verbalizers had significantly more disruptions of their regular breathing rhythm, both in rest and in work conditions, than visualizers.

WHAT ARE THE MAIN COGNITIVE STYLES?

Field Dependence–Independence

This style refers to the tendency to overcome embedding contexts; that is, to identify and to isolate elements included in complex patterns. Such a tendency is associated to personality traits linked to psychological differentiation. Field independent people tend to analyse rather then leave items of information global and confused. Field dependent–independent individuals were originally recognized by asking them to adjust a rod in a tilted rectangular frame so that it might appear vertical (Rod-and-Frame Test): field-independent subjects arrange the rod perfectly vertical since, unlike field-dependent persons, they are not influenced by the tilted nature of the frame. However, the most widely used instrument to test field dependence–independence is the Embedded Figure Test (Witkin et al., 1973), devised both for individual and for group administration. The test consists of a series of perceptual restructuring items requiring subjects to pick out a simple figure hidden in a larger, entangled design.

Impulsivity–Reflectivity

The impulsive person tends to put forward the first idea that comes to him/her, whereas the reflective person considers alternatives (Messer, 1976). This style is generally assessed by measuring differences in decision-making under conditions of uncertainty. Tasks used present several plausible choices, only one of which is correct: who responds quickly often errs; who pauses to reflect is more often correct. Different stylistic combinations of speed and accuracy can be found. For instance, the Matching Familiar Figures Test identifies four categories of respondents: fast-responding/high-error, fast-responding/low-error, slow-responding/high-error, slow-responding/low-error.

Categorization Styles

Consistent individual differences have been detected by giving a number of objects and by requiring subjects to sort them into categories (Guilford, 1980). Some persons (narrow categorization style) place objects into a wide number of small, well-defined, categories, so that each category contains only objects sharing a high number of similar features; other persons (broad categorization style) place objects into a small number of wide categories which include items with few common features.

Stylistic differences were highlighted with reference not only to the width of categorization but also to the kind of criteria employed to construct categories: analytic-descriptive style induces to include in the same category items showing surface physical–perceptual similarities; conceptual-inferential style induces to define categories on the basis of similarities in objects' functions; thematic-relational style induces to include in the same category disparate objects which have in common only the fact that they occur in the same action or situation.

Analytic–Global

Different authors converged in maintaining that a consistent dimension which differentiates

people is the tendency to consider either details of a situation or the whole picture (Schmeck, 1988). Analytic individuals have a focused attention, have an interest in operations and procedures or the 'proper' ways of doing things and prefer step-by-step schemes; their thinking is controlled and consciously directed. Global persons tend toward scanning, leading to form overall impressions, including entry of feelings into decisions; their organizational schemes involve random or multiple accessibility of components and varied associations between them.

Tests of the Cognitive Styles Analysis (Riding & Rayner, 1998) allow measurement of the analytic dimension by presenting items each comprising a simple geometrical shape and a complex figure and by asking to indicate whether or not the simple shape is contained in the complex figure; the holistic dimension is measured by presenting pairs of complex geometrical figures and by requiring to judge the overall similarity between them. The ratio between response times in the two tasks reveals preference for one of the two extremes of the style.

By means of conversational analysis – carried out involving subjects in a dialogue either with a human interlocutor or with a virtual, computer implemented partner – it is possible to recognize peculiar mental operations related to the analytic–global distinction (Pask, 1976): holistic persons have many goals, assimilate information from many topics, ask questions about broad relations and form generalized hypotheses; the opposite individuals have one goal at a time, move to another topic only when they are completely certain about the one they are currently working on, ask questions about narrow relations and their conjectures are specific.

Styles Related to Hemispheric Asymmetry

Hypotheses derived from research into brain lateralization induced Torrance (1988) to propose the distinction between a left and a right style of thinking. Left style is concerned with verbal, logical, analytical, and abstract tasks; right style refers to non-verbal, holistic, spatial, and concrete thinking. The left style implies preference for sequential processing of information and systematicity in solving problems; the right style implies preference for parallel processing, perceptual representation in the form of synthesized patterns, intuitive and creative problem-solving. The Your Style of Learning and Thinking is a self-report inventory designed to estimate the relative psychological dependence of an individual on the left or on the right mode of thinking. The instrument consists of items each reporting a pair of statements (one referred to the left and the other to the right style of thinking). Subjects have to place a check mark whether the statement is true of them; they may check one or both of the statements in a pair or neither. Three scores are computed: the number of items in which subjects check only the statement concerning the left style (left scale), the number of items in which subjects check only the right statement (right scale), and the number of items in which both or neither of the statements are checked (integrative scale).

Adaptation–Innovation

Adaptors are inclined to employ well-known information and strategies and to improve what is already available. On the one hand, innovators are more likely to neglect past experience and to look for possible novel solutions. The adaptation–innovation style is conceptualized as a continuum ranging from the habit 'to do things better' to the habit 'to do things differently'. In problem-solving settings, adaptors tend to reduce problems by improvement with a maximum of continuity and stability and by seeking solutions in understood ways; on the other, innovators try to discover problems, query problem assumptions, and manipulate them (Kirton, 1989).

Such a style can be measured through the Kirton Adaption–Innovation Inventory, a self-report questionnaire constituted by statements each describing a certain personal attribute. Respondents must imagine that they have been asked to present, consistently and for a long time, a certain image of themselves to others. They have to state the degree of difficulty that such a task would entail for them on a five-point scale from very easy to very hard. The scoring system used leads to innovators scoring higher and adaptors scoring lower.

FUTURE PERSPECTIVES

CS assessment involves a series of testing and psychometric issues which have been largely

discussed (Tiedemann, 1987). These issues are closely related to methodological and theoretical topics which future research should highlight. For instance, it is not still clear whether CS are homogeneous, unitary psychological dimensions or are multi-componential products of more specific sub-tendencies. Furthermore, the question whether CS are unique, dichotomous dimensions or are the result of two or more parallel (or orthogonal) dimensions should be answered. Finally, empirical investigations should allow assessment of whether CS are 'all-or-nothing' attributes or are continuous dimensions, so that individuals may share a style in various degrees of intensity.

Answers given to these questions have relevant implications for the ways in which CS can be assessed. For instance, the structure of most CS tests is designed to include pairs of opposite items, each concerning a pole of the style at hand. Thus, the rejection of the bi-polarity of CS undermines one of the basic assumptions of a large number of instruments.

Currently CS are measured prevalently by means of self-reports. This kind of assessment implies that individuals consider themselves introspectively in order to judge some personal features. However, the assumption that people can have direct access to the stylistic dimensions to be evaluated is under discussion. Can a person estimate adequately his or her cognitive tendencies? Doubts can be cast. For example, if a subject is requested – as questionnaires ask – to give a global judgement about the generality of his or her own experience, he or she risks reporting what he or she thinks about his or herself rather than what actually occurs to him/her; by contrast, if attention is focused – as diaries or retrospective interviews ask – on short time intervals, reports reflect only the specific experience of those periods or tasks but do not give an overall picture.

A promising direction seems to be the integration of different kinds of data, as computer-supported assessment procedures allow: recording effective behaviour in strategic tasks can show stylistic differences which might be supported both by ecological observation of everyday-life situations and by investigating how the subject perceives his or her own mental functioning.

CONCLUSIONS

Research has yielded a long list of putative CS which show a variety of shared features and overlapping distinctions, so that the need for integrative models emerges (Miller, 1987). In this perspective a promising direction does not seem to be the attempt to concentrate CS into a reduced number of same-level dimensions but to consider CS within a hierarchic model, with some styles (for instance the analytic–global dichotomy: Riding & Rayner, 1998) playing the role of super-ordinate constructs which include other styles. This should lead to drawing a structural picture of individual differences concerning the manners in which cognitive tasks can be performed.

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RELATED ENTRIES

Personality Assessment (General), Theoretical Perspective: Cognitive, Theoretical Perspective: Cognitive-Behavioural, Attributional Styles, Coping Styles

COMMUNICATIVE LANGUAGE ABILITIES

INTRODUCTION

As is often the case with other psychological functions, most people think they know the meaning of communication. Problems arise, however, when experts try to define communication, specify what it consists of, and determine its limits. Definitions can range from very broad concepts, where the simple transmission of information is considered to constitute valid communication, to more restrictive ones that imply both intent and awareness of the communicative act. Below we briefly describe the basic skills needed to communicate, as well as ways of assessing them.

BASIC COMMUNICATION SKILLS

Although linguistic abilities used to be considered sufficient for good communication, language and communication are now seen as two different functional systems. However, the relationship between them is not clear.

Among the communicative skills attributed to the speaker, the message has always had a privileged position and has been seen as responsible for the success or failure of the communicative exchange. To formulate good messages, speakers have to know what they want to communicate, identify and select the information to be transmitted, and produce unambiguous messages. However, it is not easy, even for adults, to provide unambiguous messages, nor to detect ambiguous or incomplete ones.

In order to produce and above all to restructure messages, speakers or listeners have to articulate knowledge about the message itself (meaning), about the partner (status, age, linguistic and cognitive skills, etc.) and about the context (its characteristics and the extent to which context is shared by interlocutors). Knowledge of the roles and rules governing the communicative exchange should also be taken into account (turn-taking, topic maintenance or change, etc). Furthermore, the distinction between what is meant (communicative intention and message representation) and what is said has to be made (Bonitatibus, 1988; Robinson & Mitchell, 1992).

Messages are directed to others (social language), but sometimes they can be directed inward (private speech) (see Table 1). To formulate social messages the speaker has to be skilled in role taking, taking into account the partner's characteristics and adapting the message accordingly. Likewise, the listener also has to understand messages from the speaker's perspective. Any lack of ability in role taking has a negative effect on the negotiation process.

Even though communicative responsibility is shared, a skilled listener can change the course of communication (Patterson & Kister, 1981). The listener's most powerful skill for disambiguating messages is asking questions, and then contributing any relevant information held. A well-formed query exercises two functions: a selective one with respect to the previous message (indicating the confusing terms, pointing out potential new information, etc.), and a determining function regarding the requested response (repetition, confirmation, specification, etc.) (Garvey, 1979).

Communicative exchange is not limited solely to the sharing of information. Partners, throughout communicative exchange, actively and deliberately attempt to control their own behaviour (self-regulation) and that of their partner (interlocutor regulation) through verbal utterances of different regulatory force (strong or weak). Regulation can also be carried out by a more capable outside agent such as a tutorial support system.

Private speech or internal regulation is a dialogic form of internal language linked to the egocentric developmental stage. It reappears

Table 1. Basic communication skills

	Speaker	Listener	Adult
Verbal information related to the referent	Message Restructuring and repairing of the message Ask questions Interlocutor regulation Self-regulation	Contribute relevant information	Guiding interventions
Private language	Internal regulation		
Verbal information unrelated to referent	Weak regulation		
Manipulative abilities		Adapting performance to the message	
Verbal, non-verbal, social and cognitive abilities related to the communicative process	Maintaining principle of co-operation Understanding exchange context Understanding partner's role Using and understanding communicative rules Expressing communicative intention Analysing the referent and non-referents Assessing messages		

(through lip movement, muttering, murmuring, etc.) when the subject has to deal with a difficult task.

The communicative exchange is only successful when the ensemble of skills is harmonized in a coherent and flexible way. When communication is approached from the perspective of regulation, an interface is produced between communicative, cognitive, linguistic and/or social processes.

ASSESSMENT OF VERBAL COMMUNICATION SKILLS

The assessment of communicative skills involves the identification of the functions, rules and patterns that operate in a communicative exchange. The assessment of communicative skills has been developed basically within the domains of (a) language development and pragmatics, and (b) psychopathology (studies about communicative difficulties in childhood, learning disabilities and adult aphasia). Different instruments for analysing communicative functions have been designed in both domains. These can be organized as follows: (1) observational checklist, profiles and interview, (2) standardized tests and (3) referential tasks. McTear and Conti-Ramsden (1989) and Smith and Leinonen (1992) provide good descriptions of pragmatic and communicational assessment.

Observational Checklist, Profiles and Interview

These are instruments designed to identify the strengths and weaknesses of communicative skills, and elaborated under a qualitative approach. They have proved very useful in research and in educational and clinical contexts. The interpretation of results from such techniques is usually based on the theory of speech acts.

Tough (1977) produced one of the first and most widely used instruments which aimed to classify the functions of language. It analyses four functions (directive, interpretative, projective and relational), each one being sub-divided into several more specific functions (referring to needs, planning, expressing feelings, etc.) and communicative strategies.

The Pragmatic Protocol (Prutting & Kirchner, 1987) is a checklist suitable for children older

than five years of age. It analyses pragmatic skills using the conceptual framework of speech acts and thus examines three main aspects: utterance acts (or expressed intentions), propositional acts (lexical, grammar, style) and illocutionary and perlocutionary acts (speech acts, topic management, turn-taking).

The Pragmatic Profile of Early Communication Skills (Dewart & Summers, 1988) analyses speech acts, responses to communication, interactive aspects of communication, and the effect of contextual conditions on communicative success. Information is obtained through a semi-structured interview given to parents or caregivers. The profile is useful for assessing communication in very young children or children without language. It can also be useful for analysing children from different cultural backgrounds who are not very able in the language of the community.

The MacArthur Communicative Development Inventory (CDI) (Fenson, Dale, Reznick, Thal, Bates, Hartung, Pethick & Reilly, 1993) is suitable for children from 8 to 30 months. It analyses, on the basis of parental report, early language development and symbolic and communicative gestures. Also, the Sequenced Inventory of Communication Development (Hendrick, Prather & Tobin, 1975), for young children between four months and four years of age, deals with the child's prelinguistic behaviours (reaction to environmental sounds and speech, imitation, play routines, etc.) and first language.

The McTear Conversation Checklist (1985) analyses the communication skills of school-age children, with respect to turn-taking, initiation of conversational exchanges, response, cohesion and repairing the conversational breakdown. The aim of this checklist is not only to provide an instrument capable of grasping the development of pragmatics, but also to detect disordered conversation.

As can be seen, the tools used within the pragmatic perspective simultaneously embrace both verbal and non-verbal communication, whilst those for very young children particularly emphasize pre-conversational abilities. The main weakness of these tools is that the guidelines for coding and interpretation are often not very well defined.

Standardized Tests

The Test of Pragmatic Skills (Shulman, 1985) was designed to assess a child's difficulties with conversational intentions. The test focuses on the use of illocutionary acts including requesting information or action, rejection/denial, naming/labelling, answering/responding, summoning/calling, greeting and closing conversation. It is suitable for children between 3 and 9 years of age. Speech acts are elicited in four situations while children are playing with familiar objects (puppets, pencils, telephones and blocks). The responses are evaluated according to their context appropriateness, the use of verbal or non-verbal language, and the verbal range and elaboration of expressed intention.

The *Bateria de Lenguaje Objetiva y Criterial* (BLOC) (Puyuelo, Wiig, Renom & Solanas, 1998), for children from 5 to 14 years old, analyses child development according to semantic, morphological, syntactic and pragmatic language parameters. The pragmatic part analyses communicative functions such as: greetings, saying goodbye, thanking, asking for attention, asking/giving/preventing, querying, etc. The test allows the child's performance to be compared with both educational and developmental age norms. Also, a cut-off point differentiates between risk and normal pragmatic competence.

Other tests are based upon the need to assess the functional communicative skills of aphasic adults. The Assessment Protocol of Pragmatic-Linguistic Skills (APPLS) (Gurland, Chwat & Gerber Wollner, 1982) aims to identify the linguistic abilities used in a pragmatic context, the pragmatic abilities themselves, and the specific ability to repair discourse. And the Amsterdam–Nijmegen Everyday Language Test (ANELT) (Blomert, Kean, Koster & Schokker, 1994) aims to analyse the verbal communicative abilities and changes in them over time, focusing on everyday situations involving verbal social interaction.

The main criticism of these instruments, apart from the ANELT, is that they analyse speaker competence rather than the interactional conversation.

Referential Tasks

The referential communication paradigm focuses specifically on the analysis of verbal communication skills and explicitly avoids the analysis of non-verbal communication. There are not standardized tests developed from this perspective

which uses specific tasks to elicit verbal behaviour. The most widely used tasks are:

(a) Identification, naming and describing physical objects, drawings, photographs, etc. The 'Abstract Shapes' task of Glucksberg and Krauss (1967) is one of the best-known.
(b) Giving instructions and directions: how to draw or assemble parts of an object or building blocks, communicating routes, etc. 'Route finding task' and 'Room construction task' (Lloyd, Boada & Forns, 1992), 'Tangram figures' or 'Island Map task' (see Yule, 1997) are also well known.
(c) Giving accounts of incidents, telling stories (constructing a narrative from visual or videotaped material) or expressing opinions. The 'supermarket' and 'disco' tasks are good examples (see Yule, 1997).

The main criticism of this area is the lack of a unified model able to integrate the research carried out from this perspective.

FUTURE PERSPECTIVES

Communication is an area of growing interest, both from a research and applied point of view. How meaning is negotiated, unambiguous messages are produced, and instructions understood and accurately responded to are all-important areas of study for developmental and educational psychologists, as 'learning' is, in part, a verbal communicative process.

Effective communication is also necessary for proper social development and social life (from personal to international relationships).

The study of communication skills also has special relevance from a psychopathological perspective because the correct use of these skills appears to be affected in various disorders. Communicative dysfunction and errors (absence of message reparation, poor topic maintenance, use of deviant words, excessive verbal distractions, flaws in interactive skills, etc.) seem to be particularly frequent in psychotic pathologies, in several linguistic disorders (semantic–pragmatic deficit), in cognitive deficit pathologies and in aphasic disorders. Internal regulation difficulties could lie behind hyperactive pathologies and recent studies have suggested that a lack of communication skills could explain some anti-social disorders in children.

A new and increasing area of interest, focusing on communicative verbal exchange, is the study of elderspeak language and secondary baby talk.

CONCLUSIONS

In order to develop better tools for the accurate assessment of communication skills, some aspects must be studied in greater detail.

Firstly, further studies are needed to clarify the relationship between communicative, cognitive, socio-emotional and linguistic skills. Despite the considerable amount of research carried out in this area, it is still not clear whether communicative competence is a result – the outcome of a combination of these skills – or one of the cognitive processes underpinning the development of other skills. Therefore, some tests labelled as 'communication tests' may actually be exploring cognitive or linguistic skills, or even social development or personality styles.

Secondly, a more precise knowledge of communicative developmental skills is needed. To date, there have been some developmental studies covering a wide range of ages (Camaioni, Ercolani & Lloyd, 1998) and very few provide a longitudinal perspective (Bivens & Berk, 1990; Forns & Boada, 1997; Martínez, Forns & Boada, 1997).

Thirdly, in order to grasp the nature of communicative exchange and evaluate communicative abilities, any new test has to address two main aspects: one concerns the interlocutor, and the other, the test situation. In the future, the usual interlocutor in communicative testing will be a relative, colleague or friend, not only the psychologist. And the testing will be conducted in a familiar context, besides the standardized one. Without these two conditions the conversational sample obtained by psychologists may be very different to real conversation.

Finally, although there are more tools than those described here, it is clear that the area of verbal communicative assessment is lacking a test of high technical quality. It should be acknowledged that this reflects the absence of reliable outcomes in our understanding of human communication.

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María Forns

RELATED ENTRIES

LANGUAGE (GENERAL), DEVELOPMENT: LANGUAGE, TESTING IN THE SECOND LANGUAGE IN MINORITIES

COMPUTER-BASED TESTING[1]

INTRODUCTION

Computer-based testing (CBT) has become a viable and well-developed method for administering a variety of tests in many different contexts. Various achievement, psychological, licensure, and certification tests have all benefited from computerization. The emergence of sophisticated computer

technology has enabled the implementation of measurement models that were proposed theoretically years ago.

The underpinnings of CBT are grounded in item response theory (IRT), which began to develop in the 1960s (Birnbaum, 1968; Rasch, 1960) and reached a relatively mature state by the 1980s (Lord, 1980). However, the recent expansion of operational CBT programs has introduced challenges that have considerably expanded the psychometrics supporting CBT. The purpose of this entry is to provide an overview of CBT, including its advantages, the psychometric models that support it, and some of the issues and challenges that are currently being addressed by researchers and practitioners. In addition, we offer some thoughts about how CBT may evolve to support future assessment needs.

ADVANTAGES OF CBT

The advantages of CBT include psychometric benefits, benefits to test-takers, and benefits to test-users. CBT permits automated processes that are not possible with paper-and-pencil testing, such as automatic item and form selection, immediate scoring and reporting of results, and immediate transmission of examinee data to the sponsoring organization. CBT systems also offer generally better data capturing functionality than the traditional scannable answer sheets used with paper-and-pencil testing programmes. Advantages to test-takers include convenient exam scheduling, a wide variety of appointment times, a comfortable test-taking environment, intuitive examinee interfaces, and faster score results processing.

Some advantages to test-users include excellent display and graphics options and a wide choice of item formats that may be administered, allowing sponsoring organizations to pretest many new item types with innovative graphics and user response options. Other advantages to test-users include the frequent transmission of data back to the processing centre and the ability to detect trends or problematic issues more quickly than with single batch-type test administration. Irregularities that may occur during a traditional test administration will often affect entire groups of examinees, but irregularities with software or hardware are usually more isolated and limited in scope to individual test sessions. Multiple-choice items that might be mis-keyed or problematic in a computer-based testing environment can usually be deactivated quickly with far fewer complications than in traditional paper-and-pencil test settings.

PSYCHOMETRIC MODELS FOR CBT

A number of psychometric models are available for use in CBT. The computerized linear test (CLT) is most similar to the traditional paper-and-pencil test. CLTs consist of fixed forms with a fixed number of items per form. Usually, a number of forms are assembled, pre-equated to one another and deployed simultaneously to ensure that items are not exposed too quickly to examinees. These forms sometimes include a process that randomizes the presentation of items to each examinee within a test or within a well-defined section of the test, to guard against memorization of keys or further exposure of items. In some applications, CLTs are administered by dynamically choosing the fixed number of items to be administered to each examinee from a larger pool of questions.

Computerized-adaptive testing (CAT) utilizes item response theory (IRT) to select subsets of items from a large item pool so that the statistical characteristics of the selected items are optimally targeted to each test-taker. With CAT, performance on the first few items provides initial estimates of examinee ability. Each estimate of ability is used to select items that will provide the most information about the examinee's new ability at every point in the test. As more items are administered, the examinee ability estimate becomes increasingly precise because the computer adjusts the characteristics of each question to match the performance of the test-taker.

One principal advantage of CAT is efficiency. Since the items on the test are targeted to examinee ability, more information is gained about the examinee with fewer items than in a traditional paper-and-pencil test or a CLT. Because of this efficiency, a shorter test length can be established with CAT that will yield scores or pass/fail decisions that are equally precise or more precise than those based on traditional testing methodologies. With an appropriate decision rule, a variable-length testing process

can be established that is based on giving each test-taker only as many questions as are needed for the computer to make a reliable estimate of examinee ability or to accurately classify an examinee as passing or failing compared to a minimum performance standard.

Much work on CAT in recent years has concentrated on adaptive testing algorithms. The most commonly accepted statistical criterion for CAT item selection is maximum information. However, use of this criterion alone leads to unrealistic results in most applications because test content is not accounted for. Several researchers have proposed algorithms to control content in CAT item selection. Kingsbury and Zara (1989) proposed a simple method of balancing item selection with respect to test content that involved partitioning the item pool according to content categories and choosing specified numbers of items from each content strata. Stocking and Swanson (1993) developed a weighted deviations model to account for content in CAT item selection. In their approach, content specifications are articulated as a series of upper and lower boundaries on the numbers to be selected. In addition, the maximum information objective is also reformulated as a boundary (although in this case the lower and upper boundaries are set equal at an artificially high level). A weighted sum of the deviations from all bounds is taken as the objective function, with weights reflecting the importance of both the content specifications and information. CAT item selection proceeds sequentially with the goal of minimizing the objective function.

An adaptive testing approach that constrains item selection as the test proceeds was introduced by van der Linden and Reese (1998) and van der Linden (2000). The idea behind this method is to satisfy all CAT content constraints through a series of shadow tests assembled to be optimal at the point of each interim estimate of examinee ability. The shadow test is a full-length test that includes all items previously administered and that satisfies all of the test constraints. From the full shadow test, only the most informative item at the interim ability level is selected. The remaining items are returned to the pool and the process is repeated for the next item, and subsequently until the adaptive test is completed.

Chang and Ying (1999) proposed an adaptive item selection approach based on classifying item discrimination parameter estimates into strata. In their approach, items are chosen from the lower discriminating strata early in the test when little is known about the ability of the test-taker, and strata with higher discriminating items are utilized late in the test when a more reliable estimate of ability is available. The goal of this approach is to avoid choosing highly discriminating items early in the test that may be poorly targeted due to an unreliable estimate of the test-taker's ability.

ISSUES WITH CBT

Despite the explosion of research and operational applications of CBT, there remain a number of issues with its use. Although discussion of all these issues is beyond the scope of this entry, we briefly discuss four potentially challenging areas for CBT testing programs: (1) establishing comparability between CBT and paper-and-pencil versions of an exam, (2) ensuring the security of computerized testing item pools, (3) monitoring CBT results, and (4) pretesting, calibrating and linking new items for an ongoing CBT program.

CBT Comparability

Many applications of CBT involve transitioning an existing testing programme to computer administration. In making such a transition, there is concern with maintaining the score scale established for the paper-and-pencil testing programme and ensuring that test scores or pass/fail decisions based on CBT are comparable to those based on paper-and-pencil testing. Kolen and Brennan (1995) list several significant comparability issues that arise when paper-and-pencil forms are transitioned to computer, including ease of reading passages, ease of reviewing or changing answers to previous questions, effects of time limits, and responding by keyboard or mouse versus using an answer sheet. In recent years, improvements in computerized testing interfaces and increasingly computer literate test-takers have lessened comparability concerns. Furthermore, a number of studies in a variety of contexts have supported the comparability of paper-and-pencil and computerized tests (e.g. Spray, Ackerman, Reckase & Carlson, 1989). Despite these encouraging results, comparability remains

an important issue that must be addressed whenever CBT and paper-and-pencil test scores are to be used interchangeably or an existing score scale for a paper-and-pencil test is to be retained with the introduction of a CBT version.

Ensuring the Security of Computerized Testing Item Pools

A primary advantage of computerized testing is continuous administration, which allows test-takers flexibility in deciding when they will take a test. However, continuous testing requires exposing test items repeatedly over time, which introduces the possibility that the security of test questions can become compromised. This practical problem is an extremely important one, as a threat to the security of test questions is a threat to the validity of the test. Protecting the integrity of CBT item pools involves secure administrative procedures, statistical algorithms to limit the over-use of individual test questions in a particular item pool, and approaches for constructing and rotating item pools or test forms to further control item exposure. Stocking and Lewis (2000) describe one method of controlling the exposure of items in CAT. Way (1998) reviews the literature on protecting item pool security in CBT.

Monitoring CBT Results

Most CBT applications utilize IRT in ways that rely heavily upon the strong assumptions of the underlying models. As a result, model–data fit becomes an especially critical issue with CBT programs. A number of well-known methods exist for assessing model–data fit in traditional IRT applications (Hambleton & Swaminathan, 1985). However, with CBT applications utilizing CAT or other tailored item selection procedures, the features of continuous testing and adaptive item selection create challenges in monitoring CBT results. Glas (2000) addresses the issue of monitoring CAT data to assess changes in item performance. Another side of monitoring CBT is assessing aberrant responses by individual test-takers, or person fit, based on CBT results. Many factors can contribute to person misfit, including multidimensionality of test content, pre-knowledge of a subset of questions on the test, and random guessing on multiple-choice items due to time pressures.

Pretesting, Calibrating and Linking New Items for an Ongoing CBT Program

CBT provides a flexible mechanism for trying out (or pretesting) new items because tests are administered electronically and many forms with different sets of pretest items can be published with little added expense. Most CBT programs pretest items by randomly selecting a subset of items from a larger pretest pool and interspersing them in with the operational items given to each test-taker. This on-line pretesting is easy to do if the test is composed of discrete items. However, if the pretest items are associated with passages and the number of items associated with each passage differs, sophisticated algorithms may be necessary to ensure that the pretest and operational items are administered seamlessly. For tests based on CAT, on-line pretesting places special demands on traditional IRT estimation methods. Recent studies (see, for example, Ban, Hanson, Wang, Yi & Harris, 2000) suggest that operational on-line calibration is feasible with CAT if appropriate data collection designs and estimation procedures are utilized.

FUTURE PERSECTIVES AND CONCLUSIONS

Both researchers in the area of CBT and practitioners that have interest in CBT applications have a strong sense that CBT will continue to evolve and expand rapidly in the future, primarily because of the way the technology and the Internet are transforming our society. Bennett (2001) provides a compelling vision of how the Internet will change the landscape of large-scale assessment for both purveyors and the consumers of CBT. He synthesizes a number of trends in the global economy and distance learning, and argues that assessment will have to be reinvented if it is to remain relevant to what and how students learn.

Several innovative aspects of CBT are likely to evolve most quickly. Among them is the continued development of features that can be

used with computer-administered items, including sound, graphics, animation, and video. Bennett, Morley, and Quardt (1998) provide one example of a graphical modelling item type, which test-takers respond to by plotting points on a set of axes and using curve or line tools to connect the points.

Another potential CBT development is the use of the computer to generate test questions in real time. Bejar (1993) presents a rationale for and examples of what he refers to as a 'generative approach' to measurement. According to Bejar, the two major requirements for item generation are having a reliable mechanism for generating instances of items, and having sufficient knowledge about the response process to estimate the psychometric parameters (e.g. difficulty and discriminating power) of the generated items.

One major issue with item generation is developing psychometric models that can deal with the uncertainty inherent in item modelling, in which statistical characteristics of the computer-generated items are based on predictions rather than pretest data collections. Mislevy, Sheehan, and Wingersky (1993), Mislevy, Wingersky, and Sheehan (1994), Embretson (1999), and Glas and van der Linden (2001) present and discuss IRT models that hold potential for use in an item modelling context. A second issue is the investment in time and resources that is necessary to develop credible item models for each content domain of interest. This is further complicated by the fact that the linguistic and technological tools that are successful for one construct (e.g. quantitative reasoning) may be completely inadequate for developing item models in another construct (e.g. reading comprehension).

Still another aspect of CBT that will continue to rapidly evolve is the computer's ability to interact with test-takers and to simulate realistic assessment scenarios. Recent applications of interactive simulations to high-stakes assessment have included design problems used in an architect licensure exam (Kenney, 1997) and a computerized performance test to measure the patient management skills of physicians (Clauser, Margolis, Clyman & Ross, 1997). These efforts underscore one of the greatest challenges in developing realistic CBT simulations, which is developing valid and reliable measures while at the same time presenting tasks in as authentic a manner as possible. Assessing complex behaviours through simulation requires approaches that can reveal how experts organize and apply their knowledge in a particular domain, a practice that has been referred to as cognitive task analysis (Means & Gott, 1988; Mislevy et al., 1999). Such methodological approaches are closely linked to efforts in cognitive psychology and intelligent tutoring (*cf.* Nichols, Chipman & Brennan, 1995). In many ways, these disciplines hold the key to integrating the explosion of technology tools that can be applied in a CBT with the traditional values of valid and reliable assessment.

Note

1 The positions expressed are those of the authors and not necessarily of Educational Testing Service or CTB McGraw-Hill.

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Walter D. Way and Jerry Gorham

RELATED ENTRIES

Adaptive and Tailored Testing, Automated Test Assembly Systems, Item Response Theory: Models and Features

COPING STYLES

INTRODUCTION

The term coping is generally used in association with the concepts of adaptation and stress, but it bears links to many other concepts as well. Adaptation is a very broad concept which covers many aspects of human behaviour, and coping, in turn, refers to a person's means to achieve or maintain adaptation. Situations which call for readaptation are usually stressful, and coping refers generally to managing stress, or emotional states connected to stress, but also to managing the stressful situations. Coping is the way to avoid the harmful effects of stress. The best known, and in psychological literature the most often quoted, definition of coping comes from Lazarus and Folkman (1984: 141), who define coping as 'constantly changing cognitive and

behavioural efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person'.

There are many other concepts closely related, or sometimes even comparable, to coping. This group consists of concepts such as sense of coherence, hardiness, self-efficacy, locus of control, perceived control, and many others which refer to persons' goals, perceptions or possibilities to control their own life and environment or, at least, to manage them. Also defences may be mentioned here, although many writers and researchers want to separate defences from coping, specifically because defences are considered less conscious than coping. Haan (1977), for example, has made a clear distinction between coping and defences, whereas Kahana et al. (1982) have used the concepts of coping, defence and even adaptation interchangeably.

The above mentioned concepts close to coping refer to dispositional attitudes and behaviours and are thus quite similar to the concept of coping styles. That, in turn, is associated with personality traits, which may be seen quite stable and changing, perhaps, only with life-time individual development. In other words, coping styles refer to rather stable, personality traits like dispositions to handle problematic situations and stress by various ways or strategies. Traditionally, this perspective was predominant in coping research, and it still has its proponents. In recent literature, however, the concept of coping styles has often been used quite loosely, referring also to any broader coping dimensions or even to specific strategies or ways of coping irrespective of whether they are situation specific or dispositional.

Contrary to the style or trait model, the process model emphasizes situation specific ways and strategies of coping. The process model also regards coping as highly conscious behaviour, whereas the trait model includes an idea of coping as a less conscious phenomenon, specifically when defences are accepted as ways of coping. At present, the process model seems to be more generally appreciated than the trait model. In this development the writings of Lazarus and his colleagues have played a major role (e.g. Lazarus & Folkman, 1984). This perspective depicts coping behaviour as very contextual. The process-oriented approach to coping concentrates on the actual thoughts and actions of people in specific events or situations as well as on changes in these thoughts and actions. It differs from the trait or disposition approaches, because it is not trying to identify what a person usually does. Coping is not static, unchanged from a situation or moment to another, but characterized by flexibility: specific ways to handle stress and stressful situations change according to the demands of the situations.

The choice and use of coping strategies may, however, at least partly depend on the personality characteristics of an individual. Thus, the trait and process perspectives might also be united. Unfortunately, in the recent literature and research they appear more mixed than united. This is seen, for example, in many publications describing studies where the coping styles of various groups of people are investigated using methods developed for assessing coping processes.

In all, coping research has been, and still is, characterized by conceptual vagueness and even controversy, as shown by De Ridder (1997), for example. Therefore coping assessment methods cannot be effectively developed by trying to improve their psychometric properties only (*cf.* Parker & Endler, 1992).

ASSESSMENT

When looking at publications mentioned in the PsycINFO database 1996 to 2000, only, I found over 70 differently named coping questionnaires, of which about 30 were intended for general measures of coping styles or processes, while the rest were targeted at certain age groups or problem areas. These figures do not include direct translations of original methods into other languages. Most of the methods have a North-American origin, but a few were developed in Germany, Holland or Britain and very few in other European or Asian countries. The North-American questionnaires, especially, have often been used as (almost) direct translations in other cultures on all continents. Sometimes, at least, these translations have tried to pay more attention on specific cultural features, but basically own ('domestic') methods are rare even in Europe, or at least they have not been introduced in international publications.

The methods that are used in the studies of coping reflect certain underlying theoretical or conceptual views. For example, clinical evaluation is closely related to views on egopsychological processes, and when personality tests are used the idea of coping focuses on personality traits. If it is assumed that coping is manifested especially in behavioural reactions and activities, observation of behaviour in natural, real-life situations is needed, or at least people should be asked to tell about their behaviour in stressful situations. However, observational studies on coping seem rare, and it is also hard to find studies where subjects have freely described their coping behaviour.

In most cases coping has been studied using questionnaires based on self-evaluations. These questionnaires include either hypothetical events and situations, or situations which the subjects have really experienced. The hypothetical situations have been specified with varying accuracy. In the case of authentic, really experienced events, the subjects have usually been asked to think about the most difficult or stressful situation in their life during the preceding week, month, year or some other time span. Hence, studies of this kind have been characterized by a wide range of events to be coped with. Often it has been a question of major life events and changes, but coping behaviour in habitual everyday situations has also been examined (e.g. Stone & Neale, 1984).

The questionnaires have usually listed numerous, even dozens of, ways of coping. The subjects have had to indicate, whether, or to what extent they have used each of the ways in the situations they are thinking about. These different ways are meant to represent various coping dimensions. The styles or strategies which the more or less numerous items (ways of coping) represent may be numerous, as well. However, most often three different dimensions are proposed: task- or problem-oriented, emotion-oriented and avoidance-oriented coping.

The two most often used methods in recent research are the Ways of Coping Questionnaire (Folkman & Lazarus, 1988) and the Coping Inventory for Stressful Situations (Endler & Parker, 1990). These two methods are also those that are most often translated into various European and Asian languages. They both use factor-analytically derived scales or dimensions of coping and are much alike otherwise, as well, like most coping questionnaires in general.

The Ways of Coping Questionnaire (WCQ) is the best known coping questionnaire, originally developed by Lazarus and his colleagues over twenty years ago. It is based on earlier methods, empirical findings and Lazarus' own theory about stress and coping. Several versions of the questionnaire have been presented, but the recently most often used version comes from Folkman and Lazarus (1988). The respondent is asked to think about the most stressful event or situation in his/her life recently and to indicate, using a four-point scale (from not used to used a great deal), which of the 66 given ways of coping he/she has used in the situation. Fifty of these ways contribute to eight scales representing problem and emotion-focused coping (the others remaining as buffer items). The WCQ is meant to measure coping processes, and dynamic and changing strategies in specific situations, not coping dispositions or styles.

The Coping Inventory for Stressful Situations (CISS) includes 48 items representing three different factors (16 items for each): task-oriented coping, emotion-oriented coping and avoidance-oriented coping. The last factor may also be divided into two different factors (distraction and social diversion). The items are answered using a five-point frequency scale (from not at all to very much). Although the developers of the method acknowledge situational effects on the chosen coping strategies, the CISS is meant to assess trait-like coping styles rather than situation-specific coping processes.

The *COPE questionnaire* (Carver et al., 1989) represents a theoretically based approach to assessment of coping styles, but its developers used it also to assess situational coping strategies. Being otherwise quite similar to the factor-analytical methods, it includes 13 scales of coping, each assessed by four items (plus one one-item dimension) on a four-point scale. In later studies those scales have not received psychometric support, but that is often the case with factor-analytical methods, as well.

Table 1 summarizes the main characteristics of the above mentioned three questionnaires, while Table 2 shows a selected list of coping questionnaires including these three and a few other instruments. For other listings on varying grounds and critical evaluations of coping questionnaires,

Table 1. Characteristics of three notable questionnaires of coping styles and/or processes

	Coping Inventory for Stressful Situations	COPE Questionnaire	Ways of Coping Questionnaire
Style or Process Style		Style (Process)	Process
Basis for dimensions and/or scales	Factor-analytical	Theoretical	Factor-analytical
Dimensions	Task-oriented	Problem-focused	Problem-focused
	Emotion-oriented	Emotion-focused	Emotion-focused
	Avoidance-oriented	Avoidance	
Scales	As dimensions + avoidance divided	Active coping	Confrontive coping
	Planning		Distancing
		Suppression of competing activities	Self-controlling
	Distraction		Seeking social support
	Social diversion		
		Restraint coping	Accepting responsibility
		Seeking social support – instrumental	Escape-avoidance
		Seeking social support – emotional	Planful problem-solving
		Positive reinterpretation and growth	Positive reappraisal
		Acceptance	
		Turning to religion	
		Focus on and venting of emotions	
		Denial	
		Behavioural disengagement	
		Mental disengagement	
		Alcohol–drug disengagement*	
Number of items	48	53	50 (66)
Item scale	5-point (not at all–very much)	4-point	4-point (not at all–a lot) (not used–used a great deal)

*Includes only one item.

see e.g. De Ridder (1997), Moos and Schaefer (1993), and Parker and Endler (1992). (See also Kahana et al., 1982, for some older methods.)

Many of the most often used coping questionnaires are general measures of coping behaviour. The WCQ and CISS, for example, have been used across all age groups from school children to old persons, and also in a great variety of contexts, as a general measure of coping, as well as with problem groups of various kinds. Some instruments, on the other hand, have been developed for specific purposes, e.g. for evaluating coping in case of depression, pain, epilepsy, heart disease, hearing problems, and family problems, to name just a few. Some questionnaires, in turn, have been designed to assess coping styles or processes among children, adolescents, students, older people or other defined populations. Some of these more specific measures have been developed from the general questionnaires by modifying the items and, perhaps, adding new ones.

A number of interview methods have also been developed to study coping. However, in most cases this has involved a few open-ended interview questions (or perhaps an oral presentation of a questionnaire with some extra questions) rather than specific interview methods. The Stress in Life Coping Scale developed by Pearlin and Schooler (1978) is one of the few exceptions. It includes numerous questions for evaluating general coping responses across different areas of life, but unattached to specific life events. These questions

Table 2. Selected list of general coping questionnaires

Name and reference
COPE; Carver et al. (1989)
Coping Inventory for Stressful Situations; Endler and Parker (1990)
Coping Responses Inventory; Moos (1992)
Coping Strategy Indicator; Amirkham (1990)
Coping Styles Questionnaire; Rogers et al. (1993)
General Coping Questionnaire; Joseph et al. (1992)
Life Situations Inventory; Feifel and Strack (1989)
Mainz Coping Inventory (original German name Angstbewaeltigungs Inventar); Egloff and Krohne (1998)
Stress in Life Coping Scale; Pearlin and Schooler (1978)
Ways of Coping Questionnaire; Folkman and Lazarus (1988)

form a part of a wider structured interview concerning psychological resources, strain and coping in stressful situations. The whole method has not been used much, because it is rather laborious, and recent studies with partial use of the method are not easy to find, either.

In-depth or theme interviews to study coping have been used quite seldom, but there are some exceptions, such as the Duke Longitudinal Studies of Aging, the Bonn Longitudinal Study on Aging and the Jerusalem Longitudinal Study of Midadulthood and Aging, as well as few studies concentrating on certain specific problems. However, in most such cases the method has not been described in detail, and so it is quite difficult to evaluate the variety of interview methods used in coping studies to date.

In addition to the methods mentioned above, coping has sometimes been studied more or less indirectly by methods originally developed to examine concepts close to coping. This category includes questionnaires and other methods to evaluate, for example, activity, mood, competence, recent life events and internal vs. external locus of control. There have also been attempts to examine coping and adaptation holistically, using long and demanding interviews and a variety of different tests. Usually these techniques have been originally developed for other purposes, and are often non-repeatable in their original form to confirm the results.

The validity of the coping methods has usually not been adequately examined. The construct validity of the methods is questionable, partly because of the incoherent use of the concept of coping as well as other concepts close to it, as described above. There are problems in the external validity of the methods, as well. Many of the methods were originally used with certain age and cultural groups, and would need revalidation when used with other populations. Information on the internal consistency and test–test reliability of the method is too often missing, or indicates unsatisfactory levels. For critical evaluation of the validity and reliability issues, see De Ridder (1997), Parker and Endler (1992), and Schwarzer and Schwarzer (1996). In addition, Aldwin (1994) as well as Zeidner and Endler (1996) provide informative reading also on other important aspects of coping research.

FUTURE PERSPECTIVES AND CONCLUSIONS

In this entry, some conceptual and theoretical views on coping behaviour and various methods to study coping have been examined. These two sides of the issue include some vagueness and interrelated problems. Especially, the validity problems of the assessment methods are related to the vagueness of the concepts of coping. Both theoretical and methodological aspects need further development to guarantee sufficient consistency for valid and reliable comparisons.

During the last twenty years numerous coping-behaviour questionnaires have been used, and many of these questionnaires have sprouted various versions and modifications. The use of these self-report questionnaires is connected to an emphasis on coping processes on the theoretical side. However, if coping is seen as a process or a behavioural progress of even long duration rather than a momentary reaction, completing a coping questionnaire at one point of time cannot describe this process, but the questionnaire should be repeated a number of times during the person's possible progress toward eventual adaptation. There are very few studies which have even tried this kind of design.

Questionnaires on coping styles or processes often have notable psychometric and conceptual shortcomings. In spite of that, other methods have not been used much during the last decades. For example, projective coping methods have

been used in few studies only. On the other hand, their use is closely connected to personality assessment and the conception of coping style, which has lately been less popular in coping research than a few decades ago. Processes and styles of coping are not, however, opposite or mutually exclusive concepts but coping behaviour is probably affected both by situational factors and dispositional ways of acting and reacting. Acknowledgment of this relationship gives but more reason to try and develop more versatile assessment methods.

When designing individual or group-level coping assessments one should always carefully consider what methods to use. For example, is it wise to use a method developed in different cultural surroundings as such, or should some modifications be made, which, then again, tends to weaken comparability? Consideration is needed, and perhaps even more so, also when one decides to develop or formulate a new method, because of the huge amount of different assessment tools available already. Some of the most often used (North-American) questionnaires have been translated into many languages and used in varying cultures, but the validity of these translated versions remains often questionable and they often lack any other psychometric evaluation than internal consistency.

The criticism towards the coping assessment methods proposed above does not mean that they should not be used at all in population studies or in clinical work. It means that one should be careful when choosing assessment methods and interpreting their results, and take into account the shortcomings and problems which these methods often have. The user should be aware of the origins and intended purposes of different methods when trying to find the best one for the particular setting.

What are then the most important questions to be answered when developing coping behaviour assessment? The primary challenge and necessity may be to clarify the concept of coping, reconciling various theoretical views, not least because the differing conceptions and views affect the assessments and weaken the comparability of different studies. The psychometric properties of the assessment tools already in use and those to be developed in the future should be improved in order to gather valid and reliable information on coping behaviour. For the comparability of the coping studies it would be better if there were fewer and less diversifying methods in use. On the other hand, if coping behaviour is indeed quite contextual and affected by cultural factors, we also need methods that are sensitive to these differences in order to increase our knowledge on coping in different settings.

Does the rise of self-report questionnaires represent a desirable trend or should other kinds of methods be encouraged instead? Possible alternative methods include, at least, various interview techniques and perhaps even reintroduction of projective and semiprojective assessment tools after their relative decline since the 1970s. In clinical settings or in other individual assessment, at least, many-sided up-to-date methods are needed beside the coping questionnaires.

Furthermore, it may be asked if the assessment methods should be grounded more heavily on the specific features of varying cultural (economic, social) surroundings. At the moment, most of the coping assessment methods used all over the world are originally English and developed in North America, and they have been more or less directly translated into other languages without paying much attention to the variability of attitudes and behaviours in different cultures.

What would be the most important targets of coping research in the future? More information is needed concerning various specific situations and groups of people. Even here the list of targets could become almost endless including, for example, coping behaviour with different illnesses, varying problems in social life and interpersonal communication, challenges caused by new technologies and flood of information as well as the rapid changes of various life domains in modern times. Most coping studies so far have concentrated on young and middle-aged adults. Other age groups have been studied as well, but very little information has been obtained from the youngest as well as the oldest age groups.

One point in order to improve coping research is to reconsider whether there is any sense to label certain ways of coping as inefficient or unuseful, as such. The individual processes of coping have various phases, and sometimes even those seemingly 'bad' ways or

strategies may serve as an important link in the chain towards eventual adaptation. This notion is connected with another issue, i.e. the need to describe the coping process in detail. In one of his recent writings Lazarus (1998), being critical also toward his own coping studies and methods, has proposed that the ultimate goal of methodological development should be the ability to reveal and describe individual coping behaviour, reactions and ways to handle stressful situations, as well as inter-individual differences and intra-individual changes in these ways and reactions. Better understanding of human behaviour in stressful situations would also lend possibilities to enhance individuals' coping capacity and thus improve the quality of their life.

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RELATED ENTRIES

Personality Assessment (General), Type A: A Proposed Psychosocial Risk Factor for Cardiovascular Diseases, Type C: A Proposed Psychosocial Risk Factor for Cancer, Cognitive Styles, Emotions

COUNSELLING, ASSESSMENTS IN

INTRODUCTION

The allied fields of counselling and counselling psychology have long shared a core set of values that have sustained their scholarly and professional contributions. Recent research has identified three central commitments that distinguish the field (Neimeyer & Diamond, 2001). These include a commitment to a lifespan developmental model of adjustment (as opposed to pathology), a commitment to vocational and career issues, and a commitment to issues of diversity and multiculturalism. Each of these commitments, in turn, have clear expressions within the field's contributions to the domain of assessment.

THE ASSESSMENT OF DEVELOPMENT AND ADJUSTMENT

Conceptualizing clients' problems through a lifespan developmental model of adjustment is a central feature of the field of counselling. This commitment is reflected in the interpretation and selection of various assessment instruments. For example, Blocher (2000a, 2000b) highlights the importance of interpreting assessments within the full context of an individual's life situations. This contextual awareness encourages counsellors to conceptualize client problems in terms of adjusting to a life stage or novel environment rather than pathologizing the problem as a deficiency. Danish (1981) states that issues of adjustment occur throughout the lifespan and can be categorized in the following ways: (a) normative influences that are usually either biologically or socially determined, e.g. menopause or compulsory retirement, (b) historical influences that tend to affect all individuals within a particular generation, e.g. Vietnam War or the Civil Rights Movement, and (c) non-normative life events, e.g. loss of a job or divorce. Although there has been much theorizing about lifespan developmental models of adjustment, these considerations have not yet produced an array of assessment instruments designed for use in individual counselling (Hood & Johnson, 1997). Instead, the lifespan development framework represents a context within which various assessment tools can be understood and utilized.

While counselling psychologists strive to understand assessments within the context of the individual, there are particular assessment tools that specifically embrace the field's commitment to more normative and positive adjustment. These assessment tools provide the counsellor with information regarding individual adjustment to a particular problem or situation. Personality inventories such as the California Personality Inventory (CPI) and the Myers–Briggs Type Indicator (MBTI) accomplish this by investigating enduring interpersonal personality characteristics. These inventories contrast sharply with more pathology-based personality assessments, such as the MMPI-II, that focus assessment on aspects of pathology, dysfunction, and deficiency, rather than strengths, competencies, and capacities. Additionally, the concentration on this person–environment fit, on personal capacities and strengths, and on effective adjustment and growth are clearly reflected in the field's long-standing dedication to vocational and career assessment.

VOCATIONAL AND CAREER ASSESSMENT

Early career counselling was conceptualized as a process of helping the individual to select an appropriate career. Consequently, most assessment tools focused on aspects of trait–factor matching (e.g. matching skills or abilities to occupations). The redefining of vocational counselling as a developmental process (Super, 1957),

however, turns the attention in the field away from a focus on the choice itself, and instead towards developmental features of the person making the choices. Attention to career preparedness, uncertainty, maturity, self-efficacy, and commitment all reflect this shift towards a developmental framework.

These and many other features of career development and decision making have been operationalized in assessment instruments in the field. Kapes, Mastie, and Whitfield (1994), for example, provide a review of 52 such instruments, and Kapes and Vacha-Haase (1994) provide synoptic coverage of an additional 245 assessment measures. Despite their remarkable variation, most career assessment measures are designed to fulfil one or more of four distinct functions (Herr & Cramer, 1992): *prediction* (e.g. forecast success or satisfaction); *discrimination* (e.g. determine matching of skills and demands); *monitoring* (e.g. assess ongoing identity development); and *evaluation* (e.g. assess change or effectiveness of outcome).

Selecting the most suitable assessment tool for use can be a challenging task for the counsellor and/or his or her client. Womer (1988) has provided a practical step-by-step procedure for evaluating and choosing appropriate career counselling assessments. Prediger and Garfield (1988) provide a useful complement to this by furnishing a checklist of counsellor competencies to assist the practitioner in determining his or her own suitability to administer, score, and interpret various career assessment measures.

DIVERSITY, MULTICULTURALISM AND ASSESSMENT

Attention to issues of diversity in counselling has found a number of expressions within the fields of assessment. These include (1) attention to the evaluation and development of culturally fair instruments and (2) explicit focus on the assessment of multicultural counselling competence.

Culturally Fair Assessment

Regarding cultural fairness, the field of counselling has directed its attention to the critique and development of cultural sensitivity in relation to the assessment instruments utilized within the discipline. The *Handbook of Multicultural Counselling* (Ponterotto, Casas, Suzuki & Alexander, 1995) reflects one representative resource in this regard. This handbook articulates two primary components of diversity in assessment: culturally sensitive or adapted assessment and the assessment of multicultural counselling competencies.

A framework for assessment in multicultural counselling has been advanced by Grieger and Ponterotto (1995). This framework takes into account cultural worldviews and levels of acculturation, within both clients and their families. Levels of 'psychological mindedness', and attitudes towards helping, are critical at the individual and familial levels. Additionally, recent work by Rodriguez (2000) identifies a range of culturally sensitive assessment instruments that are currently available in the field. These include intelligence tests (e.g. Wechsler Intelligence Scale for Children – Third Edition, and Woodcock–Johnson Psycho-Educational Battery – Revised) and non-verbal instruments (e.g. the Test of Nonverbal Intelligence – Third Edition, and The Leiter International Performance scale). In addition, alternate assessment strategies are utilized to accommodate cultural differences. These strategies include suspending time limits, contextualizing vocabulary, encouraging use of paper and pencil on arithmetic tests, clients target performances on tasks more familiar to the mainstream culture. The collective goals of efforts in this field are to examine and establish 'culturally fairness' in assessment in order to support the counsellor's overall dedication to cultural competence in the process of counselling.

The Assessment of Cultural Competence

The need for culturally sensitive assessment has also extended to the assessment of the counsellor's own multicultural competencies, as well. Rodriguez (2000) notes specific standards of culturally competent counsellors. These standards include (1) continued awareness and development of culturally sensitive assessment theories and (2) a thorough understanding of the instruments accessible for diverse populations. Ponterotto, Rieger, Barrett, and Sparks (1994)

provide a review of four different assessment instruments created to assess the cultural competence of counsellors. The first assessment measure, the Cross-Cultural Counselling Inventory – Revised, is based on 11 discrete cross-cultural counselling competencies. The second measure is the Multicultural Counselling Awareness Scale-Form B: Revised Self Assessment, which measures multicultural knowledge/skills and awareness. Third, the Multicultural Counselling Inventory is an instrument that measures multicultural counselling competence according to four categories: skills, awareness, knowledge, and the counselling relationship. And fourth, the Multicultural Awareness–Knowledge-and-Skills Survey is used in counsellor training programmes to assess the effect of instructional strategies on students' multicultural counselling development.

This work is complemented by related efforts in the field to develop models of racial and cultural identity development (Helms, 1990) and associated assessment instruments. Importantly, this work has been extended towards identifying the ways in which a counsellor's own identity development relates to the development of professional competencies in multicultural counselling contexts (Vinson & Neimeyer, 2000).

In sum, issues of diversity constitute an important expression of the counselling field's commitment to multiculturalism. This commitment finds expression both in the ongoing need for the development of culturally relevant assessment tools, and in sustained self-reflection regarding the counsellor's own cultural awareness and multicultural skills (Gill & Bob, 1999).

FUTURE PERSPECTIVES AND CONCLUSIONS

Explicit attention to issues concerning the field's future has been the subject of recent empirical research. Neimeyer and Norcross (1997), for example, have identified specific predictions associated with future directions in the area of counselling and counselling assessment. Together with the results of systematic Delphi Polling (Neimeyer & Diamond, 2001), this work suggests continued attention to the three themes identified in this entry. This likelihood is further enhanced by related developments in allied fields, such as the renewed interest in 'positive psychology' and models of growth and development, technological advances in computer-assisted career assessment, and the inclusion of diversity as a core domain in the accreditation of counselling training programmes.

The field of counselling supports a broad array of interests and instruments in relation to the area of assessment. Distinctive contributions are marked by the field's ongoing commitment to models of growth and development, to a sustained focus on career and vocational issues, and on an enduring commitment to issues of diversity. Each of these areas, in turn, has spawned a wide assortment of assessment instruments designed to maximize the effectiveness of the work that is done between counsellors and their clients across a broad domain of professional practice.

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RELATED ENTRIES

Applied Fields: Clinical, Applied Fields: Education

COUPLE ASSESSMENT IN CLINICAL SETTINGS

INTRODUCTION

The process for assessing couples is both quantitatively and qualitatively distinct from that for assessing individuals. With couples one has not only both partners to evaluate, but also the patterns of interaction that define their relationship. Whereas persons pursuing individual therapy typically acknowledge some culpability for their distress and assume at least token responsibility for change, partners entering couple therapy often attribute greater responsibility for relationship difficulties and burden for change to each other. A unique advantage to assessing couples is the opportunity to observe directly many of the patterns of communication and interaction that partners describe as problematic.

A CONCEPTUAL MODEL FOR ASSESSING COUPLES

Snyder and colleagues (Snyder, Cavell, Heffer & Mangrum, 1995) advocated a comprehensive model for directing and organizing assessment strategies for couples and families. They proposed five construct domains: (a) cognitive, (b) affective, (c) behavioural and control, (d) structural/developmental, and (e) communication and interpersonal. Constructs relevant to each of these domains can be assessed at each of the multiple levels comprising the psychosocial system in which the couple or family functions: (a) individuals, (b) dyads, (c) the nuclear family, (d) the extended family and related social systems, and (e) the community and cultural systems. Each of the five target domains may be

assessed with varying degrees of relevance and specificity across each of the five system levels using both formal and informal assessment approaches to self-report and observational techniques.

SPECIFIC ASSESSMENT STRATEGIES

The Clinical Interview

The initial clinical interview serves as a means for obtaining important information, informally observing partners' communication patterns, and establishing a collaborative alliance for subsequent interventions. Snyder and Abbott (2002) advocated an extended initial assessment interview lasting about two hours in which the following goals are stated at the outset: (a) first getting to know each partner as an individual separate from the marriage; (b) understanding the structure and organization of the marriage; (c) learning about current relationship difficulties, their development, and previous efforts to address these; and (d) reaching an informed decision together about whether to proceed with couple therapy and, if so, discussing respective expectations.

L'Abate (1994) recommended attending to the following questions when conducting the initial interview: What types of communication and relational patterns exist between partners? To what degree have partners been able to develop a coalition enabling them to set goals, solve problems, negotiate conflicts, handle crises, and complete individual and family developmental tasks? To what extent have the partners and extended family members been able to negotiate mutually acceptable patterns of separateness and connectedness? To what extent are members emotionally supportive of each other? What are the recurrent themes in the marriage and the extended family? Information regarding transgenerational family structures, dynamics, and critical family events potentially influencing family members' interactions with one another can be graphically depicted using the family genogram method (McGoldrick, Gerson & Shellenberger, 1999).

Observational Approaches

More than 30 years of observational research indicate that distressed couples: (a) are more hostile; (b) start their conversations with greater hostility and maintain more hostility during the course of conversation; (c) are more likely to reciprocate and escalate their partner's hostility; (d) are less likely to edit their behaviour during conflict, resulting in longer negative reciprocity loops; (e) emit less positive behaviour; and (f) are more likely to show 'demand → withdraw' patterns (Heyman, 2001). These findings affirm the importance of integrating 5–10 minute observations of non-structured problem-solving discussions without therapist intervention into the initial assessment process. How does the conversation start? Does the level of anger escalate, and what happens when it does? Do the partners enter repetitive negative loops? Are the couple's communication patterns consistent across different domains of conflict?

Partners' communication exchanges can be subjected to various systems for coding verbal and non-verbal behaviour (for reviews see Sayers & Sarwer, 1998; Snyder & Abbott, 2002). The most widely used of these is the Marital Interaction Scoring System (MICS) that includes 37 codes of both verbal and non-verbal behaviours such as criticism, disagreement, negative affect, problem description, acceptance of responsibility, agreement, and humour. An abbreviated adaptation of the MICS designated as the 'rapid-MICS' (RMICS) reduces these codes to 9 and has demonstrated both reliability and discriminant validity.

Self-Report Techniques

The use of self-report measures in couples assessment is based on the rationale that such techniques: (a) are convenient and relatively easy to administer, obtaining a wealth of information across a broad range of issues germane to clinical assessment or research objectives; (b) allow disclosure about events and subjective experiences respondents may be reluctant to discuss; and (c) provide important data concerning internal phenomena opaque to observational approaches including values and attitudes, expectations and attributions, and satisfaction and commitment. However, self-report measures also

exhibit susceptibility to efforts to bias self- and other-presentation in either a favourable or unfavourable manner, and typically provide few finegrained details concerning moment-to-moment interactions.

Published measures for assessing couples and families number well over 1000, although few have achieved widespread adoption. Several comprehensive sourcebooks regarding self-report marital and family measures are available (e.g. Touliatos, Perlmutter & Straus, 1990), as are pragmatic reviews and recommendations regarding selected measures for clinical use (e.g. Sayers & Sarwer, 1998; Snyder & Abbott, 2002).

Self-report measures of couples' *behaviour* emphasize specific behaviour exchanges, communication, verbal and non-verbal aggression, and the sexual relationship. Exemplars in this domain include the Spouse Observation Checklist (SOC) and Areas of Change Questionnaire (ACQ). Such measures of behaviour exchange typically ask each partner to indicate which behaviours their partner had emitted or the couple had participated in over some specified time period and to rate these as either pleasing or displeasing. Measures vary in their length and the extent to which they group behaviours into discrete categories (e.g. affection, companionship, communication, parenting, household tasks). Partners' responses serve to delineate relative strengths and weaknesses in the relationship and can be used as a basis for articulating specific requests and for generating behaviour exchange agreements.

Measures of partners' *cognitions* emphasize couples' assumptions, standards, expectancies, and attributions for relationship events. For example, the Dyadic Attributional Inventory (DAI) asks respondents to imagine hypothetical marital events and then, for each event, generate explanations for their partner's behaviour in that situation. The intent of such measures is to assist in identifying and modifying dysfunctional attributional sets contributing to subjective negativity. Related cognitive measures such as the Relationship Beliefs Inventory (RBI) examine unrealistic relationship assumptions or beliefs about marriage – for example, that disagreements are necessarily destructive or that spouses should know each other's feelings and thoughts without asking.

Measures of relationship *affect* or satisfaction abound. Some (e.g. the Kansas Marital Satisfaction Scale; KMSS) are as brief as 3–4 items that ask partners to rate their overall satisfaction with their relationship. A more widely used global measure in marital research is the 32-item Dyadic Adjustment Scale (DAS) assessing relationship cohesion, satisfaction, consensus, and affectional expression. Other multidimensional measures are far more extensive and are designed to identify both the nature and intensity of relationship distress in distinct areas of interaction. One such measure widely used in both research and clinical settings is the Marital Satisfaction Inventory – Revised (MSIR; Snyder, 1997), a 150-item inventory that includes two validity scales, one global scale, and ten specific scales assessing relationship satisfaction in such areas as affective and problem-solving communication, aggression, leisure time together, finances, the sexual relationship, role orientation, family of origin, and interactions regarding children.

FUTURE PERSPECTIVES

Future developments in couple assessment are likely to focus on three objectives. First, increasing attention needs to be placed on the psychometric adequacy of both self-report and observational techniques, something that to date has been sorely lacking (Snyder & Rice, 1996). Second, both clinical and empirical evaluation of optimal assessment strategies needs to be conducted. The current preferred strategy is to adopt a semi-structured clinical interview with informal observation of couples' communication, followed by a self-report strategy adopting a multidimensional measure or set of measures that differentiate among levels and sources of relationship distress. Areas of individual or relational distress revealed by these approaches can then be assessed further using structured observations or narrow-band self-report techniques with clear evidence of reliability and validity. Third, the clinical utility of specific assessment strategies needs to be evaluated by examining guidelines for linking findings to treatment and observing their differential impact on outcome.

CONCLUSIONS

Couple therapists and researchers face a vast array of measurement techniques intended to assess relevant behaviours, cognitions, affect, and patterns of interaction relevant to couples' concerns. A constructive assessment strategy is one guided by well-formulated conceptual models of assessment and treatment, use of assessment techniques with demonstrated psychometric adequacy as well as clinical utility, and an explicit case formulation that links assessment findings to clinical intervention. Specific assessment strategies – whether they emphasize informal or structured self-report or observational methods – should complement one another in serving dual purposes of generating information and helping the couple to construct a more optimistic formulation of their current difficulties, how they came about, and how they can be remedied.

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RELATED FIELDS

Applied Fields: Clinical, Child Custody

CREATIVITY

INTRODUCTION

Creativity is usually defined as the capacity to generate ideas that are jointly original and adaptive. Original ideas are those that have a low statistical likelihood of occurring in the population, whereas adaptive ideas are those that satisfy certain scientific, aesthetic, or practical criteria. An idea that is original but maladaptive is more likely to be considered a sign of mental disturbance than creativity, while an idea that is adaptive but unoriginal will be dismissed as mundane or perfunctory rather than creative. Although almost universal consensus exists on this abstract definition of the phenomenon, much less agreement is apparent regarding how best to translate this definition into concrete instruments or tests.

TESTS

Psychologists wishing to assess individual differences in creativity have a tremendous range of instruments to choose from. Therefore, before investigators can settle on any single test or battery of tests, it is first necessary that they address four major questions:

1 What is the age of the target population? Some measures are specifically designed for

school-age populations, whether children or adolescents, whereas other measures are targeted at adult populations.

2 Which domain of creativity is to be assessed? Not only may creativity in the arts differ substantially from creativity in the sciences, but also there may appear significant contrasts within specific arts (e.g. music vs. literature) or sciences (e.g. mathematics vs. invention).

3 What is the magnitude of creativity to be evaluated? At one extreme is everyday problem-solving ability ('little c' creativity) where at the other extreme is eminent creativity that earns awards and honours appropriate to the domain ('Big C' Creativity, or genius).

4 Which manifestation of creativity is to be targeted? That is, the investigator must decide whether creativity manifests itself primarily as a product, a process, or a person. Some instruments postulate that creativity takes the form of a concrete product, others assume that creativity involves a particular type of cognitive process, while still others posit that creativity entails a personal disposition of some kind.

Of these four questions, it is the last that is perhaps the most crucial. Assessment strategies differ dramatically depending on whether creativity is best manifested as a product, process, or person. As a consequence, the description of creativity measures that follows will be divided into three subsections.

Product Measures

Ultimately, a creative idea should take some concrete form, such as a poem, story, painting, or design. Hence, one obvious approach to creativity assessment is to measure the quantity or quality of productive output. A case in point is the Consensual Assessment Technique devised by Amabile (1982). Here a research participant is asked to make some product, such as a collage or a poem, which is then assessed by an independent set of experts. This technique has proven especially useful in laboratory experiments on the social circumstances that are most likely to favour creative behaviour. However, this approach has at least two disadvantages. First, the creativity of an individual is decided according to performance on a single task. Second, the assessment is based on a task that may not be representative of the domain in which the individual is most creative. For instance, a creative writer will not necessarily do well on a task in the visual arts, such as making collages.

An alternative is to assess individual differences in creativity according to products that the person has spontaneously generated. For example, the Lifetime Creativity Scales assess creative behaviour by asking participants to self-identify examples of their own creative achievements (Richards et al., 1988). According to this approach, creativity assessment is based on multiple products in the domain that the individual finds most germane to personal creative expression. Although this instrument has proven validity and utility, it can be objected that a product's creativity requires an external assessment, such as that provided in the Consensual Assessment Technique. Furthermore, this instrument is clearly aimed at everyday creativity rather than creative output that is highly valued professionally or socially.

One way to assess such Big-C Creativity is to use some variety of productivity measure. Thus, the creativity of scientists may be gauged by journal articles, that of inventors by patents. Often such measures of pure quantity of output are supplemented by evaluations of quality. For example, the quality of a scientist's productivity may be assessed by the number of citations to his or her work. Another approach is to assess creative impact in terms of awards and honours received or the evaluations of experts in the field – a tactic that dates back to Francis Galton (1869). One especially innovative strategy is Ludwig's (1992) Creative Achievement Scale, which provides an objective approach to evaluating a creator's life work. This scale has proven useful in addressing the classic question of whether exceptional creativity is associated with some degree of psychopathology (the 'mad-genius' debate).

Process Measures

One major drawback of all product measures of creativity is that they appear barren of truly psychological content. These measures stress outward behaviour and its impact rather than

internal mental states. Yet presumably there exists some special thought processes that underly these creative products. Accordingly, psychologists can instead devise instruments that tap into these crucial processes. For example, Mednick (1962) theorized that creativity requires the capacity to generate remote associations that can connect hitherto disparate ideas. He implemented this theory by devising the Remote Association Test, or RAT, that has seen considerable use in subsequent research. A person taking the RAT must identify a word that has an associative linkage with three separate stimulus words (e.g. associating the word 'chair' with the given words 'wheel, electric, high').

An even more popular set of measures was devised by Guilford (1967) in the context of his multidimensional theory of intelligence. These measures assess various kinds of *divergent thinking*, which is supposed to provide the basis for creativity. Divergent thinking is the capacity to generate a great variety of responses to a given set of stimuli. Unlike *convergent thinking*, which aims at the single most correct response, ideational productivity is emphasized. A specific instance is the Unusual Uses test, which asks research participants to come up with as many uses as possible for ordinary objects, such as a toothpick or paperclip. The participants' responses can then be scored for fluency (number of responses), flexibility (number of distinct categories to which the responses belong), and originality (how rare the response is relative to others taking the test).

Although the foregoing measures were initially conceived for assessing creativity in adults, comparable measures have been devised for use with children and adolescents. Indeed, such measures have become especially commonplace in educational settings. Probably the most well-known instruments for this purpose are the Torrance Tests of Creative Thinking (Torrance, 1966; see also Crammond, 1994). Although designed to assess creativity in the early developmental years, these tests have been shown to have long-term predictive validity well into adulthood.

Person Measures

Process measures of creativity operate under the assumption that creativity requires the capacity to engage in somewhat distinctive cognitive processes. Not all psychologists agree with this position. In the first place, often performance on process instruments can be enhanced by relatively straightforward training procedures, and sometimes performance enhancements can occur by changing the instructional set when administering the test (i.e. the command to 'be creative!'). In addition, creative individuals appear to have distinctive non-cognitive characteristics that set them apart from persons who fail to display creativity. This has led some psychologists to propose that creativity be assessed by person-based measures.

The most frequently used instruments assess creativity via the personality characteristics that are strongly correlated with creative behaviour. These personality assessments are of three kinds. First, the assessment may simply depend on already established scales of standard tests, such as the Minnesota Multiphasic Personality Inventory or Eysenck's Personality Questionnaire. These measures will tend to yield the lowest validity coefficients. Second, the assessment may be based on the construction of a specialized subscale of an already established personality test. For instance, Gough (1979) devised a Creative Personality Scale from his more general Adjective Check List. Third, the assessment may rely on a measure that is specially constructed to gauge individual differences in creative personality. An example is the How Do You Think questionnaire that gauges whether a person has the interests, values, energy, self-confidence, humour, flexibility, playfulness, unconventionality, and openness associated with creativity (Davis, 1975).

An alternative person-based approach is predicated on the assumption that creative potential emerges by means of a particular set of developmental experiences. These experiences may reflect either genetic predilections (nature) or acquired inclinations (nurture). For example, Schaefer and Anastasi (1968) designed a biographical inventory that identifies creativity in adolescent boys (see also Schaefer, 1970). The items tap such factors as family background, school activities, and extracurricular interests. Moreover, the inventory discriminates not only creative from non-creative adolescents but also between scientific and artistic creativity. Similar biographical inventories have been devised for both children and adults.

Table 1. Summary table of representative creativity measures

Product Measures	Consensual Assessment Technique (Amabile, 1982)
	Lifetime Creativity Scales (Richards et al., 1988)
	Creative Achievement Scale (Ludwig, 1992)
Process Measures	Remote Associates Test (Mednick, 1962)
	Unusual Uses Test (Guilford, 1967)
	Torrance Tests of Creative Thinking (Torrance, 1966; Crammond, 1994)
Person Measures	Creative Personality Scale of the Adjective Check List (Gough, 1979)
	How Do You Think Inventories (Davis, 1975)
	Biographical Inventory – Creativity (Schaefer, 1970; Schaefer & Anastasi, 1968)

The above list by no means exhausts the inventory of tests that purport to measure creativity. The instruments listed were merely chosen as representative of the various types of tests that have been developed since the 1960s. For a more detailed inventory, see Hocevar and Bachelor (1989).

FUTURE PERSPECTIVES

Ideally, scores on the diverse creativity measures should intercorrelate so highly that all alternative instruments could be said to assess the same underlying latent factor. The various measures can then be said to display convergent validity. Yet many empirical studies have found that alternative instruments often fail to converge on a single, psychometrically cohesive dimension. Even worse, many measures seem to lack divergent validity as well. For instance, some of the process-type instruments exhibit unacceptably high correlations with scores on intelligence tests. These correlations have driven some researchers to question whether creativity can be reliably separated from the problem-solving ability associated with general intelligence (i.e. 'Spearman's *G*'). In contrast, other creativity researchers have advocated more positive conclusions, believing that there indeed exists a subset of instruments that have the desired convergent and divergent validity – as well as the requisite predictive validity. Whether this optimistic position will receive empirical justification in future research remains to be seen.

CONCLUSIONS

Clearly, psychologists who want to assess creativity must confront a tremendous number of alternative creativity measures. Not only do the various instruments differ in their respective reliabilities and validities, but also the alternative measures are often based on rather contrary conceptions about what has to be measured. Even within a single approach there is available several rival measurement tools. Thus, the person-type measures include both biographical inventories and personality questionnaires, and the latter may be subdivided into more than one kind. Complicating matters even more, the choice of instrument is contingent on such criteria as the age of the target population, the domain of creativity involved, and the magnitude of creativity to be assessed. Creativity assessment is no easy task, and may even require some creativity.

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RELATED ENTRIES

Intelligence Assessment (General), Personality Assessment (General), Applied Fields: Education

CRITERION-REFERENCED TESTING: METHODS AND PROCEDURES

INTRODUCTION

Criterion-referenced tests are constructed to allow users to interpret examinee test performance in relation to well-defined domains of content and/or behaviours. Normally, performance standards are set on the test score reporting scale to permit examinee test performance to be classified into performance categories such as below basic, basic, proficient, and advanced. Criterion-referenced tests are well suited for many of the assessment needs that exist in education, the professions, the military, and industry. Today, criterion-referenced tests are called by many names – domain-referenced tests, competency tests, basic skills tests, mastery tests, performance tests, authentic assessments, objectives-referenced tests, and more. In different contexts, test developers and users have adopted these different names. For example, in school contexts, the term 'mastery testing' is common. When criterion-referenced tests are developed to model classroom activities or exercises, the term 'authentic test' is sometimes used. When criterion-referenced tests consist of many performance tasks, the terms 'performance test' or 'performance assessment' are used. Regardless, all of these terms refer to a type of assessment where what examinees know and can do is estimated, and often performance standards are used for interpreting examinee performance.

This entry has been divided into three sections. First, the most important criterion-referenced testing concepts will be presented. Second, criterion-referenced tests will be compared to norm-referenced tests. Finally, some conclusions and predictions about the future for criterion-referenced tests will be offered.

KEY CRITERION-REFERENCED TESTING CONCEPTS

Defining Content Domains

When this approach to assessment was introduced by Glaser (1963) and Popham and Husek (1969), criterion-referenced tests were constructed to assess a set of behavioural objectives. Over the years, it became clear that behavioural objectives did not have the specificity needed to guide instruction or to serve as targets for test development and test score interpretation (Popham, 1978). Numerous attempts were made to increase the clarity of behavioural objectives including the development of detailed domain specifications that included a clearly written objective, a sample test item or two, detailed specifications for appropriate content, and details on the construction of relevant assessment materials (see Hambleton, 1998). Domain specifications seemed to meet the demand for clearer statements of the intended targets for assessment but they were very time-consuming to write and often the level of detail needed for good assessment was impossible to achieve for

higher order cognitive skills, and so test developers found domain specifications to be limiting.

Recently the trend in criterion-referenced testing practices has been to write objectives focused on the more important educational outcomes (fewer instructional and assessment targets seem to be preferable) and then offer a couple of sample assessments, preferably samples that show the diversity of approaches that might be used for assessment (Popham, 2000). Coupled with these looser specifications of the objectives is an intensive effort to demonstrate the validity of any assessments that are constructed.

Writing Valid Test Items

The production of valid test items, that is test items that provide a psychometrically sound basis for assessing examinee level of proficiency or performance, require (1) well-trained item writers, (2) item review, (3) field testing, and (4) the use of multiple item formats. Well-trained item writers are persons who have had experience with the intended population of examinees, know the intended curricula, and have experience writing test items using a variety of item formats. Item review often involves checking test items for their validity in measuring the intended objectives, their technical adequacy (that is, being consistent with the best item writing practices), and ensuring items are free of bias and stereotyping. Field-testing must be carried out on samples large enough to provide stable statistical information and representative of the intended population of examinees. Unstable and/or biased item statistical information only complicates and threatens the validity of the test development process. And, finally, one of the most important changes today in testing is the introduction of new item formats, formats that permit the assessment of higher level cognitive skills (see Zenisky & Sireci, in press).

Setting Performance Standards

Perhaps the most difficult step in the criterion-referenced testing process is the setting of performance standards. Ultimately, this process is judgemental, and the goal is to create a framework in which judgements provided by panellists lead to reliable and valid ratings and ultimately reliable and valid performance standards. Many factors about the standard-setting process have changed over the years (for an excellent up-to-date review, see Cizek, 2001). For one, more emphasis today is given to the selection and training of panellists to set the performance standards. Panellists need to be representative of the appropriate stake-holder groups, and be thoroughly trained in the method being implemented. Second, detailed descriptions of the performance categories are being set. These are needed to provide the framework for panellists to make meaning judgements about the performance standards. Third, new methods for standard-setting have emerged for use with criterion-referenced tests, but research remains to be done to determine the most valid ways in which these methods can be implemented. Cizek (2001) describes a number of these new methods including the book-mark method, the body-of-work method, the analytic judgement method, and more. Fourth, the topic of feedback to panellists has become very important. How much and what kind of information do panellists need to set valid standards: information about their own consistency over items and over rounds of ratings; their agreement with other panellists; their consistency with empirical evidence about the test items and the examinees?

Assessing Reliability and Validity

Criterion-referenced test scores are used to assign examinees to performance categories. It is obvious then that reliability of test scores is less important than the reliability of the classifications of examinees to performance categories. This point is well-accepted in the criterion-referenced testing field (see Hambleton, 1998). But it is difficult, if not impossible, in practice to administer parallel forms (or even a retest) of a criterion-referenced test to assess the consistency with which examinees are assigned to performance categories. What have evolved then are single-administration estimates of decision consistency for criterion-referenced tests when items are scored 0–1, and there are two performance

categories (Hambleton, 1998) and single-administration estimates of decision consistency when items are polytomously scored (i.e. more than two score categories are used per test item) and when more than two performance categories are used (see, for example, Livingston & Lewis, 1995). Both statistical procedures for obtaining single administration estimates of decision consistency involve strong true score modelling of the available data to obtain the estimates.

Validity assessment might focus on the relationship between classifications made on the basis of the test scores and classifications or performance ratings provided external to the test (e.g. teacher ratings, or job performance ratings). Other evidence to support the score inferences from a criterion-referenced test can come from the compilation of content, criterion-related, and construct validity evidence. See the AERA, APA, and NCME (1999) Test Standards for guidance.

Documenting the Technical Adequacy of a Test

The American Educational Research Association (AERA), American Psychological Association (APA), and the National Council for Measurement in Education (NCME) *Test Standards* (AERA, APA & NCME, 1999) make very clear that a test developer's job is not completed with the administration of his/her test. A major initiative is needed to compile the relevant procedural and technical information to document the usefulness of the test for achieving particular purposes. To quote the *Test Standards*, 'Test documents need to include enough information to allow test users and reviewers to determine the appropriateness of the test for its intended purposes' (AERA, APA & NCME, 1999: 67).

DIFFERENCES BETWEEN CRITERION-REFERENCED AND NORM-REFERENCED TESTS

Criterion-referenced tests are sometimes incorrectly assumed to be very similar to norm-referenced tests. It has been said, incorrectly, that these two types of tests are really no different, and both criterion-referenced tests and norm-referenced tests are constructed in the same way. The only difference is the way in which the test scores are used. It is certainly true that scores from criterion-referenced tests and norm-referenced tests are used differently – criterion-referenced test scores are used to interpret examinee performance in relation to well-defined content areas and to make performance classifications. Norm-referenced test scores are used in comparing examinees on the construct that is measured by the test. Percentile norms, grade norms, age norms, and standard-score norms are all very popular and in common use. But these fundamental differences in test score interpretations have serious implications for the development and evaluation of criterion-referenced and norm-referenced tests. Criterion-referenced tests and norm-referenced tests differ in three important ways.

First, criterion-referenced tests require very precise definitions of the content to be measured. How else can content-referenced interpretations of scores be possible? With norm-referenced tests, content specifications are important because they impact on their construct validity. At the same time, the level of detail need not be as great because content-referencing of norm-referenced test scores is not done, and if it is done, this type of interpretation is only of secondary importance.

Second, with criterion-referenced tests, precise matching of test items to the content being measured is very important, and test items are chosen because of their content validity. Item statistics are important in identifying flaws in test items such as two correct answers or non-functioning distractors but items are selected because of judgemental and statistical evidence that they provide a basis for assessing the objectives of interest. When item statistics are used, it may be to assist in building tests that can maximize the precision of scores in and around the performance standards. In this way, decision consistency and decision accuracy can be increased by reducing measurement errors for examinees near the performance standards. In contrast, with norm-referenced tests, item match to the content specifications for the test is important, though not to the same degree, and most importantly, item statistics often play a critical role in item selection. In general, items with moderate difficulty levels and high levels of

discriminating power, along with the appropriate content characteristics, are chosen to produce a test with a desired mean, and to maximize test score variance and test score reliability.

Finally, criterion-referenced tests and norm-referenced tests are judged against different criteria. For criterion-referenced tests, the consistency with which examinees are assigned to performance categories (e.g. below basic, basic, proficient, and advanced) and the accuracy of these classifications (that is, the consistency between performance classifications made based on test scores, and classifications based on an independent criterion) are important. Norm-referenced tests are judged based on a consideration of classical reliability estimation (e.g. test–retest, parallel-form, and internal consistency estimates of reliability) and criterion-related validation. Content and construct validation evidence is normally important for both criterion-referenced and norm-referenced tests.

In summary, it might be said that criterion-referenced and norm-referenced tests share many common features; for example, they often use similar test directions and similar item formats. On the other hand, since the purposes are fundamentally different, there are important differences in the ways the test content is specified for each, and the ways these two types of tests are constructed and evaluated.

FUTURE PERSPECTIVES AND CONCLUSIONS

The number of criterion-referenced tests being constructed today is substantial. These tests are being used in (1) the diagnosis of individual skills, (2) the evaluation of learning and achievement, (3) programme evaluation, and (4) credentialling. There is simply no shortage of situations where there is interest in assessing what examinees know and can do, and interpreting criterion-referenced test scores in relation to levels of expected or desired performance. But criterion-referenced testing continues to change – more focus is being placed on the definition and clarification of constructs to be measured (without clarity of content domains, neither instruction nor test development can be done well), more item formats are being used in the tests (whereas 20 years ago multiple-choice items were common, today item formats extend to many variations of performance assessments), and more technical sophistication is being applied in the setting of performance standards and the assessment of reliability and validity (Hambleton, 1994).

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RELATED ENTRIES

Achievement Testing, Classical and Modern Item Analysis, Performance Standards: Selected Response Item Formats, Performance Standards: Constructed Response Item Formats, Validity: Criterion-Related, Theoretical Perspective: Psychometrics

CROSS-CULTURAL ASSESSMENT

INTRODUCTION

Cross-cultural assessment refers to the use of assessment procedures with testees from different cultural backgrounds. Various instances can be distinguished: (i) an existing procedure is used in another country than the one in which it was originally designed, (ii) individuals within a single country differ from each other in ethnic or cultural background, or (iii) testees currently living in different countries take part in the same assessment procedure. Underlying all these forms of cross-cultural assessment are certain issues about the cross-cultural comparability or equivalence of test scores. These are briefly discussed in the first section. In the second section some traditions of cross-cultural test use are mentioned with a view to evaluate how serious the threats are to meaningful and valid cross-cultural assessment.

EQUIVALENCE ISSUES

Suppose a second generation migrant takes a test of word knowledge in a language that is not the home language of the parents. Then the question arises whether the obtained score is affected by the home language of this testee, and whether this is relevant for the interpretation of the score. Common sense tells us that the score can be a valid indicator of the current level of skill or achievement, but that it is likely to give a biased impression of the testee's language abilities, and about the testee's intellectual capacities in case the word knowledge test is part of an intelligence battery. This example shows that scores on one and the same instrument can be used to make inferences or generalizations about more than a single trait.[1]

If persons from different cultural backgrounds, who have the same test score, do not have the same standing on the trait to be assessed, the instrument concerned is called biased or inequivalent. Thus, it often depends on the generalization whether or not scores are biased for testees belonging to a certain cultural population. A definition in which this is taken into consideration is the following: cultural biasedness or inequivalence implies that an observed difference between two cultural groups on a score variable is not matched by a corresponding difference in respect of the trait in terms of which the scores are interpreted.

From the 1960s cultural bias or inequivalence began to be addressed as a psychometric issue. Initially the focus was very much on item bias; items that were unexpectedly difficult for a new cultural group, to which a test was applied, were identified as biased and removed from the instrument. Gradually awareness increased that inequivalence is a more comprehensive issue (e.g. Malpass & Poortinga, 1986; Poortinga & Malpass, 1986). A framework for the analysis of cultural equivalence (or absence of bias) has been described by Van de Vijver and Leung (1997; Van de Vijver & Poortinga, 1997). They distinguish three levels of equivalence that are hierarchically ordered:

(i) structural or functional equivalence; viz., a test measures the same trait (or set of traits) cross-culturally.
(ii) metric or measurement unit equivalence; viz., differences between scores have the same meaning across cultures; the metric of the score variable is the same.
(iii) scale equivalence or full score equivalence; viz., scores have the same meaning cross-culturally and allow identical (quantitative) interpretations in terms of norms or criteria.

The general consequence of all forms of bias is that they make the scores of a test in some way incomparable across the cultural populations concerned. The test user or test author has to show that scores are not affected by bias

(Poortinga & Malpass, 1986). This is done by demonstrating that scores meet certain conditions of invariance of relationships cross-culturally. The remainder of this section gives examples of various levels of bias and how these can be identified.

Before the translation of a test, a panel of judges can examine the content validity of the items for the new cultural context. It is considered part of the translation of a test that the identity of linguistic meaning is being checked. However, most analyses of equivalence are carried out after data sets from different cultures have been obtained.

A first set of controls pertains to the question whether the same trait is measured in the various cultural groups. Bias occurs, if important aspects of the relevant trait are not included in the test, or somehow misrepresented. An example is the notion of being smart or clever, which in African societies much more than in Western countries appears to be associated with positive social behaviour. Another example is found in an analysis of Kagitcibasi (1970) who found that components of authoritarianism on an American scale showed lower intercorrelations in Turkey than in the USA, suggesting that the scale had a different meaning in Turkey. Needless to say, if a test or scale does not measure the same trait, cross-culturally, any comparison of scores is meaningless; it amounts to comparing apples with pears.

Relevant information can be obtained by examining structural relationships between item variables or (if there is a set of tests referring to a nomological network) between test score variables. This is called analysis of structural equivalence (Van de Vijver & Leung, 1997). For equivalent tests such structural relationships should be invariant. Usually this is taken to imply that correlations between variables should be equal across cultures. In practice it is usually not the similarity between correlation matrices that is determined, but the similarity of factor structures. The most common statistic to assess this similarity is Tucker's [phi]; values larger than 0.90 are seen as evidence that the same traits are being assessed cross-culturally.

A second level of inequivalence distinguished by Van de Vijver and Leung (1997) is called metric equivalence. This form of equivalence implies that quantitative differences between individual scores have the same meaning in different countries. An example of metrically equivalent scales is the Kelvin and Celsius scales. Both are measures of temperature and a difference of a certain numerical value has the same meaning everywhere, but an identical value on these two scales has quite a different meaning. In a similar sense the same word knowledge score of migrant and non-migrant testees may reflect different levels of underlying verbal ability. And cultural differences in the emphasis on speed versus accuracy may lead to differences on speeded tests that are not found on power tests. Still another example concerns unequal effects across groups of response styles. Van Herk (2000) found evidence for a systematic tendency towards higher scoring on item response scales in representative samples from Greece, and to a lesser extent Italy, than in Western European countries.

There are no clear traditions for the analysis of the numerous sources of metric inequivalence (Van de Vijver & Tanzer, 1997). Since most of them tend to affect all the items of an assessment procedure to a similar extent, psychometric conditions to rule out metric equivalence depend on some external standard, or repeated administration of the instrument under different conditions or with different samples. For example, suspected effects of social desirability can be evaluated by the use of a separate scale for social desirability, and effects of speededness can be identified by allowing extra time to an experimental group. All in all, test users and test authors should realize that it is virtually impossible to rule out all of the many possible, and even plausible, sources of bias leading to metric inequivalence.

Most controls concern scale equivalence or full score comparability, i.e. the state of affairs where a test score has the same meaning in terms of the intended trait independent of the cultural background of the testee. Sometimes these controls are in the form of an extension of analyses for structural equivalence. Structural equation models like LISREL allow an ordered sequence of tests examining increasingly strict conditions, including aspects of scale equivalence as well as structural equivalence (Marsh & Byrne, 1993).

An important set of control procedures for scale equivalence are directed at finding evidence of item bias, also called *differential item*

functioning (DIF). In these analyses the other items on a test are taken as a standard against which the target item is evaluated. The general condition for equivalence is, then, that testees with the same test score, independent of culture, should have the same expected item score. An item can be biased because of problems with translation, or because its contents refer to cultural specific knowledge or practices. Item difficulty, or the rate of endorsement in typical performance tests, can be influenced in various subtle ways. For example, in a study with French and German respondents, Ellis (1989) could make plausible that some items were biased because of slight shifts in linguistic meaning. For bias in other items no reason could be given and on replication of the study not all the same items came out as biased. This is to be expected as a statistical decision rule invariably leads to some false positive and false negative outcomes.

Various statistical procedures have been developed to test for item bias (e.g. Berk, 1982; Holland & Wainer, 1993; Van de Vijver & Leung, 1997). Initially these were based on classical test theory, with the difficulty index (p_i) as the most important item parameter. An item with a larger, or smaller, difference between cultural groups in p_i than expected would be identified as biased. One common technique, which continues to be handy to gain a first impression, is the preparation of a plot of the p_i values in two groups and to visually inspect these for outliers. Another common technique is analysis of variance, with the item by culture interaction term as the main index for bias.

For dichotomous (yes–no, correct–incorrect) items the p_i index has several disadvantages (Lord, 1980). Therefore, analyses based on item response theory (IRT) models and contingency tables (so-called χ^2 procedures) were developed. Such models not only lead to better estimates, they also allow the researcher to distinguish between different forms of item bias, although the numbers of respondents required for stable estimates may be large, especially with IRT models. Moreover, these more recent procedures are so-called 'conditional' methods, in which item bias is investigated per ability level. In 'unconditional' methods, like those based on correlations between p_i values, the implicit assumption is that item bias is invariant across the entire range of scores.

Currently the most popular technique with dichotomous items is the Mantel–Haenszel statistic (e.g. Holland & Wainer, 1993). In a first step, each of two groups of testees are split up in subgroups with equal test scores. The procedure then compares the means of the items across these subgroups. An unbiased item will show means that are the same for all pairs of subgroups; an item is biased when it shows differences in difficulty between at least some of the pairs of subgroups.

USING THE SAME TESTS ACROSS CULTURAL GROUPS

The evidence on the feasibility of using the same tests across cultural populations comes mainly from three (overlapping) sources, viz., (i) adaptation and transfer of tests, (ii) analysis of bias in cross-cultural studies, and (iii) analysis of fairness of tests in multicultural societies.

Most well-known psychometric tests, especially from the USA and the UK, have been translated into many languages. Sometimes translated tests are used without even determining new norms. Although no cross-cultural comparison of scores may be intended, it should be clear that full score equivalence is assumed if scores in one country are interpreted on the basis of norms from another country. At other times elaborate adaptation procedures are followed, especially with intelligence batteries like the Wechsler intelligence scales. In projects of this kind new norms are established on the basis of a local sample. The scores are not used for cross-cultural comparison, but usually it is assumed that the research conducted in the country of origin is also valid for the adapted version. Thus, structural equivalence is assumed, but other levels of equivalence are of limited concern. Available evidence tends to be in support of construct equivalence. For example, Vander Steene et al. (1986) found for a Dutch version of the WISC that the factor structure was similar to that reported by Kaufman (1975) for the USA. However, it should be noted that 'similarity' is often decided on an impressionistic basis rather than on the basis of formal statistical procedures of the kind mentioned earlier on.

In the area of personality there is at present much interest in the so-called Five-Factor Model

(FFM) or 'Big Five' personality dimensions. Research on structural equivalence indicates that more often than not these dimensions travel well from culture to culture (e.g. McCrae, Costa, Del Pilar, Rolland & Parker, 1998). These findings are moderated by studies in which locally constructed scales have led to the identification of additional factors beyond those found with the FFM (cf. Cheung & Leung, 1998). But this may mean that the FFM model does not represent the entire domain of personality traits, rather than questioning the structural equivalence of dimensions that are represented.

Another example of a much used instrument is the MMPI, including the MMPI/2. In a number of countries the validity of diagnostic profiles originally established for the USA has been investigated. By and large these were found to be rather similar, although it would be a step too far to assume strict metric equivalence even across the industrialized countries (cf. Butcher, 1996). Other findings have been reported for the *Eysenck Personality Questionnaire* (EPQ). Similarity in factor structures was found by Barrett, Petrides, Eysenck, and Eysenck (1998) in comparisons of numerous countries with the original factor structure in the UK.

The second source of empirical evidence derives from cross-cultural research in which equivalence is an explicit target of investigation. In the previous section various examples have been discussed. The largest volume of research has been directed at item bias. No studies were found that were based on samples from cultures with substantial differences in behaviour repertoires that did not show statistical evidence of item bias. A conservative conclusion from such findings is that the trait domain from which items were sampled is not identical across cultures and that this preempts any comparison. On the other hand, in such studies the majority of items tend to behave fairly similar; an item that is difficult, or has a high rate of endorsement in one population, also does so in another population. This kind of evidence justifies the practice of removing biased items to improve the equivalence of tests.

The empirical evidence derived from analyses of bias in multicultural societies is difficult to interpret. One reason is that recent minority groups as a rule are culturally heterogeneous, not only in terms of background, but also in terms of the extent of their acculturation to the new society. Most research has been conducted in the USA, where some minorities have been part of the society for a number of generations. Here limited, though non-negligible, effects of item bias have often been found (e.g. Berk, 1982; Holland & Wainer, 1993). In countries in Europe that in recent decades have become more multicultural systematic attention for test use is now emerging (e.g. Bleichrodt & Van de Vijver, 2001).

With test use in multicultural settings score distributions from different ethnic groups can be evaluated in terms of common criteria (e.g. job performance). In this way, the 'fairness' of the tests can be assessed. One problem is that analyses of fairness are rather underdeveloped. Criterion ratings and test scores may suffer from common sources of bias (e.g. poor quality of schooling for minorities) when interpretations are made to more encompassing traits, like intellectual capacities. In studies of differences in intelligence between African-Americans and European-Americans this difficulty has been seriously underestimated (cf. Herrnstein & Murray, 1994). On the other hand, there is a growing emphasis on broader views of assessment for higher education, including the potential of the student for growth and development, and for fairness in employment testing (Sireci & Geisinger, 1998).

FUTURE PERSPECTIVES AND CONCLUSIONS

Across the educated groups in the world to whom psychometric tests are administered there is limited evidence of structural inequivalence. Therefore, transfer and adaptation of existing tests appears to make sense. An important advantage is that the knowledge and expertise can be used which has gone into the original development. Moreover, the information on validity can be employed that has been accumulated, sometimes over many years. About metric equivalence there remains uncertainty. To what extent profiles of personality scales, as used in clinical diagnosis, and profiles of cognitive abilities allow the same interpretation remains unclear and will have to be judged from instance to instance on the basis of concrete evidence. The extensive record of item bias makes clear that full score equivalence can hardly ever be assumed and this imposes strong limitations on the

interpretation of scores of testees with different cultural backgrounds, in terms of the same norms or standards. This is especially the case if scores are interpreted in terms of comprehensive psychological traits like cognitive abilities and personality dimensions.

Note

1 'Trait' is used for the behaviour domain, personality trait, cognitive ability, etc., in terms of which a test score variable is interpreted. The notion is similar to that of 'universe of generalization' (Cronbach, Gleser, Nanda & Rajaratnam, 1972).

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RELATED ENTRIES

Test Adaptation/Translation Methods, Testing in the Second Language in Minorities, Theoretical Perspective: Psychometrics

D

DANGEROUS/VIOLENCE POTENTIAL BEHAVIOUR

INTRODUCTION

The past decade has witnessed a growing interest in the clinical assessment of dangerousness and violence risk (Monahan & Steadman, 1994; Quinsey, Harris, Rice & Cormier, 1998). Successful prediction of often covert, low-frequency events can be particularly difficult to demonstrate. Within groups of mentally ill, criminal offenders, and/or mentally ill criminal offenders, major predictors of violent recidivism are largely the same, with criminal history variables most predictive of future violence relative to clinical variables associated with diagnosis of mental illness (Bonta, Law & Hanson, 1998).

Several assessment protocols have been advanced, including those adapted for specialized types of violence, such as sexual offending. Reliable and valid procedures such as the Psychopathy Checklist – Revised (PCL-R, Hare, 1991), Violence Risk Appraisal Guide (VRAG, Quinsey et al., 1998), Sex Offender Risk Appraisal Guide (SORAG, Quinsey et al., 1998), HCR-20 (Webster, Douglas, Eaves & Hart, 1997), and Rapid Risk Assessment for Sexual Offense Recidivism (RRASOR, Hanson, 1997) allow forensic practitioners to anchor their clinical opinions in empirically based nomothetic data while providing an estimate of violence potential over a given period of time.

While historical information forms a starting point for assessing potentially dangerous and violent individuals, idiographic data obtained from *individualized personality assessment* fills in the 'missing middle' (adding clinical and dispositional information to substantiated historical and contextual data) to inform and guide the tasks of understanding and treating dangerous and violent patients (Gacono, 2000; Gacono & Meloy, 1994, 2002).

VIOLENCE PREDICTION

Debate over the superiority of actuarial versus clinical approaches in the prediction of behaviour may hazard the creation of an artificial dichotomy. For example, a patient possessed by the delusion that he must hurt or kill another (to save himself, humankind, the earth) should be considered potentially quite dangerous, regardless of actuarially determined risk. In assessing individuals, actuarial tools are used as guides to inform clinical judgement.[1] With this caveat in mind, we turn to the most intensive actuarially oriented project assessing violence risk.

The MacArthur Violence Risk Assessment Study

Monahan and Steadman's (1994) work outlining the beginnings of the MacArthur Violence Risk Assessment Study is sometimes credited with reinvigorating a more collaborative, second

generation effort to standardize an actuarial approach in the prediction of violence. Drawing upon a panoply of previously identified but variously operationalized risk variables, Monahan and Steadman adapted a number of standardized tests and variables to operationalize prospective violence risk factors found in four general groupings:[2]

1 Dispositional factors, including anger, impulsiveness, psychopathy, and personality disorders.
2 Clinical or psychopathological factors, including diagnosis of mental disorder, alcohol or substance abuse, and the presence of delusions, hallucinations, or violent fantasies.
3 Historical or case history variables, including previous violence, arrest history, treatment history, history of self-harm, as well as social, work, and family history.
4 Contextual factors, including perceived stress, social support, and means for violence.

Dependent on the referral context and setting, an assessment of potentially violent individuals requires gathering data from each of these four domains.

Assessing Historical, Dispositional, Clinical, and Contextual Factors

Assessing potentially violent individuals begins with a thorough review of documented historical information, whether performed in institutional or community setting. Documentation, often obtained from legal authorities, must be reviewed relating to history of violence (including sexual assault), previous offences, weapon use, and so forth. Contemporary data including mental status markers (acute paranoid ideation, delusions, etc.) can be substantiated from a review of treatment records, staff interviews, and other corroborative sources. Antecedents and consequents surrounding previous violent acts should be noted along with the mode of violence (affective versus predatory). While a history of *affective violence* in an unmedicated psychotic patient (without concurrent psychopathy or character pathology) will likely respond, first, to neuroleptic intervention and, second, to anger management instruction, the same interventions will not likely impact the psychotic psychopath with a documented history of *predatory violence*.[3] Evaluation of a patient's past violence includes assessment of the cognitive, affective, and behavioural patterns prior to, during, and consequent to violent episodes, as well as any current situational or dynamic factors that could be impacted by immediate intervention.[4] In addition to relevant historical, dispositional, clinical, and contextual factors, victim characteristics (age, gender, circumstances) should also be noted.

Subsequent to assessing the above history and mental status, clinical opinions are anchored by completing an established actuarial risk assessment instrument. Historical information and semi-structured interview data are used to complete these procedures. The Violence Risk Appraisal Guide (VRAG) and the Sex Offender Risk Appraisal Guide (SORAG; Quinsey et al., 1998) are two protocols that produce a violence prediction probability estimate based on the summation of demographic, historical and clinical findings, with a significant contribution made by the patient's score on the PCL-R (requiring record review and semi-structured interview; Hare, 1991).

The PCL-R (Hare, 1991) assesses psychopathy level and is an integral part of the VRAG and SORAG. The PCL-R is a 20 item protocol based on interview findings anchored in a thorough record review and substantiation through related corroborative sources. High psychopathy scores have consistently been related to findings of criminal recidivism, including violent recidivism, and are viewed as a particularly intractable dispositional factor that should never be ignored (Bodholdt et al., 2000; Gacono, 2000).

Provided the data from the evaluation protocol described above, personality testing, like the Rorschach, refines our understanding of dispositional or clinical factors such as impulsivity, levels of anger and hostility, presence of thought disorder, problems with affect regulation, methods of coping with emotions, and so forth. Standardized psychological testing aids in teasing out the similarities and differences among individuals to an extent not possible with risk assessment guides and instruments such as the PCL-R alone (Gacono, 1998, 2000). Combined historical information, risk assessment guide scores, PCL-R scores, and testing data allow the clinician to provide opinions highlighting

individualized context–person dynamics; that is, under what set of circumstances is a given patient more likely to perpetrate a particular type of violence directed at a particular type of victim.

Conducting the Evaluation

The choice of actuarial tools and evaluation format is dictated by setting, referral question, clinical presentation, resource availability such as treatment, and the purposes served by the evaluation. Probabilities and other correlations determined from actuarially derived methods require a consideration of their clinical application.[5] The following case example illustrates the use of historical, dispositional, clinical, and contextual factors in evaluation of a previously violent, and prospectively, potentially dangerous individual.

Case Example. Mr. Jones is a married, Caucasian male, in his mid-twenties, referred for a psychological evaluation to determine risk of future offending, amenability to parole supervision, and to better understand offence and substance abuse history. Mr. Jones is currently serving a 3-year sentence for assault with a deadly weapon.

Mr. Jones' history reveals a sporadic work history, a lengthy history of substance and alcohol abuse, and the absence of a major mental disorder. He meets criteria for multiple substance dependencies, dysthymia, and Antisocial Personality Disorder (historical, clinical, dispositional). His violence has never been predatory, rather, it has always been impulsive, unplanned, driven by intense affect, and associated with intoxication (dispositional, contextual factors).

PCL-R (28) and VRAG (+23, category 8) scores, both static variables based primarily on historical data, place him at a high risk for violent re-offence within the next 7 to 10 years. Rorschach and MMPI-2 findings highlight dispositional and clinical factors suggesting problems managing emotions, high levels of hostility, difficulties handling complexity, and associated problems with perception and judgement. Legal factors are also of consequence. The state has two remaining years of hold over an individual, who discharging 'as is' presents a fairly substantial risk of re-offence. There are no institutionally based resources (no substance abuse, anger management, or similar treatment) to target the somewhat more malleable (dynamic) but difficult dispositional and clinical risk factors. Thus, any treatment impact on those risk factors highlighted through psychological assessment would need to come from a community setting, preferably offered under parole supervision and paid for by Mr. Jones' family.

The parole board decision to release or retain becomes more straightforward when presented with evaluation findings. They can: (1) incarcerate Mr. Jones until his time is completed and subsequently release him unsupervised to the community with all the 'static' actuarial risk unmitigated; or (2) use his supervision period in an attempt to impact any dynamic (changeable) factors relevant to re-offence rates. The senior author (CBG) recommended the latter, including recommendations that the parole board consider a nine to twelve month residential substance abuse treatment programme followed by transition to a halfway house.

FUTURE PERSPECTIVES

The immediate future involves the task of assimilating into clinical practice the vast amount of data and findings on violence and violence prediction from the ongoing MacArthur Violence Risk Assessment Project and other programmatic research (see also Gacono, 2000). To be of practical use, we expect further refinement of assessment protocols, followed by necessary cross-validation and normative studies. Item Response Theory item analysis may be particularly well suited to cross-cultural studies as well as test or protocol refinement (Bodholdt et al., 2000). Further, as computational algorithms continue to be developed, and computer memory and processing speed become less of an obstacle, we expect neural network modelling to assist prediction accuracy by extracting more relevant and less redundant predictors and also quantifying non-linear relationships among variables found to be highly interactive (Marshall & English, 2000). In this light, we are hopeful that data obtained regarding factors tending to mitigate or worsen potential for violence will be applied in efforts involving early intervention, with special attention to social and societal forces impacting violence and aggression.

CONCLUSIONS

In any setting, assessing potentially dangerous and violent patients quite frequently becomes an exercise in harm reduction. Had our case example involved a highly predatory psychopathic individual, with or without substance abuse problems or a supportive family, available data concerning amenability to treatment would very likely have resulted in a harm reduction strategy involving no parole, thus minimizing exposure to the public for a year or two, but not impacting subsequent risk (Gacono, Nieberding, Owen, Rubel & Bodholdt, 2001).

Advances in the actuarial prediction of violence have been impressive, and continue to be more fully elaborated and refined. In assessing individuals, actuarial protocols can inform clinical judgement, but not replace clinical judgement. The evaluation begins with historical and actuarial formulations, but it also assesses dynamic factors addressing risk reduction, setting, available resources, as well as ethical and legal constraints. Not only should the assessment consider the probability of violence within a given setting, it must also consider the capacity of the setting to control or contain the potential violence to staff or other patients. A harm reduction approach allows the evaluator to organize his or her data into a cogent conceptual model.

Notes

1 We note that more recent studies have found clinical judgement, in the absence of formalized actuarial tables, to be less lacking than initially suspected (Gardner, Lidz, Mulvey & Shaw, 1996; Mossman, 1994).
2 A complete listing of well over 100 variables and tests would exhaust the space allotted for this entry.
3 Contrasted to *affective violence* which has been characterized as 'flight or fight', increased autonomic arousal, reactivity, and possible loss of reality testing, *predatory violence* has been linked to psychopathy and is associated with minimal or absent autonomic arousal, minimal perceived threat, planned and purposeful behaviour, and unimpaired reality testing (Meloy, 1988).
4 This includes identification of specific person–context factors (e.g. medication non-compliance, alcohol or drug use, level of supervision or custody) expected to mitigate or amplify more immediate risk of re-offence, including violent re-offence.
5 For example, empirical data indicating the rare use of the insanity defence (NGRI) and even rarer occurrence of those who malinger, when used to dismiss the need for considering psychopathy level in these evaluations, the relevance of questioning NGRI statutes, or ignoring the undue burden of attempting to treat the NGRI psychopath, are of little consolation to forensic hospital staff who are forced by legal statute into the untenable position of managing the serious behaviours of a malingering psychopath (Gacono, 2000).

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RELATED ENTRIES

Applied Fields: Clinical, Anger, Hostility and Aggression Assessment, Antisocial Disorders Assessment

DECISION (INCLUDING DECISION THEORY)

INTRODUCTION

Most problems dealt with in the practice of psychology can be solved only by the application of a treatment, e.g. an intervention. In most cases, more than one treatment is available. The psychologist has to choose between several options. His or her choice of or decision for a certain treatment cannot be made in an arbitrary way but has to follow certain rules which are the subject of a field of study called decision theory (*cf*. Klein et al., 1993). In the practice of psychology, an important component of the decision rules are case-related assessment data, which are collected in the course of an assessment process. The role of assessment data in the decision-making process is the topic of this entry.

A CLASSIFICATION OF DECISIONS

For every decision it is necessary that a minimum of two alternative treatments is given, e.g. acceptance versus rejection of an applicant. Decisions which occur during the assessment process can be classified within a system proposed by Cronbach and Gleser (1965), who distinguished between six kinds of assessment-related decisions.

The first feature of decisions refers to whether the gain of a decision is in favour of an institution or an individual. A decision is *institutional*, for example, when an organization tests all individuals using the same standardized procedure. In such a case, a decision rule is required that yields as much benefit to the institution as possible from multiple (homogeneous) decisions over all individuals. Individual interests may be taken into account, but only insofar as they affect the realization of the goals of the institution. A decision is *individual*, for example, when an individual asks an institution for help in a decision making process. In order to get information that can support the individual in the decision, the institution arranges a specific test programme. Individual decisions are often unique. The choice confronting the decision maker may rarely or never recur. In this case only the individual benefit is important.

The second feature of decisions distinguishes between fixed and variable rates of acceptance. A *fixed rate of acceptance* exists, for example, when job openings in a company are limited to a certain number. In such a case the decisions

depend on each other. A *non-fixed* or *variable acceptance rate* exists, when independence of the decisions is given. This is the case, for example, when there is a job for every applicant who fulfils the respective requirements.

Cronbach and Gleser (1965) also differentiate between *single-stage* and *multi-stage (sequential) tests*. In the first case, the decision is made in only one step, in the second case in multiple steps on the basis of a sequential procedure.

The fourth feature of decisions refers to whether persons are *selected* (e.g. for a job, training, therapy) or *placed* to different treatments. When people are selected, only a certain number is accepted. However, when they are placed, nobody is excluded from the institution, but each person is assigned to the treatment with the best fit to his or her individual characteristics.

Assessment data are either restricted to only one dimension (*univariate* information) or composed of more dimensions (*multivariate* information). The use of multiple predictors increases the validity of a decision, because multiple facets of the criterion can be considered.

The last feature of decisions distinguishes between terminal and investigative decisions. If the individual is assigned to a treatment in which the person will stay in for a relatively long period of time, the decision is considered to be *terminal* and the assessment process to be complete. If the person is assigned to a temporary treatment, the decision is considered to be *investigative* and the treatment will lead to further questions.

The combination of the six features of classification results in $2^6 = 64$ different types of decisions in an assessment process. Tack (1976) combines these different components in his circular model and emphasizes especially the objective of the decision, which is important for the decision-making strategy. He defines a strategy as a normative system of rules that are applied to given data considering the prevailing objectives. The fundamental types of these strategies are referred to in the following sections.

COMPENSATORY AND CONJUNCTIVE DECISION STRATEGIES

In a *compensatory* model, a certain decision can be made on the basis of various combinations of predictor scores (i.e. low scores in some of the predictors can be compensated by high scores in other predictors). In compensatory models the combination of the predictor scores is linear. In addition to these combinatory-compensatory strategies, *disjunctive strategies* (Or-strategies) exist as another class of compensatory strategies. Using the Or-strategies, an applicant needs to obtain a certain score in only one predictor to be accepted, not a sum of many competencies. Compensatory strategies are always dysfunctional when certain minimum requirements in all tests are necessary to obtain a result, e.g. success in a particular job. In those cases *conjunctive* strategies (And-strategies) need to be applied.

SINGLE-STAGE VS. MULTI-STAGE DECISION STRATEGIES

Decision strategies can be single-stage and multi-stage. A single-stage strategy is called '*non-sequential battery*', in which persons are selected who achieve the highest sum score in the whole battery of tests. Another one is called '*single screen*', which means that only one test is administered and all further decisions are based on that test.

Multi-stage decision strategies can be divided into three different procedures: the first one is called the *pre-reject strategy*, in which all persons who do not achieve a certain score are excluded from further testing and are rejected.

Using the *pre-accept strategy* all persons are accepted who achieve a particular score. The rest of the persons are further tested.

The *complete sequential strategy* is a combination of the former two procedures: those individuals who score higher than a certain score are accepted, and those who are below another score are rejected. Persons in the medium range are further tested for acceptance or rejection.

Sequential strategies (multi-stage) are in general superior to non-sequential strategies (single-stage), but this superiority disappears when extreme selection rates are given (see Cronbach & Gleser, 1965: 77ff). Sequential decisions can be reduced to a series of single-stage procedures.

DECISION-ERRORS

The central task of assigning-strategies is to avoid classification errors. Such errors occur when the assignment on the basis of predictor variables does not overlap with the real class affiliation. Two types of assigning errors can be distinguished: the type-one-error consists of false positive decisions (for example, people are diagnosed as being sick although they are healthy); the type-two-error consists of false negatives (for example, people are diagnosed as being healthy although they are sick). Four evaluation criteria can be distinguished: (1) *Sensitivity* is the probability with which a given positive state is recognized as such. (2) *Specificity* is the probability with which a given negative state is recognized as such. (3) *Positive prediction value* is the probability with which a positive decision or diagnosis is correct. (4) *Negative prediction value* is the probability with which a negative decision or diagnosis is correct.

The ratio of the number of persons that are successful in the criterion and the number of all persons considered defines the *base rate*, which is also called the *success rate without use of test*. The efficiency of the selection can be calculated as the ratio of the number of selected and qualified persons and the number of all selected persons, which is also called the *selective qualification quotient*. This quotient is identical with the positive prediction value.

FIXING CUT-OFF SCORES

Increasing or decreasing the cut-off score of a predictor or predictor combination, which separates negative from positive decisions, can alter the size of the positive prediction value (and the selective qualification quotient). The more the critical cut-off score is moved towards the characteristic or attribute that has to be identified (e.g. illness or qualification), the larger will be the size of the quotient. But then, only the error of a false positive decision is considered, whereas the risk of a false negative decision is neglected. For setting the cut-off score, the base rate and the success rate without use of test are important. With the help of the ROC-curve (*R*eceiver *O*perating *C*haracteristic), specificity and sensitivity can be determined simultaneously and independently of the base rate for various cut-off scores, if the test score distribution of the different groups could be determined on the basis of empirical studies.

To reconcile the particular aspects, an additional evaluation of the certain outcomes and possible errors, which is completely independent of methodological approaches, is necessary. Wieczerkowski and Oeveste (1982: 929) point out that there is no unequivocal solution for setting critical cut-off scores but that personal, social, and economic factors must be considered.

UTILITY CONSIDERATIONS

Institutional and individual decisions are made because the respective organizations or persons want to achieve positive economic results, i.e. gains, whereas losses are a result of wrong decisions. Cronbach and Gleser (1965) formalized this economic dimension of institutional decisions and developed a utility function with which the total utility of a certain decision strategy can be estimated. To do that, a *strategy matrix* is an important requirement. A strategy matrix includes rules according to which decisions can be made on the basis of assessment data. The entries of such a matrix are the probabilities with which the alternative treatments are assigned to groups of persons which are characterized by certain classes of assessment data. For a treatment t and a group of persons characterized by assessment information x_r the entry would be the conditional probability $p(t \mid x_r)$.

In addition to the frequently used 0/1-rule, which confines the range of the conditional probabilities $p(t \mid x_r)$ to the values 0 (i.e. no assignment to treatment t in case of assessment data x_r) and 1 (i.e. assignment to t given x_r), probabilistic links are also possible. Despite this, it is also important to link the considered treatments to their results as well as to the success in the criterion. This link is included in the so-called *validity matrix*. Its entries stand for the probability that persons characterized by assessment information x_r and assigned to

treatment t achieve a criterion score c_r: $p(c \mid x_{r,t})$. In the simplest case, the criterion scores can be dichotomous categories (successful versus not successful, healthy versus ill). Continuous categories are possible as well.

Finally, it is necessary to assign to every criterion class a utility-vector e_c and to every class of assessment data a cost vector c_c. The utility is the value, which can be calculated for every stage of the criterion in the respective institution. Costs come into existence through the efforts of getting certain information. It is important that utilities and costs are put on the same scale and that the scale consists of equal intervals (interval level). For monetary units, those restrictions are fulfilled.

Based on the strategy matrix and the validity matrix as well as on the values of the utility and cost vectors, the following non-parametric gain function can be established (after Cronbach & Gleser, 1965: 24):

$$U = N \overbrace{\sum_r p(x_r) \underbrace{\sum_t p(t|x_r) \underbrace{\sum_c p(c|x_{r,t}) e_c}_{I}}_{II}}^{III} - N \underbrace{\sum_r p(x_r) \cdot c_r}_{IV}$$

U = Utility
e_c = Gain of the achievement of the criterion c
$p(c \mid x_{r,t})$ = Value from the validity-matrix for the treatment t
$p(t \mid x_r)$ = Value from the strategy-matrix
$p(x_r)$ = Probability of the class of assessment data x_r
c_r = Costs for getting assessment data x_r
N = Number of persons the strategy is applied to
I = Expected gain of an individual in the criterion, if the individual is characterized by a class of assessment data x_r and treatment t is applied
II = Expected gain of an individual who is characterized by the class of assessment data x_r
III = Expected gain of an individual (mean over criterion classes, treatments, and classes of assessment data)
IV = Expected cost for getting the information from a person

The multiplication of utility and cost by the number of tested persons results in the expected net-utility of a strategy when it is applied to a group of N individuals. This model merges with the model of Brogden (1949), when assumptions of continuity are made for the information and criterion categories. Constant costs for all persons are presumed and the test scores are linearly related with the achievement in the criterion. The central formula of this model is:

$$U = N \cdot s_e \cdot r_{xe} \cdot V_{(xiT)} + N\varphi_{(xiT)} e_{t(A)} - NC_x$$

$e_t(A)$ = Average gain of a person after treatment A (accept) for the institution
s_e = Deviation of the expected gain values
r_{xe} = Correlation between the predictor and (gain differences in) the criterion; $e_{t(A)}$, s_e, r_{xe} have to be specified in the population before the test is applied
$V_{(xiT)}$ = Ordinate of the standard normal distribution in the (standardized) cut-off score x_{iT}
$\phi_{(xiT)}$ = Selection rate for the cut-off score x_{iT}
C = Costs

The a priori utility results, when $N^*\varphi_{(xiT)}$ persons out of a population are selected randomly:

$$U_o = N\varphi_{(xiT)} e_{t(A)}$$

The utility of applying the test (net utility) on N persons is therefore:

$$U - U_0 = N \cdot s_e \cdot r_{xe} \cdot V_{(xiT)} - NC_x$$

Divided by the number of tested persons, the net utility 'per man tested' (Cronbach & Gleser, 1965: 308) evolves. As seen in the equations, the validity of the tests, the variability of the utilities and the selection ratio are important for the utility.

FUTURE PERSPECTIVES AND CONCLUSIONS

The requirement of a linear relation between the predictor and the utility is often not fulfilled. It is also very difficult to get the entries for the validity matrices because, for their specification, no earlier selection should have taken place. The respective persons should have been (randomly) assigned to the treatments and then observed longitudinally to demonstrate adequate success rates.

Next to this basic problem, the determination of the monetary equivalence is comparatively simple because it is easy to determine what has to be paid for a test, its administration, and its evaluation. On the other hand, the efforts of developing a test and the training of assessors should also be included as well as the loss of a (right or wrong) rejection.

Although the requirements of the model are sometimes empirically not fulfilled and the difficulties of collecting the necessary information are notorious, there are some publications which demonstrate the usefulness of the model for practical purposes (Brandstätter, 1970; Weinstein and Fineberg, 1980) and underline that psychological testing may yield enormous benefits to institutions and the society in total (Amelang, 1999).

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RELATED ENTRIES

Classification (General, Including Diagnosis), Explanation, Outcome Assessment/Treatment Assessment, Prediction (General), Utility

DEMENTIA

INTRODUCTION

Dementia is currently defined as 'a syndrome consisting of progressive impairment in both memory and at least one of the following cognitive deficits: aphasia, apraxia, agnosia or disturbance in executive abilities, sufficient to interfere with social or occupational functioning, in the absence of delirium or major non-organic psychiatric disorders' (American Psychiatric Association, 1994). This narrow definition is a remnant of the 'cognitive paradigm' of dementia (Berrios, 1989). According to the latter view (developed during the late 19th century), cognitive deficits are the only pathognomonic features of dementia and psychiatric and behavioural

symptoms are just coincidental encumbrances. Due to the work of Ebbinghaus, memory became the first measurable cognitive deficit and this introduced a lasting bias in that ever since memory impairment has tended to be considered as the main cognitive deficit of the dementias.

Up to the 1970s, the cognitive paradigm seriously emasculated clinical research, particularly into the diagnosis of 'early dementia' and the identification of varieties and subtypes of dementia. The realization that neuropsychological assessment alone was not going to resolve these problems led during the 1980s to the acceptance that psychiatric symptoms were, after all, central to dementia (Berrios, 1992). In due course, this allowed for a better understanding of the disease and the identification of subtypes such as, for example, Lewy body Dementia.

The problem of what is 'early dementia' and how it can be identified has not yet been resolved in spite of the desperation of the pharmaceutical industry which would like to have a reason to start pro-cholinergic 'treatment' early. Likewise, little is known about 'symptom-sequencing', namely the finding that psychiatric and personality changes may precede or follow the cognitive deficits. The central questions in this regard are whether the sequencing is random or reflects the influence of clinical and genetic factors. The development of neuroimaging and genetics (*inter alia*) has of late led to important advances in the classification of the dementias.

The dementias are complex neuropsychiatric disorders with a clinical profile that includes disorders of personality, emotions, mood, and will; conventional mental symptoms (hallucinations, delusions, agitation, sadness, anxiety, etc.); disorders of awareness and consciousness; psychosocial incompetence; and the full gamut of neuropsychological deficits. It follows from this that subjects suffering from dementia should be clinically looked after by *multidisciplinary teams* and that it should be considered unethical for neurologists, psychiatrists or psychologists *alone* to monopolize their diagnosis and/or care (Berrios & Hodges, 2000).

It also follows from the symptomatic complexity of the dementias that their assessment must be exhaustive and longitudinal. Together with the finding of specific markers such as volumetric changes in the medial temporal lobes, analysis of these clinical data should contribute to resolve the problems of symptom-sequencing and 'early dementia'. In this latter case, it is expected that the old concept of early dementia as a 'mini-dementia' (i.e. one dependent upon instrument sensitivity) will change to one with a broader symptom profile which may include personality and behavioural changes as markers of early dementia.

It has been said that the assessment of dementia should be carried out by a multidisciplinary process involving the neurologist, neuropsychiatrist, neuropsychologist and occupational therapist. In terms of the objectives of assessment, as important as determining a 'diagnosis' is the profiling of deficits and assets. Outcome measures, developed on the basis of this knowledge, will have the adequate sensitivity and specificity to help select the right treatments for the right patients and also to take other hard therapeutic decisions (e.g. rationing of expensive treatments such as pro-cholinergic medication).

The concept of assessment is a dynamic one. It should start by reconstructing a premorbid profile, for it is only against this information that the progressive effect of the disease can be evaluated. When seen, most subjects are already affected by the disease so that the assessment must look both backwards and forwards. This model is followed at the Cambridge Memory Clinic (CMC) (Berrios & Hodges, 2000).

ASSESSMENT BY THE NEUROLOGIST

The neurological assessment includes an interview with the patient and carer, a bedside cognitive examination and physical examination. The interview should be aimed at getting the details of cognitive functions which includes memory, language, numerical skills, visuospatial skills, neglect phenomenon, visual perception, personality changes, self-care, thinking and problem solving abilities. Many patients lack insight into the nature and extent of their cognitive deficits. The interview with the carer is essential to get objective data and to plot the progression of the illness. The Addenbrooke's Cognitive Examination (ACE) (Mathuranath et al., 2000) constitutes the core instrument. All patients

have a full general, physical and neurological examination, blood pressure, cardiac auscultation, frontal release signs, eye movements and fundal examination, gait, tone, abnormal movements and blood screen to rule out reversible dementias. Neuroimaging (CT Scan, MRI, PET scan, SPECT scan) provides structural and functional aspects of the brain, which can be crucial for the differential diagnosis.

ASSESSMENT BY THE NEUROPSYCHIATRIST

The neuropsychiatric assessment of the dementias entails *more than* the search for 'associated' psychiatric disorders such as depression, anxiety or delusional disorder. Since the dementias are first and foremost *neuropsychiatric* disorders, the main objective of the assessment is psychiatrically to diagnose the condition and to profile deficits and assets. The mapping of the symptoms is made by means of the 'Cambridge Behavioural Inventory' (CBI) (completed by a relative) and the 'Insight into Memory Questionnaires' (self and relative) (IMQ) (Marková & Berrios, 2000).

Like with other neuropsychiatric disorders, the psychopathology of the patient with dementia is better captured at the symptomatic level (Berrios et al., 2001). Trying to reach formal categorical diagnoses is ending up with the empty claim that the patient 'does not meet diagnostic DSM IV criteria for disease XX'. This is misleading because a great deal of the rich psychiatric and behavioural symptomatology of dementia is expressed in isolated mental symptoms which are never sufficient to 'meet criteria' for anything; and also because it may delay treatment. Being told that a morose, sad and distractible patient does not meet DSM IV criteria for major depression means little and can be positively misleading given that some clinicians may want to go ahead with antidepressants in some cases.

In view of the above, it is essential that instruments be used in the neuropsychiatric assessment that generate information analysable at both levels (symptomatic and nosological). It is the combination of all this information, usually carried out in special meetings of the multidisciplinary team at the end of the assessments, that differential diagnosis and behavioural phenocopies of dementia are ruled out (Berrios & Marková, 2001).

The Cambridge Computerized Neuropsychiatry Battery includes 9 core instruments and another 11 (to measure hypochondria, mania, attention, metamemory, etc.) which are chosen according to clinical findings (see Table 1).

ASSESSMENT BY THE NEUROPSYCHOLOGIST

Clinical neuropsychology (whether cognitive or not) is concerned with the evaluation of mental function and plays a crucial role in the differential diagnosis and the profiling of deficits and assets. The experienced neuropsychologist will interpret the data against his assessment of the patient and this usually leads to greater discrimination. The assessment should be comprehensive enough to generate information about attention, general intellectual skills, executive functions and to identify impairment in specific areas such as memory, language, calculation, praxis and visuospatial skills. Practical aspects of the assessment procedure are of particular importance in the case of patients with dementia given that they tend to become fatigued, distracted and bored easily. In the CMC, a standard set of core tests is administered. They include tests of general intelligence such as Wechsler Adult Intelligence Scale – Revised, assessment of premorbid IQ, assessment of frontal lobe functions, tests of verbal and visual memory, visuospatial and perceptual tasks (a full description in Hodges, 1994).

FUTURE PERSPECTIVES AND CONCLUSIONS

So far in the history of mankind, it is an observed fact that upon reaching certain age, mind and body deteriorate; and to explain this fact a number of narratives have been put together (Berrios, 1994). Straddling the legal and medical narratives, the concept of 'dementia' developed early in the cultural history of Europe; by the end of the 18th century it had become enthroned as a 'disease' (Berrios & Freeman, 1991).

Neither the deterioration in question nor the concept of dementia are, however, ineluctable. Whether by dint of genetic engineering or by social

Table 1. Cambridge Computerized Neuropsychiatry Battery

Core instruments	Reference	Commentary
28-General Health Questionnaire	Goldberg & Hillier, 1979	Self-administered; yields 4 factors: somatic symptoms, anxiety and insomnia, social dysfunction and depression.
Personality Deviance Scale	Bedford & Foulds, 1978	Measures 'Extrapunitiveness', 'Intropunitiveness' and 'Dominance'. Normative data available; good reliability and validity.
Beck Depression Inventory	Beck et al., 1979	Self-administered measure of depression. Emphasizes subjective states.
Snaith's Irritability Scale	Snaith et al., 1978	Yields 4 factors: anxiety, depression, outward irritability and inward irritability. Good measure of irritability. Normative data available.
Cognitive Failures Questionnaire	Wagle et al., 1999	Measures lapses of perception, memory and motor behaviour in daily life.
Signal Detection Memory Test	Miller & Lewis, 1977	Recognition memory test based on signal detection theory; developed at Addenbrooke's hospital, Cambridge, UK. Standardized in 3000 normal subjects. A d = 1.50 cut off discriminates with a sensitivity of 85% and a specificity of 82% ($N = 350$).
Maudsley Obsessive-Compulsive Questionnaire	Rachman & Hodgson, 1980	Self-administered scale; yields 4 factors: checking, washing, slowness-repetition and doubting-conscientious.
Dissociation Questionnaire	Riley, 1988	Assesses degree of dissociation construed as a failure to integrate thoughts, feelings and actions into consciousness. Tested in the general population, it has good reliability and validity.
Zung Anxiety Scale	Zung, 1971	Self-administered measure of *state* anxiety.

whim, mankind may decide to prolong life and/or create a new terminus for it. The assessors of the future will soon create a new 'science' to accommodate the consequences of such momentous decisions. In the meantime, dementia remains a fashionable area of research and much has been invested in finding a cure. The implications of a successful outcome, in terms of *Lebensraum* and economy, have not yet been contemplated.

In terms of conventional nosology, the 'syndrome' dementia is considered as a final common pathway to a gamut of aetiologies which in turn create their own clinical profiles. The classifications issued out of the latter have of late been challenged by categories based on the new neuropsychology and genetics. For example, 'Alzheimer's disease', a notion constructed during the early part of the 20th century, has now all but been broken up into a growing number of overlapping disorders (Berrios, 1990).

In conclusion, dementia is a neuropsychiatric disorder warranting a multidisciplinary approach which should include neurologists, neuropsychiatrists, neuropsychologists, occupational and nurse therapists. Combined they should generate a patient-centred narrative describing his/her current state and including educated guesses about his/her past and future.

If the cross-sectional examination does not provide a clear diagnosis, the patient should be followed up. Initial assessments are never definitive but only provide a baseline. From the start, dementia sets up 'self-damaging loops' (e.g. patients realize that they cannot do something well and voluntarily abstain and this leads to forgetting and functional loss). These loops

complicate the assessment as voluntary abstentions may be taken to be real deficits. It is understood that often enough behavioural analysis is more important to the patient's understanding and management than measuring his apolipoproteins.

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RELATED ENTRIES

Applied Fields: Clinical, Applied Fields: Neuropsychology, Applied Fields: Gerontology, Memory Disorders, Brain Activity Measurement, Cognitive Decline/Impairment

DEVELOPMENT (GENERAL)

INTRODUCTION

Human behaviour takes place in both a temporal and social context. Psychological development refers to the temporal context, and deals with (dis)continuous progression, increasing complexity and non-entropy of behaviours, cognitions and emotions. Development dominates the first half of life, and is latent in the second half. It refers to behavioural changes

that cannot be instantly turned back. Firstly, in this contribution, characteristics and purposes of assessment and of development are described. Secondly, the role of developmental constructs and test theory for assessment of behavioural development are both discussed. Thirdly, instruments for assessing behavioural development, specifically in children, are described. Finally, some thoughts are presented on the future of assessment of development.

GENERAL AND DEVELOPMENTAL ASSESSMENT: PURPOSES

Assessment in general is characterized as solving a client's problem by following specific decision rules, by measuring individual differences, by gathering and integrating information about a client's behaviour and environment in order to help, and by deciding for interventions using information about the client's behaviour and his or her social environment (Fernández-Ballesteros et al., 2001). Assessment of development usually refers to children and is defined as assessing the levels of behavioural, cognitive, and socio-emotional functioning in order to show the strong and weak sides of a client (Johnson & Sheeber, 1999).

Both general and developmental assessments have three main objectives. The first is to diagnose the presence or absence of disorders. This refers to the activity of ascribing a person to a category by means of explicit rules; for example, those presented in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV, 1994). A child can be fitted into a ADHD or Conduct Disorder category (see 'Classification' entry). The second purpose is prediction (see 'Prediction (General)' entry). If one knows, for example, the level of intelligence, extroversion or conscientiousness of a child, one can predict the probability of school success or future behavioural adaptation. The third main objective is the explanation as expressed in the Hypotheses-Testing-Model (HTM) of assessment (see 'Explanation' entry). Explanation is pre-eminently relevant in developmental assessment, because it looks for the cause of problematic and deviant behaviours and helps to design effective interventions.

While development implies progression, change, increasing complexity, and seemingly even erratic change, it is easily presupposed (partly because of the frequent use of trait-like concepts and instruments) that the categories, the individual differences, and the effects of intervention are stable (Lewis, 1999). In addition, hypotheses testing in the HTM does not refer to testing a population parameter, but to comparing an assessment result with a pre-established criterion. An example is the hypothesis that this child is not able to profit from normal education, because its IQ is lower than 80. To conclude, developmental assessment is aimed at classifying, predicting, and explaining. This last goal is important because of the explaining and changing of children's problematic behaviours.

ASSESSMENT AND DEVELOPMENTAL PSYCHOLOGY: METHOD AND CONTENT

Assessment is not a separate and independent psychological discipline. It borrows from methods and theories of all psychological (sub)-disciplines. Developmental assessment uses developmental theories, models, and constructs but also test theory in order to design appropriate instruments. Moreover, it is based on the methodological rules that come from the empirical-analytical tradition. This disciplines the assessment process scientifically (ter Laak, 1997). The quality of developmental assessment depends on how well the structure of developmental constructs, test theory, instruments, and the rules followed during the assessment process '*fits*'. The first three, and how they fit, are discussed below.

As a scientific discipline developmental psychology has to offer *theories, models and constructs, and methods* to describe and explain behavioural development. Theories primarily determine the 'what' of assessment, and in principle they have to guide decisions about appropriate methods and data analyses. The latter refer to the 'how' of assessment.

With respect to the 'how', in psychology two research approaches dominate (Cronbach, 1957) that are appropriate in experimental, social, personality, and educational psychology. They are the correlational or observational (e.g. Spearman's analysis of intelligence), and the experimental disciplines (e.g. Fisher's analysis

of variance for the crops in the fields). The correlational discipline elicited developmental studies that investigate stability and (linear) predictability of test scores over time, and individual differences between age groups. The experimental approach elicited studies designed to accelerate cognitive achievements and behavioural adaptations particularly in youngsters. To conclude, the fit between the experimental and correlational methodology and developmental questions is limited. Cronbach did not distinguish a 'third developmental discipline' of scientific psychology besides his 'two disciplines of scientific psychology'.

The 'what' of developmental assessment is traditionally determined by organismic and mechanistic developmental theories, models or constructs. These connect the behavioural past to the present as qualitatively different steps or stages (organismic), or as gradual growth taking the immediate context into account (mechanistic). In organismic theory strong (Piaget, Kohlberg) and weak (Erikson, Loevinger) constructs dominate. Recently, non-linear dynamic models have been applied to developmental phenomena (Van Geert, 1994).

According to strong organismic theories qualitatively different stages exist. These are strictly ordered in time, with an unavoidable final equilibrated stage, and sudden stage transitions are expected to occur. Conceptual analysis and research are conducted to prove the existence of stages, e.g. criteria are used to determine if children are in the pre-operational or concrete operational stage. Kerssies, Rensen, Oppenheimer and Molenaar (1989) offer empirical support for the ordering of the six Piagetian sub-stages in the sensorimotor period. Boom, Brugman and van der Heijden (2001) have analysed the arguments in moral dilemmas and found support for the expected ordering of Kohlberg's stages of moral development in Dutch and Russian adolescents. These two studies owe the descriptions of developmental levels or stages to the work of Piaget and the Brunet–Lezine. The claim that there is an unavoidable last and equilibrated stage for every person was doubted from the beginning, because of lack of empirical support. People usually only reach the formal operational level in their own profession. Van der Maas (1993) has used eight transition criteria from chaos theory and non-linear dynamics to test the sudden change from the Piagetian pre-operational stage to the concrete operational stage. He reports support for a few of these criteria, e.g. much variation, and a bimodal distribution of responses in the transitional period.

'Weak' organismic theories resemble 'strong' ones, but do not require a strict progression and an equilibrated last stage. Erikson simply presupposed the existence and the ordering of the seven stages, and connected the sequence to increasing age, and to different social and cultural tasks. Loevinger supported the claim of existence by results from a sentence completion questionnaire that classified a person in or between two adjacent stages of Ego development. The ordering from impulsive, symbiotic, pre-social (level 1) to autonomous and integrated (level 7) during life has, however, not been empirically tested.

Mechanistic models can be used to describe and explain development, but they are not popular. Lewis (1999) recently argues for a mechanistic, context-bound interpretation of development, and he also makes it plausible that in order to explain the development of attachment and depression organismic models are not sufficient. To conclude, there is limited empirical research and support for the claims of the strong and weak organismic constructs. They elicited, however, the construction of some theoretically based developmental scales. In explaining behavioural development mechanistic models are probably underestimated.

Classical (CTT) and Modern Test Theory or Item Response Theory (IRT) comprise models for subjects' answers on items. CTT is a true score model for estimating errors in answers on items and tests, and not for describing the development of behaviours. Nevertheless, reliable tests can show average differences in test scores for different age groups as well as changes in test scores for the same group or individual over time. These differences can, under certain conditions, be interpreted as development. Most intelligence, aptitude and achievement tests, and personality questionnaires, use a true score model of CTT. This implies that the cause of age-groups, and inter-individual differences, is not interpreted developmentally, and that test items are not designed to depict development. To conclude, Classical Test Theory helps to measure reliably age- and inter-individual

differences, but it is not related to developmental theory. IRT meets some technical shortcomings of CTT by using specific estimation procedures to assess the probability that a subject answers an item correctly or agrees upon an item. Items measure latent traits, such as spatial ability, reading skill, openness to experience or short-term memory. IRT models can be helpful in designing and testing developmental scales. For example, a developmental stage-like scale requires that items represent each stage by steep, similarly shaped, non-overlapping item characteristic curves. Some developmental constructs imply stages or developmental levels, but, as stated above, there is seldom interest in testing characteristics of these stages. To conclude, IRT offers possibilities to design developmental scales, but they are not regularly used until now.

Developmental constructs must be operationalized, i.e. their meaning and structure have to be reflected in measurement procedures and results, such as *developmental quotients*, *developmental scales*, *tests*, *questionnaires*, *observation* and *judgement procedures*. Several instruments have been reported that are designed from a developmental perspective. Most instruments that are called 'developmental' are, however, instruments for children, and are constructed from a non-developmental individual differences or correlational perspective.

INSTRUMENTS: CHILDREN DEVELOPMENT

The instruments described below have been adapted from American instruments and are widely used. The reliability and validity of these adaptations must be researched empirically for each country. The judgements about their psychometric qualities have been taken from the third and fourth review of Dutch test research (Evers, Van Vliet-Mulder & ter Laak, 1992; Evers, Van Vliet-Mulder & Groot, 2000). It is likely that these judgements apply, at least partly, to other language communities.

Firstly, a series of instruments to measure cognitive and motor development is available.

An old concept is the developmental quotient (*Gessell Scales for Motor Development*), in which a developmental scale is supposed that is empirically reflected in the age of the children. So (the lack of) age-adequate behaviour can be determined, i.e. the amount a child is behind or in front of the developmental level of same aged peers. The test can be administered from 4 weeks up to 6 years. The observed behaviour is, however, not limited to motor behaviour, it also includes adaptation, speaking and social behaviour (Gesseff, 1947).

The *Denver Developmental Screening Test* can be used for children between 6 days and 6;6 years. It estimates the presence of motor and cognitive developmental disorders and of retardation. It consists of 105 items, 25 of which have to be scored by observation, the remaining items are scored by asking the parents. The reliability and predictive validity are sufficient. The items are not chosen with a developmental construct in mind. A child's result is compared with norms established for the age group. If a child deviates substantially then further investigation is recommended.

The *McCarthy Scales of Children's Abilities* aim to assess the cognitive and motor developmental level of children between 2;6 and 8;6 years. There are six scales (verbal, perceptual, quantitative, cognitive, memory, and motor behaviour) that use 18 subtests. Because empirical research is scarce, reliability and validity are insufficient. The scales presuppose a developmental pattern that is plausible, but has not been empirically tested.

The *Bayley Scales of Infant Development* (BSID) are the most used scales for measuring mental and motor behaviour in children between 2 and 30 months. The mental scale consists of 163 dichotomous items of increasing difficulty level. The bases for this increase in difficulty levels are empirical findings, but not a developmental construct. The scale for motor behaviour consists of 81 dichotomous items. Finally, 25 items are scored on a 9-point scale, that contains evaluations of (social) behaviours using observations of the child during the testing. Norms for 14 age groups are developed, and by interpolation 33 norm groups are available. This test is well constructed. Sufficient norms are available, reliability (both internal consistency and test–retest) is between 0.80 and 0.96, and validity is good, respectively sufficient. Although the scales correlated very highly with another test measuring the developmental level (i.e. the

Bühler–Hetzer Test, 1953: correlation from 0.83 to 0.89), it is frequently reported that the scales do not predict IQ at school age well. An extensive training is necessary before taking the test with these young children. There is a substantial relationship between the scores on the two scales and age in normal healthy children. Correlation between 0.25 and 0.30 are found between the BSID and the educational levels of fathers and mothers.

The *Stanford–Binet Scale* was aimed at measuring the cognitive level of children. The scale has been translated the world over and became popular in the US due to Goddard and Terman. The scale is used from age 2 years on and contains different sets of items for different age groups.

Nevertheless, for the estimation of children's IQ the *Wechsler Scales* (WIPPSI and WISC-R) and the deviation IQ became more popular. There is no developmental construct and the age differences are not interpreted developmentally in the Wechsler scales. The psychometric properties show a test that works well.

Secondly, instruments measuring school achievement are available in many language communities. The CITO, the Dutch Institute of Educational Testing, develops all achievement tests in the Netherlands. These achievement tests are all IRT modelled and of high psychometric quality. Well known is the 11+ achievement test taken before entering secondary school. Almost all 11–13 year olds are investigated using this battery. The achievement tests are not based on an explicit idea of language, arithmetic, and cognitive development. They do, however, predict later school achievement very well.

Thirdly, social and emotional development in children can be assessed. The *School* uses 52 items measuring social and emotional functioning in the classroom. They parallel four of the Big Five factors and add the attitude towards school tasks. The questionnaire is not based on an developmental construct. It can be used for pupils between 4 and 11. The reliability and validity are sufficient (see Evers et al., 2000).

The *Self-Perception Profile for Children* was originally constructed by Harter and adapted for Dutch children from 8–12 years. It measures, using 36 items, six scales, e.g. social acceptation, physical appearance, ability in sports, and feelings of self-worth. Reliability and construct validity are sufficient; data for predictive validity is too scarce, and is consequently judged as insufficient. A developmental construct was absent in the constructing of the test.

Fourthly, several instruments help in the assessment of pathology and adaptation in children. Most frequently an adaptation of the *Child Behaviour Check List* (CBCL) is used. This list can be used for children between 4 and 18 years old and the questions can be answered by parents and teachers. The norms are good, and both reliability and predictive and construct validity are good, respectively sufficient. It yields a profile of the child that informs about the level of problematic internalizing and externalizing behaviours. Although the empirical data show age and gender differences there is not a developmental construct to explain these differences.

There is a 102-item *Children Depression Scale* available, yielding 10 different facets of depression for children from 9–12 years old. The Kovacs questionnaire is usually the basis of these scales. Reliability is sufficient as is construct validity. Predictive validity is insufficient (see Evers et al., 2000).

The *DSM IV R* is appropriate for persons of 18 years and older. Nevertheless, some specific disorders can be measured in children. The *ADHD Questionnaire for Children* can be used to assess Hyperactivity, Impulsivity, and Attention Deficit in 4 to 18 year olds, using 18 items. The psychometric properties allow to judge it as a good and sufficient instrument for measuring ADHD. There is no developmental interpretation of the age differences in amount and type of expression of this syndrome.

Lastly, personality in children is assessed from 8 years on using adaptations of scales for adults.

Eysenck's three factors, extroversion, neuroticism and psychoticism, are adapted for children (see *ABV-J Questionnaire* in Evers et al., 2000). They are used for children from 8–15 years old and are sufficiently reliable and valid to measure Extraversion. Slotboom and Elphick (1997) adapted the questionnaire for youngsters: *Big Five for Children* from 2;6 to 18 years old. They used three partly different sets of items for the very young and the adolescent subjects. For the younger children the parents fill the questionnaire in. The authors found sufficient support for the existence of the Big Five in these age groups. Judgements of reliability and validity are not yet

available. The preliminary results are promising. There is no developmental construct that explains age differences in either instrument, and there is no developmental theoretical explanation for the necessity to use different items for the age groups.

Loevinger's Ego development model uses a sentence completion test (*Ego Development Scale*) to assess the level of ego development. The children can be assigned to a level or between two levels. Scoring is reliable and there is some validity data. There is a developmental construct and scoring is rather time consuming. The scale is not very sensitive for differences within the period of 0 to 12 years, because it is based on a life-span model.

To conclude, there are many sufficiently reliable and valid instruments and procedures available to assess motor and mental status, school achievement, social emotional development, pathology, and personality in the formative years of life (see Table 1). Very few, however, are inspired by developmental constructs. This implies, that in addition to the moderate fit between test theory and developmental constructs, the fit between developmental constructs and instruments measuring changing and developing behaviours is partly lacking.

Table 1. Summary of the instruments

Instrument	What is measured?	Methodological discipline	Developmental construct?	Age
Gessell Motor Scales	Motor speech, social behaviour	Developmental	Yes	4 weeks–6 years
Denver Developmental Screening Test	Presence of cognitive and motor delay	Correlational/ Observational	No	6 days–6;6 years
McCarthy Scales	Verbal, perceptual, motor, etc. behaviour	Developmental: conceptual not empirical	Yes and No	2;6–8;6 years
Bayley Scales of Infant Development	Mental, motor behaviour; adaptation	Correlational/ Observational	No	2–30 months
Stanford–Binet Scale	Intelligence	Developmental: conceptual not empirical	Yes and No	Lifespan
School Achievement Tests	School achievement	Correlational/ Observational	No	6–30 years
Social-Emotional Development	Socio-emotional functioning at school	Correlational/ Observational	No	4–11 years
Self-Perception	Social acceptation, physical appearance, self-worth	Correlational/ Observational	No	8–12 years
Child Behaviour Check List	Childhood pathology: internalizing, externalizing behaviour	Correlational/ Observational	No	4–18 years
Childhood Depression Scale	Clinical depression	Correlational/ Observational	No	9–12 years
Attention Deficit Hyperactive Disorder	See above	Diagnosis; based on expert agreement	No	4–18 years
Personality	Extroversion, neuroticism, test attitude	Correlational/ Observational	No	8–14 years
Personality	The Big Five	Correlational/ Observational	No	2;6–18 years
Personality	Stages of ego development	Conceptual developmental, and empirical	Yes and No	Almost whole lifespan

FUTURE PERSPECTIVES AND CONCLUSIONS

The quality of assessment of behavioural development depends on the fit between test theoretical models, substantive developmental constructs, and instruments. Classical test theory is not designed to assess development. Nevertheless, it shows test score differences between age groups and within individuals. Combined with a substantial developmental theory these differences can be interpreted developmentally. In the future, age differences between and within individuals can be interpreted from a developmental perspective (Willett, Singer & Martin, 1998). Item response theory and non-linear dynamic theory offer explicit models to test developmental hypotheses. In the future, these models and theory will be used more, and also enhance insight in behavioural development. Developmental models and theories contain mainly strong and weak organismic constructs. In the future these constructs' claims will be tested empirically, and different constructs will be added to allow for other than stage-like developmental patterns. Most instruments for assessing children's behaviours are based on the correlational/observational individual differences approach. Many of these instruments meet their goals. They will remain important in the future, but they will be enriched with developmental insights and constructs to interpret inter-individual and intra-individual age differences of cognitions, behaviours, and emotions.

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RELATED ENTRIES

DEVELOPMENT: PSYCHOMOTOR, DEVELOPMENT: SOCIO-EMOTIONAL, DEVELOPMENT: LANGUAGE, DEVELOPMENT: INTELLIGENCE/COGNITIVE

DEVELOPMENT: INTELLIGENCE/COGNITIVE

INTRODUCTION

Cognitive development is the study of how fundamental processes of acquiring knowledge and information about the self and environment develop. The evaluation of cognitive development, known as cognitive assessment, is an important part of monitoring normal child development. The study of cognitive development, indeed the roots of cognitive assessment, can be traced to the French psychologist Jean Piaget (1896–1980). In many respects, Piaget's theories formed the basis for the modern study of cognitive development. Although not all of Piaget's tenets have withstood the test of time, they continue to influence modern cognitive assessment, if only conceptually (Wadsworth, 1996). Here we will briefly describe Piaget's theory of cognitive development as well his observations of the A-not-B tasks. Finally, we will illustrate the modern tools of cognitive assessment with the Bayley Scale of Infant Development, two Slosson tests, and the Kaufman Adolescent and Adult Intelligence Test (KAIT).

FOUR STAGES OF PIAGET'S THEORY

In 1920, Piaget began testing infants and children to see at what age they could solve certain problems correctly and how they did so. Based on his observations, Piaget became more interested in the children's errors on specific tasks which he noticed occurred at distinct ages of development for the majority of children tested. Piaget's first developmental stage, the sensorimotor stage, encompasses the first two years of life. During this stage, the infant uses the motor movements and sensory stimulation of touching, mouthing, looking, and other actions to organize the properties of its environment. It is through these interactions with the environment that the infant begins to develop schemas. Piaget believed that sensorimotor stage infants lacked cognition; in other words, infants did not think about the environment, they merely organized it. Most patterns of infant behaviour are dominated by reflex. After eight months, the infant begins to develop the concept of object permanence, or the awareness that an object still exists despite its being taken from view. By the end of the second year, the infant begins to have internal representations of objects and events and understand that objects may affect the environment as the infant can (Halford, 1978).

Piaget's second stage, the pre-operational stage, encompasses ages 2 through 6 or 7 years. In this stage, the child begins to represent objects and events symbolically through, for example, representational behaviours such as symbolic play, drawing, and mental image memory. Language develops rapidly during this period. As the child progresses through this stage, language is increasingly used as a social tool and moral feelings and reasoning start to develop. However, thoughts and language are largely egocentric with the child having difficulty distinguishing perception and logical reasoning. As a result, the capacity for structured conversation is not yet apparent. Affective and social schemata are continuously assimilated and accommodated throughout this stage (Inhelder & Piaget, 1958; Piaget, 1972).

Piaget believed that a third process, equilibrium, prevented an extreme use of either assimilation or accommodation to classify stimuli. Equilibrium is a self-regulatory mechanism that created a balance between accommodation and assimilation. When schemata cannot assimilate to a new stimulus or situation, the child is said to be in a state of disequilibrium. As the schemata adapt to the new stimulus, a cognitive balance is achieved, or equilibrium. This process is referred to as equilibration (Piaget, 1977). In combination, these three processes facilitate cognitive development throughout an individual's life.

From the age of 7 to 11, Piaget noted a third stage, the concrete operational stage, in which the child's logical reasoning abilities increase. The child is successful at seriation (the ability to accurately categorize or mentally arrange a set of stimuli according to a dimension such as size, weight, or volume), and classification of concrete objects, and is capable of understanding conversation tasks, such as conversation of number. Even though some logical reasoning skills have started to develop, the child is unable to apply these skills to abstract problems and hypotheses. Perception plays a greatly reduced role in judgements (Kaufman & Flaitz, 1987).

Piaget's last stage of development, the formal operations stage, encompasses ages 11 to 15+ years. During this period, the child is able to apply logical reasoning to abstract verbal and hypothetical problems. By the end of the formal operations stage, the child's cognitive behaviour is qualitatively similar to that of an adult. Indeed, Piaget (1972) wrote, in these years 'a whole series of novelties highlights the arrival of a more complete logic' (p. 3). This stage is focused on a development of a capacity for dealing with possibilities; thinking becomes increasingly flexible (Kaufman & Flaitz, 1987).

HOW EACH STAGE IS QUALITATIVELY DIFFERENT

Piaget's theory included four main stages with each stage reflecting a qualitative change in a child's reasoning abilities. Common changes to each stage are: (a) cognitive reasoning becomes superior with the advancement of each step; (b) each improvement in a reasoning ability is generalized across all things associated with the reasoning ability; (c) each progressive step incorporates past learning and skills with the new knowledge; and (d) cognitive and intellectual development depend on four variables which include maturation, experience, social interaction, and equilibration (Piaget & Inhelder, 1969).

COGNITIVE DEVELOPMENT ASSESSMENT DERIVED FROM PIAGET'S THEORY

Throughout Piaget's observations of child behaviour, he derived several tasks to assess a child's current level of cognitive functioning, according to his theory. A familiar task demonstrating object permanence for the sensorimotor stage (infancy) is the 'A-not-B' task. In this task, the experimenter shows an infant a toy and then places the toy underneath a nearby cloth, designated as location 'A'. At around 12 months of age, the infant will find the toy in the 'A' cloth. Once this is accomplished, the experimenter then places the toy under a second cloth at location 'B'. Despite having seen the toy being placed under cloth 'B' and despite showing success previously at retrieving the toy from cloth 'A', many infants continue to search for the toy under cloth A. This is the A-not-B error. The average age for infants to accomplish this task (i.e. searching for the toy under the 'B' cloth) is from 12–18 months of age.

BEYOND PIAGET: CONTEMPORARY COGNITIVE ASSESSMENT

While influenced by Piaget's theories of cognitive development, most contemporary tools of cognitive assessment use more general theories of intelligence, not theories that are specific to child development. Many of these tests, such as the Wechsler Primary Preschool Scales of Intelligence – Revised (WPPSI-R), Kaufman Assessment Battery for Children (K-ABC), and Cognitive Assessment System (CAS) are explored in greater details elsewhere in this encyclopedia (see 'Intelligence Assessment (General))'. Three other instruments for the assessment of cognitive development will be addressed below.

BAYLEY SCALES OF INFANT DEVELOPMENT – SECOND EDITION (BSID-II; BAYLEY, 1993)

The Bayley Scales of Infant Development – Second Edition (BSID-II; Bayley, 1993) are a revision of the original BSID that was developed by Bayley (1969) to assess the development of infants and very young children. The BSID-II may be administered to infants between the ages of one month and 42 months. Comprised of three scales (Mental, Motor, and Behaviour Rating), the BSID-II is one of the most commonly used tests in the psychological testing of an infant's

current level of development and achievement of specific developmental milestones. The Mental scale contains items for the assessment of precursors of intelligence, including memory, habituation, problem solving, early number concepts, language, and logical thinking. The mental scale contains no subtests and yields a single global index or Mental Development Index (MDI), ($M = 100$, $SD = 15$), which is interpreted as a measure of overall cognitive development, not as a measure of intelligence, language or visual perception. The BSID-II has high psychometric quality, more specifically high internal consistency coefficients, and good test–retest reliability. Overall, the average reliability for the BSID-II is 0.88 across all age levels and the coefficients for internal consistency are 0.89 and 0.90 for ages of 36 months and 42 months, respectively (Alfonso & Flanagan, 1999; Bracken & Walker, 1997).

SLOSSON TESTS

The Slosson Intelligence Test Primary – (SIT-R; Erford, Vitali & Slosson, 1999) and the Slosson Full-Range Intelligence Test (S-FRIT; Algozzine, Eaves, Mann & Vance, 1993) are assessment tools that are useful for a variety of practical purposes such as evaluating the cognitive ability of individuals with learning disabilities, mental retardation, visual impairments, orthopaedic disabilities, or children who are considered potentially gifted. The SIT-R is appropriate for individuals from the age of 4 years old and up, while the S-FRIT is appropriate for individuals from 5 years old to 21 years old. The SIT-R measures General Information, Similarities and Differences, Vocabulary, Comprehension, Arithmetic, and Auditory Memory, while the S-FRIT has a Verbal Index, Performance Index, and Memory Index, that combine to produce a Full-Range Intelligence Quotient (Algozzine et al., 1993).

CONCLUSIONS

The assessment of cognitive development emphasizes the examination of variables relevant to the current developmental functioning of a child. Cognitive development assessments, historically, have been an important part of Western society's emphasis on education and have enabled the identification of children who may need early intervention services due to developmental delay. Piaget was one of the first theorists to identify the importance of the assessment of cognitive development. Over time, not all of Piaget's theory has been supported by modern research. It nonetheless continues to remain one of the most important preliminary theories of cognitive development today, and its influence remains in the assessment of cognitive development, and, occasionally, in clinical assessment.

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RELATED ENTRIES

Development (General), Development: Psychomotor, Development: Socio-Emotional, Development: Language, Applied Fields: Clinical, Applied Fields: Education, Applied Fields: Neuropsychology

DEVELOPMENT: LANGUAGE

INTRODUCTION

The assessment of language development is aimed at establishing the level of competence or proficiency attained by children and second-language learners in the linguistic knowledge and abilities involved in speaking, listening, reading and writing activities.

From a theoretical point of view, language development assessment rests on similar assumptions and biases as adult language assessment. See Language (General) in this volume. Unlike language adult testing, however, language development assessment presupposes that the linguistic subject's competencies and abilities are not yet fully developed, and thus should be assessed at some intermediate point between an *initial non-linguistic state* (typical of newborns and people beginning to learn a second language), and the *final state* typical of people possessing a basic linguistic competence (e.g. normally developed children above 6–7 years old with a good command of their native/mother tongue, and highly proficient second-language learners).[1]

Individual language tests are used for a number of different practical purposes. According to Stark et al. (1982: 150–151), these include: (1) screening large groups of children in preschool or early school years for language disorders; (2) determining level of language functioning or degree of deficit in language in children considered to be at risk for a language disorder (these measures being often employed in making decisions as to whether a child should be admitted to a treatment programme, assigned to a given level of educational placement, or included in a research study); (3) in-depth evaluation of language and language-related skills in a child who has been admitted to a clinical, educational or research programme; and (4) determining to what extent an intervention programme has benefited individual language-impaired children.

As in adult language assessment, two general perspectives underlie the tools created to assess developing language: a psychometric approach and a cognitive approach.

Classical psychometric assessment – which largely rests on the behaviourist assumptions on language prevailing in the 1950s and 1960s – implicitly views the linguistic progress of children as a relatively linear process that can be adequately outlined through the quantitative scores that subjects obtain in a number of standardized linguistic tasks. Test items (which are not contextually relevant) are selected on the basis of their ability to discriminate between typically developing children at different ages, but not necessarily on developmental considerations. The examiner can derive conclusions about the developmental 'normality/non-normality' of a child by merely comparing the language ages and quotients that the child obtains with those expected by age.

The *cognitive approach* – which is the prevailing one since the early 1970s – views linguistic behaviours as reflecting both the abstract knowledge that a speaker–listener possesses about language (the so-called 'linguistic competence'), and the ongoing mental processes that operate on linguistic representations in real-time language production and comprehension ('linguistic performance'). Therefore, language development assessment is primarily focused on the description of the underlying competence of subjects over time, as well as on characteristics and changes in utterances during actual verbal performance.

The cognitive approach implicitly assumes the representational complexity of linguistic competence (which is viewed as consisting of phonological, morphological, syntactic, lexical, semantic and pragmatic principles), as well as the differential constraints that speaking and comprehension activities impose on the cognitive system.

Therefore, from this perspective, it is virtually impossible to make a good developmental diagnosis of language if the examiner (a) does not possess an extensive knowledge of the *stages* at which the different subsets of linguistic principles are acquired, or (b) ignores the specific mechanisms involved, or (c) lacks a theoretically grounded *model* about human cognitive growth and organization (that appears to be not as modularized in children as it seems to be in adults – see Karmiloff-Smith, 1992). Diagnostic conclusions about the linguistic *competence* of subjects must also take into account that verbal comprehension abilities develop faster than speaking, which is particularly true for the youngest children.

THE CONTENTS OF LANGUAGE DEVELOPMENT ASSESSMENT

During the last decades, the contents of language development assessment have undergone several critical changes. These changes mirror the different theoretical models on language yielded by both psychologists and linguists, but also run in parallel to the ongoing diversification of professional settings in which language development assessment has been required (these settings being, at first, highly restricted to speech *therapists* and second-foreign language *teachers*, and now also involving *psychologists*).

In the 1960s and 1970s, the emphasis of language examiners was primarily focused on deficits and disorders in phonology and grammar. The use of the *mean length of utterance in morphemes* (MLU) to assign the child to a developmental level is a good example of strategies focused on the structural aspects of language, which were developed in these years and have been extensively used around the world since then (although MLU cannot be applied without adaptations to languages other than English – e.g. languages with more complex morphologies such as Spanish, German or Hebrew). The batteries included in Table 1 are also classical and well-known examples of psychometric tests based on models of linguistic competence.

In the late 1970s and mid-1980s, a number of strands emerged that resulted in both an enlargement of the contents to be assessed, and a double shift away from the deficit-centred focus on the formal aspects of language towards client-centred approaches focused on the subject's linguistic abilities in natural settings (Howard & Müller, 1995).

In the theoretical domain, an increasing interest in *discourse* and *pragmatic* abilities grew in these years which has been frequently referred to as the 'pragmatics revolution'. This pragmatic revolution was brought about by the innovative proposals of authors such as Austin (1962), Searle (1969), and Bates (1976). Generally speaking, it allowed researchers to criticize the grammatical bias of previous language models and to become more and more interested in analysing how *real people* use language in social contexts (as opposite to the *ideal speakers* referred to in the previous psychometric and linguistic traditions). In the clinical domain, a huge body of observations had also been accumulated at that time concerning children who did not show difficulties to construct phonologically and grammatically well-formed utterances, but used language in an odd and inappropriate fashion (the so-called 'semantic pragmatic disorder').

Taken together, these new clinical and theoretical interests paved the way to the construction of assessment tools and measures now focused in communicative and pragmatic abilities. See Communicative Language Abilities in this volume. Besides, methods originally devised for adult language assessment, such as the analysis of spoken discourse and conversations, began to be used for children assessment purposes, largely exceeding the limits of previous psychometric and grammatical testing (see, for example, Brinton & Fujiki, 1989; McTear, 1985).

METHODS FOR LANGUAGE DEVELOPMENT ASSESSMENT

Four main categories of techniques of language development assessment will be presented here that try to simultaneously collect informative data about a broad range of language functions,

Table 1. Commonly used standardized tests for the assessment of language development

Illinois Test of Psycholinguistic Abilities (ITPA) (Kirk & McCarthy, 1961). Based on Osgood's neobehaviouristic model on language, this test includes 12 different tasks which explore a wide repertoire of abilities (phonological, syntactic, semantic and visual abilities, gestural expression, fluency and memory) that, according to its underlying theoretical model, are involved in the communicative process. Although the use of this battery is very usual in ordinary and special schools, some authors have questioned its usefulness for language development assessment due to its lack of developmental foundations.

Peabody Picture Test of Vocabulary (PPVT) (Dunn, 1965; revised in Dunn & Dunn, 1981). This test (also very commonly used) assesses the recognition of a set of 100 words presented by the examiner and ordered by difficulty. Its materials are plates with four pictures each, and the child is asked to identify the one that matches the target word. It can be applied to children above 2.6 years.

Reynell Expressive Developmental Language Scale (Reynell, 1969). This scale allows assessment of the verbal comprehension and expression abilities of children between 18-months and 6 years of age. The complete battery includes two different scales. In the comprehension scale, the child is asked to carry out a set of verbal instructions that the examiner proposes in a semi-structured play situation. The expressive scale allows estimations of the vocabulary, structure and creative use of language of children without visual aids of pictures or objects.

The Edinburgh Articulation Test (Anthony et al., 1971) and *The Goldman–Fristoe Test of Articulation* (Goldman & Fristoe, 1972). Probably the most commonly used phonological tests, these two tests involve the production by the child of a small set of lexical items from pictures presented by the examiner. The lexical items are designed to contain a representative sample of the phonemes of the English language in various positions within the word (word-initial, word-medial, word-final). The responses are tape-recorded, transcribed and categorized by the examiner, and then compared with the targets.

The Northwestern Syntax Screening Test (NSST) (Lee, 1971). This test evaluates the morphosyntactic proficiency of children between 3–8 years by means of expressive (imitation) and receptive tasks (pointing to the correct choice among four different pictures). The morphosyntactic contrasts evaluated include, among others, the affirmative/negative contrast, inflectional marking of tense and number, prepositions, and different kinds of pronouns and interrogative adverbs (such as 'who', 'what', 'where').

The Carrow Auditory Test of Language Comprehension (CATLC) (Carrow, 1974). This test assesses the morphosyntactic proficiency of children between 3–6 years. Children are asked to choose among three pictures the one that best matches the input provided by the examiner. The pictures depict contrasts about different kinds of function words (e.g. prepositions, determiners, etc.), inflectional morphemes, various sorts of syntactic structures, etc.

and meet the constraints of limited time and resources typical of clinical explorations: (1) *structured tests*, (2) *language sampling*, (3) *parental reports*, and (4) *non-standarized elicitations* McDaniel et al. (1996).

Structured tests are the best exponents of the psychometric tradition in language development assessment, and the most common method still used in educational and clinical settings. Structured tests have steadily been developed from the 1960s, and currently they could be counted in tens.

Individual language testing typically involves asking children to solve linguistic tasks such as discrimination of individual phonemes, naming or pointing to objects and pictures, carrying out actions asked by the examiner, etc. in isolated, fixed and non-natural communicative situations where contextual and particular variations must be avoided. Although some differences exist between batteries of tests developed for the assessment of language level or of the degree of language deficit, they are usually treated as a scale, their results being expressed in the form of language ages or language quotients.

The assessment of language of children by using standardized tests is usually expensive, requires the cooperation of children, and shows a limited validity for children under 3 years. Besides, most of the available tests do not fit well under current cognitive theories and data on normal language development, and lack updated theoretical foundations. A remarkable and worthy exception is the *Test for the Reception of Grammar* – TROG – developed by Bishop (1983), where the targets were carefully selected on the basis of psycholinguistic criteria, and errors are informative about the linguistic *strategies* the children use when listening to messages.

The *language sampling* methodology consists of recording samples of spontaneous language in natural and meaningful settings. These samples (recorded in audio- or videotape) are supposedly representative of language children use in day-to-day conversations.

Language sampling became the true 'method of choice' for early language assessment, given its great ecological validity and versatility (it made it possible to gather information about grammatical and pragmatic components of language from a single sample, as well as to compare samples from a same subject in different conversational conditions: familiar and unfamiliar settings, peers, adults, and younger people as partners, etc.).

Until now, a wide variety of indices (phonological, morphological, lexical, syntactic, semantic, and pragmatic) have been thought to be derived from linguistic sampling (see Miller, 1981 for a review). However, normative data are lacking for most of these indices, and a great variability could be induced in them when minimal changes in conversational or environmental conditions occur.

The use of a sample-based methodology for assessing language development requires highly trained personnel, and consumes a substantial amount of time for analysis. In the last few years software has been designed to derive linguistic profiles and measures by computer (e.g. the *Systematic Analysis of Language Transcripts* – SALT – developed by Miller & Chapman, 1983, and the *Child Language Analysis Program* – CLAN – see MacWhinney, 1991). However, although the computerized analysis of speech samples has become a formidable tool for researchers, their clinical use for diagnostic purposes is still limited.

Even under ideal circumstances, the representativeness of measures gathered from language samples analyses is not always guaranteed, which poses the problem of their reliability. Another methodological problem is that a child might simply choose not to produce a particular linguistic construction (or pragmatic function) even though she has acquired it, and that examiners interpret the *non-observed* targets as a sign of a *non-acquired* ability.

The *parental reports*, as Dale has stated (1996: 162), involve 'the systematic utilization of the extensive experience of parents (and potentially other caregivers) with their children'. This method usually adopts the form of diary studies, retrospective reports, and/or free-form reports elicited by the examiner through questionnaires or interviews.

Parental reports about children's language are basically used for young children, and have significant advantages because, among other things, they are 'likely to reflect what a child knows, whereas [a sample of] free speech reflects those forms that she is more likely to use' (Bates, Bretherton & Snyder, 1988).

Although the parental report's validity could be negatively affected by numerous different variables (e.g. social class, interests and skills of parents, age and disability of the child, etc.), this old and 'low-tech' procedure is still commonly used by researchers and clinicians, especially for purposes of initial screening. Excellent examples of language development measures based in parent reports are the *MacArthur Communicative Development Inventories* (CDI) (Fenson et al., 1993), and the *Receptive-Expressive Emergent Language Scale* (REEL) (Bzoch & League, 1994).

The *elicited non-standardized production* is an experimental technique in which the adult suggests certain tasks and probes to the child (usually in the broader context of a game with puppets) in order to elicit particular linguistic responses. Elicited non-standarized production has been successfully used both in clinical and psycholinguistic research contexts to evoke morphological and syntactic structures (as well as pragmatic and communicative functions) that occur only rarely, if at all, in children's spontaneous speech. It allows the diagnostic impressions derived from language testing and spontaneous speech analyses to be contrasted, and enables examiners to obtain robust samples of data of the targeted structures within a single experimental session.

LANGUAGE VARIABILITY AND LANGUAGE DIFFERENCE IN CHILDREN DEVELOPMENT

Individual variations in patterns of linguistic development of clinically normal children have been repeatedly noted by researchers and clinicians

since the 1980s (e.g. Bates & MacWhinney, 1987), which points out the need to bear in mind the non-linear character of language learning, and the intrinsic variability of language performance (moment to moment, across contexts and subjects, and developmentally over time). On the other hand, there is an issue of deep concern regarding the data that have been recently published, showing an increasing number of children from 'minority' ethnic groups who are misdiagnosed as having language disabilities (and are included in special education classes) because of their low scores in standardized language tests.

In order to neutralize the cultural bias in language assessment, practical suggestions could be recommended when testing these 'minority' children, such as 'rewording instructions, providing additional time or practice, asking the child to provide an explanation for incorrect responses, having a parent or another trusted adult administer the test, and using repeated presentations of test stimuli' (Gutiérrez-Clelles, 1996: 49). However, children speaking languages or dialects other than the official ones could constitute more than 50% of the school population in some states, and the practical problem arises of how to adequately differentiate language disorder from language difference. Because of the great variability within the clinically normal population itself, rigid norm-based criteria cannot be established to distinguish specific language disorders and delays from normal individual variations.

Standardized tests and competence-based measures in language development assessment used so far seem unable to adequately capture both variability and stability in a child's verbal performance. Consequently, an increasing number of specialists have recently proposed to complement (if not to substitute) the classical strategies in language development assessment with *dynamic methods* that allow comparisons of the child's performance as it changes during ongoing language processing, and to obtain language-learning measures (e.g. Evans, 1996; Peña, 1996).

Undoubtedly, these new proposals will imply wide and profound changes both in theoretical assumptions and assessing practices. Perhaps they must be considered as the first signs of an imminent and largely necessary new 'revolution' in language development assessment.

FUTURE PERSPECTIVES AND CONCLUSIONS

In our review of the current state of language development assessment, we have pointed out three relevant issues.

First, we have referred to the great enlargement of the contents of the assessment in the last two decades, showing that the assessment was initially limited to structural aspects of language, whereas now it is also focused on pragmatic and communicative abilities.

Secondly, we have briefly described the methods and strategies commonly used in language development assessment, and identified both their advantages and limitations. Because the individual language tests only provide limited information about a narrow range of linguistic abilities, and since they must be applied outside the natural context in which language is used, we strongly claim against using standardized tests as the only basis for the assessment of linguistic competence in children, and recommend usage of complementary methodologies such as speech-sample analyses, parental reports, and elicited productions.

Finally, and on the basis of recent data revealing the great variability of language development in normal children (and the cultural differences that negatively affect the performance of children from minority ethnic groups in standard language testing), we have pointed out the need of distinguishing between language variation and language difference. We have also warned about the current lack of operative criteria for such a distinction, and feel confident that a dramatic change will soon ensue (which already seems to emerge) in the theoretical and practical assumptions of current language development assessment.

In future, language development assessment must still go towards a more theoretically grounded case-study approach, and an acknowledgement of the individual nature of the linguistic profiles of children. Strategies which allow the examiners to simultaneously exploit normative references and obtain individual language samples, in a range of different communicative contexts, could be the most useful strategy in order to conjure up a complete and representative picture of the language abilities of children.

Note

1 In a recent charming book, the cognitive psychologist Steven Pinker (1994: 15) referred to human language as 'an instinct to acquire an art' to emphasize the idea that it is not possible for human beings to develop the *natural* faculty of language (which is part of our biological – phylogenetically inherited – endowment) without *learning* any particular language.

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RELATED ENTRIES

DEVELOPMENT (GENERAL), DEVELOPMENT: PSYCHOMOTOR, DEVELOPMENT: SOCIO-EMOTIONAL, DEVELOPMENT: INTELLIGENCE/COGNITIVE, LANGUAGE (GENERAL), COMMUNICATIVE LANGUAGE ABILITIES, APPLIED FIELDS: EDUCATION, APPLIED FIELDS: CLINICAL, THEORETICAL PERSPECTIVE: COGNITIVE

DEVELOPMENT: PSYCHOMOTOR

INTRODUCTION

Assessing psychomotor development is an important component in the interdisciplinary process of evaluating young children. Movement is an avenue through which infants and children interact with their environment, and is closely tied to and interrelated with both perceptual and emotional development. Hence, it may appear in the literature under the name of psychomotor. Nonetheless, this entry will refer to motor development, defined here as changes in the level of movement performance based on neurological and environmental influences.

This entry will address the assessment of motor development in children from birth to 6 years of age, relating only to observable, quantifiable development.

HISTORICAL TRENDS

In the early 1900s the trend was for psychological examination of relationships between cognitive abilities and motor abilities, represented, for the most part, by fine motor manual dexterity skills.

From Motor Abilities Assessment to Motor Skills Assessment

In the 1920s, assessments focused mainly on motor abilities and capacities were expressed in a single composite score.

From the 1940s, assessments began focusing more on direct measures of motor skills. Gesell and Bayley laid the foundations for the assessment of motor skills in infants and young children from the early 1900s and into the 1950s.

From Product-Oriented Assessment to Process-Oriented Assessment

In the field of assessing fundamental motor skills, the era between the 1930s to the 1960s was dominated by product-oriented assessments. The 1970s saw a shift to more process-oriented assessments, pioneered by the work of Seefeldt and Hubenstricker (1982), and on fundamental motor patterns development.

From Neuromaturational Hierarchical Frameworks to Functional Activities

Since the 1930s and 1940s, functional movement skills have been the main focus in assessment of daily living activities. This shift from the use of neuromaturational and reflex hierarchical frameworks for evaluation of children to the measurement of disablement related to functional activities was driven by contemporary theories of motor development and motor control, which supported motor learning and systems approaches to evaluation and intervention.

The focus on functional movement skills can also be seen today in the area of adapted physical education and special education (Davis & Burton, 1991), as in the development of the Movement Assessment Battery for Children Checklist (Henderson & Sugden, 1992).

TERMINOLOGY

Motor Development

Adaptive or functional changes in movement behaviour throughout life, and the processes underlying this behaviour. Changes occur in observable movement behaviours, usually categorized as non-locomotor (stabilizing), locomotor, or manipulative, or any combination of the

three. Maturation, growth, and experience are variables that may lead to change in movement behaviour.

Psychomotor Development

Changes in behaviour throughout life, emphasizing the interaction between psychological and motor process.

Motor Abilities

General traits or capacities which underlie movement skills and are not easily modified by practice or experience.

Movement Skill

Specific and goal-directed movement patterns (e.g. running, writing). Also used as a qualitative expression of movement performance.

Psychomotor Development Assessment

Any activity, either formal (standardized, norm-referenced, criterion-referenced) or informal (using developmental, observational checklists or profiles), designed to elicit accurate and reliable samples of movement behaviour, that represent the developmental status of an individual.

A THEORETICAL MODEL OF MOTOR DEVELOPMENT

Gallahue (1982) suggested a four-phase model of motor development: (1) reflexive movement, (2) rudimentary movement, (3) fundamental movement, and (4) sport-related movement. This model can serve as a framework and used as a tool for assessment. In this discussion, we refer to motor development only in regard to the sequential progression of movement in the first three phases, representing motor development of preschool children. These phases parallel the *motor abilities*, *early movement milestones*, and *fundamental movement skill* levels of movement skill described in the six-level movement skill taxonomy developed by Burton and Miller (1998).

Phase 1. Reflexive Movement (in utero–1 year)

Neonatal movements are reflexive. Rooting and sucking are primitive survival mechanisms, controlled by lower levels of the central nervous system. Postural reflexes (e.g. stepping and crawling) are another form of involuntary movement. As the child grows, the developing cerebral cortex inhibits lower-level reflexes, and movement milestones follow a predictable sequence.

Phase 2. Rudimentary Movement (birth–2 years)

Rudimentary movement abilities involve stability movements (e.g. control of head, neck, and trunk muscles), manipulative tasks (reaching, grasping, and releasing), and locomotor movements (creeping, crawling, and walking). In the first year, motor development is mostly a matter of biological maturation, and rudimentary movements appear in a highly predictable sequence whose rate varies from child to child, depending on biological and environmental factors (Gallahue, 1982; Burton & Miller, 1998).

Phase 3. Fundamental Movement (2–7 years)

The fundamental movement abilities of early childhood grow from the rudimentary movement phase of infancy. It is then that children acquire and refine fundamental motor patterns and begin to develop more complex locomotor, stability, and manipulative movements, first in isolation and then in combination with other motor skills. Fundamental locomotor skills include walking, running, jumping, sliding, galloping, hopping, and leaping, while fundamental object-control skills include throwing, catching, striking, bouncing, kicking, pulling, and pushing (Gallahue, 1982; Burton & Miller, 1998). Maturation and factors such as opportunity, motivation, and instruction have a significant influence on the degree of skill development. Fundamental motor patterns provide the infrastructure for learning more complex games, sports, and dance skills in later life. Without these prerequisite skills, children may experience a high failure rate both in school and in the playground.

AIMS OF MOTOR-DEVELOPMENT ASSESSMENT

Categorization or Identification

Assessing eligibility for special educational services or appropriate placement as provided by law. Screening to determine whether a child is lagging, and his/her level of development/performance in relation to peers. Planning intervention or instruction: providing a baseline measurement of the child's skills and of desired family outcomes, to determine appropriate goals and objectives for intervention (Bricker, 1993).

Evaluating Change over Time

Assessing the child's age-related progress with no special intervention. Evaluating progress or intervention effectiveness. Predicting a child's future performance (e.g. using the APGAR score).

Research

For data collection as a research tool. Note that assessment is highly recommended for screening and evaluating individuals with noticeable delays, but it does not generate labels or identify causes of deficiency (Burton & Miller, 1998).

For purposes of assessment various tests have been constructed. Table 1 presents one selection of such tests. This is by no means an exhaustive list, and tests should be carefully chosen for each case.

MOTOR DEVELOPMENT TESTS: CLASSIFICATION AND SELECTION

Some of the myriad tests for motor development use Gallahue's (1982) four phases as a framework for description and selection. These are:

Assessment of Motor Abilities

Motor abilities are general traits or capacities of an individual that underlie the performance of a variety of movement skills. The Bruininks–Oseretsky Test of Motor Proficiency (Bruininks, 1978), the Basic Gross Motor Assessment, and the Movement Assessment Battery for Children Test (Henderson & Sugden, 1992) are examples of motor ability assessments.

Assessment of Early Movement Milestones

Most of the early movement assessment instruments, such as the Movement Assessment of Infants, focused on neuromotor aspects (evaluation of posture, tone, and various reflexes or 'reactions'). Other tools measure acquisition of early milestones, e.g. the Bayley Scales of Infant Development, the Peabody Developmental Motor Scales, and the Gesell Developmental Scales. Though these instruments differ considerably in their stated aims, in practice the differences are sometimes ignored. Some were designed as screening tests (e.g. the Denver Developmental Screening Test), others for designing intervention programmes such as the Bayley-II (Bayley, 1993), but all may be used for assessment too.

Few of the early movement milestone assessment tools were constructed specifically to document change, such as the Gross Motor Function Measure. Some tests provide normative data on the whole range of abilities (e.g. Bruininks, 1978).

Assessment of Fundamental Movement Skills

Most contemporary movement skill assessments are designed for males and females. Gender differences may be apparent in tests of fundamental movement skills, when norms are established for individual skills. The main two approaches to assessing fundamental movement skills are product-oriented assessments and process-oriented assessments.

Product-Oriented Assessment

Product-oriented assessment focuses quantitatively on movement performance, i.e. how fast children can run (regardless of their stage or maturity of running style), how high they can jump, and the number of repetitions they can perform for a given motor skill. Before 1975, specific fundamental movement skill assessment instruments were product-oriented; for example, the Bruininks–Oseretsky Test of Motor Proficiency (Bruininks, 1978) and Test of Motor Impairment – Henderson Revision.

Table 1. Assessment tools

Assessment Instrument	Movement Category	Purpose	Description	Ages	Time Required
Bayley II – Bayley Scales of Infant Development (Bayley, 1993)	Motor abilities; Early movement milestones; Fundamental movement skills	Identify developmental delays; Design intervention programmes; Monitor programmes' effectiveness	Criterion- and norm-referenced test. Three scales: Mental, Motor, Behaviour Rating	1–42 months	Under 15 months 25–35 minutes Over 15 months up to 60 minutes
BOT – Bruininks–Oseretsky Test of Motor Proficiency (Bruininks, 1978)	Motor abilities; Fundamental movement skills; Specialized movement skills	Determine educational placement; Assess gross and fine motor skills; Develop and evaluate motor training programmes; Special screening; Assist clinicians and researchers	Long- and Short Form, norm-referenced, product-oriented test. LF: 46 items in 8 subtests; SF: 14 items	4.5–14.5 years	LF: 45–60 minutes SF: 15–20 minutes
Denver II (Frankenburg et al., 1990)	Early movement milestones; Fundamental movement skills	Screen asymptomatic children; Confirm intuitive suspicions; Monitor children at risk for developmental problems	Norm referenced; 125 tasks. Categories: Personal-Social, Fine Motor – Adaptive, Language, Gross Motor	Birth–6 years	15–30 minutes
I CAN Instructional Management System (Wessel, 1976)	Early movement milestones; Fundamental movement skills; Specialized movement skills	Prescribe appropriate movement activities for students; Evaluate skill-specific progress	Criterion-referenced checklists; process and product items. Categories: Preprimary, Primary, Sport/Leisure/ Recreation	Not specified	Specific to individual checklist
MABC Checklist – Movement Assessment Battery for Children Checklist (Henderson & Sugden, 1992)	Motor abilities; Fundamental movement skills; Specialized movement skills; Functional movement skills	Checklist: Screening; Identifying special problems; Research. Test: Clinical exploration; Intervention planning; Programme evaluation	Criterion-referenced test; 5 12-item categories: C (child) stationary/ E (environment) stable; C moving/ E stable; C stationary/ E changing; C moving/ E changing; Behaviours which may interfere with performance	5–11 years	Recommendation: Complete over 1–2 week period of observation

PDMS – Peabody Development Motor Scales (Folio & Fewell, 1983)	Motor abilities; Early movement milestones; Fundamental movement skills	Identify children with delayed or aberrant skills; Determine need and/or eligibility for intervention; Plan programme; Evaluate changes over time	Two-scaled criterion- and norm-referenced instrument; Gross Motor and Fine Motor	Birth–6 years, 11 months	20–30 minutes per scale, total of 45–60 minutes
SIGMA – Ohio State U. Scale of Intra-Gross Motor Assessment (Loovis & Ersing, 1979)	Fundamental movement skills	Determine most logical starting point for planning intervention	Criterion-referenced instrument for assessing qualitative aspects of 11 fundamental movement skills	2.5–14 years	Not reported
TGMD – Test of Gross Motor Development (Ulrich, 1985)	Motor abilities; Fundamental movement skills	Identify children significantly below age norms in GMS; Plan programme to improve skills; Assess improvement as function of age or experience/of instruction and intervention	Criterion-referenced test on the movement patterns used to perform 12 fundamental movement skills; Subtests: locomotor and object-control	3–10 years	About 15–20 minutes
TPBA – Trans-disciplinary Play-Based Assessment (Linder, 1993)	Early movement milestones; Fundamental movement skills	Identify service needs; Develop intervention programmes based on individual treatment objectives; Evaluate progress	6-phase criterion-referenced tool: 1. Unstructured facilitation; 2. Structured facilitation; 3. Child–adult interaction; 4. Parent–child interaction; 5. Motor play; 6. Snack	Birth–72 months	Varies: up to 25 minutes per test

Process-Oriented Assessment

Process-oriented assessment looks at the quality or form of motor performance and provides a detailed description of the nature of the child's movement, based on observation of components and sequential elements. Among process-oriented tools we find the test of Gross Motor Development, the Ohio State University Scale of Intra-Gross Motor Assessment, and the I CAN Fundamental Skills assessment instrument.

FUTURE PERSPECTIVES

This section will address the challenges inherent in assessing young children.

From a 'Single Assessor' Model to an Environmental Model

Using a team approach, children are evaluated in the presence of family members, also considering home and social environment. Parents/guardians, who see their child in natural settings, are taught to observe motor development. Often they are motivated to take an active role in their child's assessment and intervention, working with educators.

From Isolated/Formal Settings to Natural/Informal Environments

Children's motor behaviours in an isolated therapy setting are not taken as a prediction of their behaviours in real-life environments, nor is performance in a therapeutic setting transferred to tasks that children must accomplish in real-life situations. An 'authentic' assessment (e.g. Play-Based Assessment) is recommended, since young children tend to produce their true behaviour in their natural environment, be it home, preschool, or childcare facilities. Each child's interaction with toys and playmates can be systematically observed and reliably recorded as in the Trans-disciplinary Play-Based Assessment (Linder, 1993). The assessment is constructed so that the team can communicate with the play facilitator concerning unobserved skills (e.g. can the child stack three blocks?).

From Standardized Assessments to Assessments Accommodating Special Needs

The importance of interaction between individuals and all aspects of their environment is best supported through the ecological assessment approach. The ecological theory forms the framework for families and professionals working with an interdisciplinary approach. According to the Ecological Task Analysis (ETA) model, a goal is selected and the environment is structured in such a way that it elicits various movement patterns from the child interacting within it. The assessor can challenge, direct, and manipulate the environment, and at the same time observe and record the change(s) in motor behaviour.

From Neuromuscular Explanations to an All-Inclusive Outlook

Rather than looking only at the neuromuscular factor, the systems approach looks at the physiological and mechanical systems underlying motor control. This approach addresses motor control in terms of a group of physically based interactive systems (sensory, motor, musculoskeletal, higher level adaptational, etc.), which in combination produce movement. This approach is aimed at identifying the contributions of the different systems to a given task. In people who are observed to have motor problems, this approach aims at identifying the deficits in terms of the dysfunctional systems. The systems approach assumes a high degree of interdependence between the individual systems that contribute to a movement.

In children identified as having a motor deficiency of unknown aetiology, systems and modular approaches can be used to try and identify the underlying dysfunction and to design appropriate remedial programmes. Identifying the dysfunctional system rather than the problematic skill facilitates the development of a remedial programme for training the underlying deficit instead of training the specific behavioural task (Case-Smith, 1996).

Employing Technology

Videotapes and computers may be employed. Videotaping produces a permanent record of the child's motor behaviour. Tapes can be categorized,

analysed, and recorded for use in the child's file, though the process is time-consuming and expensive. To ensure valid results, recorders ensure that children are unaware of the crew and the equipment.

Movement and motor development can also be recorded on a camera connected to a computer, and compared with previously stored data. The computer can provide a printout with the child's profile, indicating the skill observed, level of development, and age comparison, as well as suggestions for professionals to enhance skill development.

CONCLUSIONS

Despite the well-established use of development instruments, it is only in the last decade that have we become more sensitive to their use, misuse, and limitations, especially when very young children are being assessed (National Association for the Education of Young Children [NAEYC], 1988; Bredekamp & Rosegrant, 1993). During the early formative years, young children display wide variations in their motor development making it difficult to compare motor behaviour based on standardized scores. Young children are environmentally influenced, constantly changing, and unpredictable in their behaviour. Careful, day-to-day, repeated observations are needed to document behaviour reliably. Many published tests are both extremely complex to administer and time-consuming, decreasing valuable time for direct intervention and contact with the child. Some assessments may also stigmatize individuals.

The dynamic nature of growing children requires a thorough understanding of their cognitive, social, emotional, and physical development, and how these aspects affect their responses to testing. The use of a valid and reliable test instrument, in itself, is insufficient. The test must come in conjunction with knowledge of each child's unique developmental needs, incorporating new approaches and alternative assessment instruments while adhering to specific evaluation guidelines.

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Orli Yazdi-Ugav and Shlomo Romi

RELATED ENTRIES

DEVELOPMENT (GENERAL), DEVELOPMENT: SOCIO-EMOTIONAL, DEVELOPMENT: LANGUAGE, DEVELOPMENT: INTELLIGENCE/COGNITIVE

DEVELOPMENT: SOCIO-EMOTIONAL

Emotional life, which develops earlier than rational life, is the key to understanding the world in early childhood. However, up to now, less research has been carried out on this important aspect than on others, such as intellectual, linguistic, motor or moral aspects, and this has had a corresponding effect on assessment.

The mechanism of emotional development still remains obscure. Thus, there are very few scales for assessing emotional development, compared to the number of instruments for assessing, for example, cognitive or motor development. Of the emotional assessment scales that do exist, the most notable are those of: Erikson (1963), who described the psychosocial development of children, and whose theory involves a polar evolution of emotions with five different stages: Trust–Mistrust (0–18 months), Autonomy–Shame (18 months–3 years), Inactive–Guilt (3–5 years), Industry–Inferiority (6–11 months) and Identity–Confusion (12–17 months); Jersild, who proposed five psycho-affective stages based on different fear elicitors, the most important of which were: strange, being different, ridicule, separation and imagination; and Sroufe (1979), who identified the following stages: smile (1–3 months), positive affect (3–6 months), active participation (7–9 months), attachment (9–12 months), practising (12–18 months) and self-concept (18–36 months).

Experts in this field are concerned with clarifying certain issues such as the age at which children show emotions and how we can notice them, the age at which they detect other people's emotions, or when they begin to recognize their own emotions. Serious assessment is necessary if we are to answer such questions (Campus & Barret, 1984).

There are three main strategies for measuring infants' emotions: laboratory procedures, parental reports and observation in natural contexts. When children grow up – and depending on their age at the time of assessment – it is possible to add other methods, including pictorial tests, questionnaires to be answered by the child, matching pictures, drawing and playing.

While assessing emotions in children, it is often necessary to focus on some of their components, such as elicitors, receptors, states, expressions or experiences (Lewis, 1998). Therefore, the psychological assessment of emotions should take into account physiological factors, facial expressions and body postures, as well as vocalizations and language.

We can also analyse the physical basis of emotion by means of skin conductance, cortisone rates, electromyography, and so on. These methods are normally used in clinical settings, and rarely in developmental research.

The commonest method for assessing emotions in children is observation of the relationship between elicitors and expressions. The emotional behaviour is usually studied by means of video recording while the child is performing a specific task in the laboratory. Observation in natural environments is also possible, but is much more rarely used.

All experts accept the fact that basic emotions are present in children from birth, and that the more complex ones become established successively according to a schedule. The basic emotions of joy, sadness, anger, fear and interest appear before the more complex ones, such as guilt, empathy, pride or shame.

Observing the child's reactions to elicitors such as sweet and bitter drinks, restraints or sudden noises has constituted the basis of many experiments on children's emotions (Watson & Morgan, 1917). Another procedure has consisted in taking photos of children in the presence of elicitors in a natural context and showing the pictures to judges who are requested to identify the emotions in them. The emotions identified most accurately through this method in children 1 to 9 months old are: happiness (81%), sadness (78%), surprise (69%), anger (41%) and disgust (37%) (Izard, 1980). Concordance among judges improves when they

are able to see the sequence elicitor-expressive facial response. Another assessment strategy has been to observe child–mother, child–stranger or child–peers interaction during a playing task. The facial emotional response has been found to be similar in many cross-cultural studies (Mesquita & Frijda, 1992), with judges clearly identifying emotions on looking at photographs of people from other cultures (Ekman, 1973).

Another strategy has been to observe emotional reactions in mother–infant play. The situations most often used are the following: 'tell me a story', 'gonna-get-you', 'walking fingers so big', 'pat-a-cake' and 'peek-a-boo', with children aged 1–6 months; and 'tactile games', 'body movement', 'visual games', 'horsie' and 'ball', with those aged 3 to 8 months; and 'independent toy play', 'co-ordinated toy play', 'give and take', 'tower', 'role games', 'reading' and 'pretending', with children aged 7 to 17 months.

The first assessment of children's emotional development was carried out through laboratory observation. Based on data from different authors, whose laboratory experiments consisted of adults identifying children's emotions, we can develop a schedule of emotion appearance (see Table 1).

The basic emotions are present from birth, but as the child grows up, they mature and become more differentiated, complex and focused. Social learning plays an important role in this process. Children's social adaptation depends on their ability to express and detect emotions.

A different question is that of locating and assessing the age at which a child is able to recognize and identify other people's emotions. Empathy is the emotion that allows us to identify this ability. Haviland and Lelwica (1987) detected this capability in children aged 2 months, while Yarrow and Waxler (1975) identified complex responses to help adults cope with their distress in children aged 10 to 20 months. Sorce et al. (1985) showed that children 9 to 12 months old change their behaviour with regard to a visual cliff by understanding facial emotions (joy or fear) in their mother's face. Also, a child's acceptation or avoidance of a new toy is mediated by his/her mother's behaviour at the age of 1 (Hornick et al., 1987): Feiring (Feiring et al., 1984) found that the child looks at the caregiver's face before reacting to a new stimulus, which shows that 1-year-old children are able to comprehend other people's emotions. By the age of 3, children can correctly point out the mentioned picture among others (Müller, 1954).

It is difficult to establish when self-awareness of emotions appears in a child; Lewis and Brooks claim that self-emotion awareness begins at the age of 18 months, and also that 2-year-old children are able to use emotional terms (Breterton et al., 1986). However, Dunn (1988) showed that children could rarely talk about inner states at the age of two, and that it was not until the age of 3 that 30% of children could do so without any trouble. Trotter (1982) agrees with Dunn, and locates the capability of self-emotion awareness at about the age of 2. At two and a half years of age, the child understands the relationship between desire and emotion. At about 3, children are able to match pictures of emotions with the words that name them, and can also use proper words to describe situations related to different emotions (Wellman et al., 2000), as well as identifying individual emotions and situations that elicit them (Borke, 1971). Finally, it can be stated that children from 2 to 4 years old have some knowledge of their own emotions, which experts affirm that they can perceive from around age two.

At the age of 4, children can draw basic emotions by means of selecting the discriminative emotion factors, especially those related to mouth shape. (del Barrio, 2000).

Also by the age of 4, the child can match photos that represent similar feelings, name different emotions represented in pictures and answer questions about them. It is widely accepted, then, that a child of 4 years old is capable of perceiving his or her emotions and the situations that elicit them.

Language is used to assess emotions in two ways: through the *Mean Length Utterance*, in that greater length implies a more positive feeling, and through the *Feeling State Talk*, which consists of analysing the content of the child's utterances; this procedure can only be used after language capabilities have developed. Dunn et al. (1991) analysed children's talk through a categorization system of conversational patterns, referents, themes, disputes and causal references. They found out a strong relationship between the language of mother and child about feelings when children are 3 years old; these data also revealed that children improve their ability to

Table 1. Schedule of appearance of the expression of emotions

Emotion	Author	Expression	Age
Interest Smile Dislike Startle	Trotter, 1982	Facial, body	From birth
Smile Dislike	Sroufe, 1979	Facial, body	From birth
Excitement	Bridges, 1932	Body	From birth
Anger	Stenberg & Campos, 1990	Facial	First month
Interest Distress	Sroufe, 1979	Facial	First month
Anguish	Bridges, 1932	Facial	First month
Enjoyment Dislike	Ganchrow et al., 1983	Facial	First month
Anger Surprise Sadness	Trotter, 1982	Facial	3–4 months
Distress Delight	Bridges, 1932	Facial	3–4 months
Pleasure Rage Anger	Sroufe, 1979	Facial	3 months
Enjoyment	Sroufe, 1979	Facial	4 months
Anger	Lewis, 1998	Facial, motor	2 months
Love Anger Fear	Watson, 1917	Facial, body	2 months
Sadness	Gaensbauer, 1980	Facial	3.5 months
Enjoyment Anger Sadness Interest Fear Surprise Dislike	Izard et al., 1980	Facial	5–9 months
Fear	Trotter, 1982	Facial, body	5–6 months
Joy Sadness Interest Fear	Izard et al., 1980	Facial	5–9 months
Shame Timidity	Izard et al., 1980	Facial	6–9 months
Fear Disgust Anger	Bridges, 1932	Facial	6 months
Anger	Sroufe, 1979	Facial, body	7 months
Attachment	Sroufe, 1979	Facial, body	9 months
Anxiety Elation Petulance	Sroufe, 1979	Facial, body	12 months

(*continued*)

Table 1. Continued

Emotion	Author	Expression	Age
Guilt	Case, 1991 Trotter, 1982 Bridges, 1932	Facial, body	18–24 months
Pride	Heckhausen, 1987	Facial, body	14–20 months
Shame	Heckhausen, 1987 Sroufe, 1979	Facial, withdrawal	9–14 months
Elation Affection Jealousy	Bridges, 1932	Facial	12 months
Joy	Bridges, 1932	Facial, body	2 years
Pride	Sroufe, 1979	Facial, body	2 years

Source: From del Barrio (2002).

judge other people's emotions when they reach the age of six.

An interesting study by Harris et al. (1987) showed differences in emotional self-awareness in children aged 5 to 14. The task consisted of giving examples of words related to emotions such as 'happy', 'sad', 'angry', 'proud', 'jealous' or 'guilty'. At the age of 5, children can explain basic emotions verbally, at 7 they explain complex emotions, and at 14 a child's verbal explanations are similar to those of an adult.

The observation of facial expressions and body movements in different situations, such as mother–child interaction, is the principal method of assessing emotion in young children.

Strange Situation Technique (STT, Ainsworth & Wittig, 1969). This is a standard procedure for assessing the quality of infants' attachment to parents. A secure attachment is considered the basis for good emotional development, this concept being quite similar to that of 'ethological imprinting'. The suitable age range for the application of this tool is 9 to 34 months. Observed situations are: (1) Mother–child interaction in a playroom. (2) An unknown woman goes into the room and talks to both mother and child. (3) While the stranger is talking to the child, the mother leaves the room. (4) The stranger tries to interact with the child. (5) The mother returns and the stranger leaves the room. (6) The mother goes out and the child remains alone. (7) The stranger returns and tries to make contact with the child. (8) The mother comes back.

Each situation described above takes three minutes, or even less in the case of the child becoming distressed. The child's behaviour is recorded and evaluated by three different judges. The behaviour units to be observed are: seeking contact, maintaining contact, avoiding contact and resistance to contact. The child's behaviour is classified into four different types: 'A' Anxious/avoiding attachment, 'B' Secure attachment, 'C' Ambivalent attachment and 'D' Disorganized attachment.

Maximally Discriminative Facial Movement Coding System (MAX, Izard, 1979). This system was developed as an objective system for identifying the discrete facial changes of fundamental emotions. It identifies the following affects: fear, joy, anger, shame, sadness, interest, disgust and surprise. The AFFEX (Izard, 1980) is used with children, and is a system in which the basic emotions are identified through observing the whole face. These two instruments are complementary, but have been criticized on the grounds of the low reliability of their subjective judgements. Another tool designed by Izard is the Mother's Perception of Baby's Emotion Expressions (MPBEE, Izard et al., 1979), which assesses the frequency with which children aged 2 to 9 months express emotions.

Facial Action Coding System (FACS, Ekman & Friesen, 1978). This system is an anatomically comprehensive system that codes all observable facial expressions and identifies the following affects: joy, surprise, disgust, anger and fear. It assesses action units (AUs), and has been adapted for use with infants from 0 to 3 months old (Oster, 1978). There are 24 different AUs, which represent different positions of the child's brows,

mouth, eyes and cheeks. There are also three different movement intensity levels. The child's face is recorded and different judges subsequently assess the tape. Agreement between judges increases as child's age increases from 3 (58%) to 8 weeks (92%); these data are interpreted as reflecting an evolution of the child's facial expressions, which shift from ambiguity to clarification. The child's facial movements can be observed in combination, so that it is possible to obtain patterns of the basic emotions.

The most structured laboratory observation system for assessing a child's emotional behaviour is the *Attachment Q-Set* (AQS, Walters & Deane, 1985). This is an instrument designed to describe the basic security behaviour of 1 to 5-year-old children. It is made up of 100 items using the Q methodology, and has a three-point scale: (1) non-confident, (2) somewhat confident and (3) very confident. This scale can be used to assess the observer's confidence of the adequacy of the Q-descriptions. There is also a *Q-Short* (Q-S, Walters & Deane, 1985). This is a short scale consisting of two lists with 90 items related to traits and behaviours; both can be filled out by parents and trained observers.

Kiddie-Infant Descriptive Instrument for Emotional States (KIDIES, Stern et al., 1989). This is a clinical instrument designed to assess emotional and behavioural state levels as well as disorders of infants and young children. It measures 16 affective and behavioural dimensions, and quantifies frequency (0–4) and intensity (presence or absence of observable behaviours). The affective dimensions assessed are happiness, sadness, anger, fear, disgust, surprise, distress and soberness. All channels of expression of emotional states can be assessed, especially the face (smile), the posture (jumping up), the voice (pleasant vocalizations) and the gesture (arms flapping).

AIMS: Developmental Indicators of Emotional Health (AIMS: DIEH, Partridge, 1990). This consists of a structured dialogue between parents and practitioners about the emotional health of children aged 2 weeks to 5 years. It explores four areas: Attachment, Interaction, Mastery and Social Support. Each dimension is assessed through 10 items and rated using a Likert scale (1–5).

When the child is over 3 years old, the emotional assessment may include children's actions such as labelling, pointing, matching or telling stories.

Test of Social Sensitivity (TSS, Rothenberg, 1970). Children listen to four tape-recorded scenarios in which a man and a woman interact. The emotions presented in this task are 'Happiness', 'Anger', 'Anxiety' and 'Sadness'. Photos of a man and a woman depicting the four emotions are used, as well as the tapes. The child must identify how the actor feels. Responses are scored according to their accuracy: (2) the child mentions emotion changes, (1) the child mentions only one emotion, (0) the child does not mention any feeling, and (−1) the child chooses a wrong emotion.

Affect in Play Scale (APS, Howe & Silvern, 1981). This is a standardized measure of the affective expression in children's pretend play. The first form was elaborated for children 6 to 10 years old. There is also an adaptation for pre-school children aged 4 to 5, called *PAPS*. The play task uses human puppets, a boy and a girl with neutral expressions, and three coloured blocks. Animal puppets can also be used instead of the human ones. The child is encouraged to play with the puppets for five minutes, in a situation of free play without any instruction. The play is videotaped. Emotion-loaded content and expressions of emotion during the play are coded. There are three major affect-related scores: Frequency of affective expression units (verbal or moving/motor), Categorization of the units (Happiness, Anxiety, Sadness, Frustration, Affection, Aggression, Oral aggression, Sexual aggression and Competition) and Intensity of the units. These dimensions are rated 1 to 5.

Fantasy and Imagination are also scored according to the following elements: Organization, Elaboration and Imagination (rated 1 to 5), and Quality of Fantasy (mean of previous scores). Comfort while playing is also scored (rated 1 to 5). Total score is obtained by means of multiplying quality of fantasy by frequency of the affect score.

Affective Labelling Task (ALT, Denham, 1986). Children over 4 years old are asked to identify verbally and point out the appropriate expressions of 'Happiness', 'Sadness', 'Anger' and 'Fear' in four drawings of faces. First, they have to identify emotions, answering questions such as: 'Who is sad in these four drawings?'

They are then required to name the emotion represented in the picture, answering the following question: 'What is he feeling?' As an answer, children have to point to the corresponding drawing. Responses are scored 1 if the child identifies the emotion as positive or negative, or 2 if the child has a specific label for the emotion.

The same task can also be presented as a story performance, using puppets as actors that express the four emotions.

Conflicting emotions (CE, Gordis et al., 1989). This is composed of two set stories that each describe three different events. In the first one (Explain), a character experiences two opposite emotions mentioned in the story, saying, for example, 'You know I feel both happy and sad, about the last day of school.' The task consists in explaining the reasons why the actor feels that way. Possible scores are: (0) no explanation, (1) explanation of one of the emotions, and (2) explanation of both emotions. In the second set story (Explain/Detect), the child is told the story alone and asked what the character is feeling. It is scored in the same way as the first one, though in this second task the child can be prompted.

At the end, the child is asked to recount a similar event that he or she has experienced (Own Story). This third part is scored as follows: (2) the story contains two opposite emotions, and (1) it contains only one emotion.

Total possible score is 14.

Teddy Bears' Picnic (TBP, Mueller, 1996). This is an adaptation of the 'MUG and TAT' instrument for assessing emotional and behavioural problems in younger children. It was developed to be used with 4- to 6-year-old children. It utilizes a bear family: a mother, a father and two children, a boy and a girl. The young bear with the same sex as the child's is introduced to him/her. The child then has to answer some questions about each of the ten different stories presented, such as: 'What happens next?', or 'What does this bear do?' The TBP provides quantitative information about several problems, such as disorientation, drive expressions, aggression, helplessness or vulnerability.

There are also instruments for assessing children's development that include the assessment of emotional development. Some examples are shown in Table 2.

Children usually learn to regulate their emotions in their relationships with other people; this is called 'emotional competence'. The most important instruments for assessing emotional competence are shown in Table 3.

Greenspan described the following developmental sequence by means of the *FEASIE* instrument:

18 months: the child has a representational/affective communication system.
24 months: the child can create mental representations of intentions, wishes, needs or feelings.
30 months: the child has a representational elaboration system.
36 months: the child has a representational differentiation, so that he can distinguish real versus unreal events.
42 months: the child has a matured representational differentiation.

Finally, we can identify two main conceptions of children's emotions: it can be argued that children cannot experience emotions until they develop the capacity for reflective, self-conscious awareness, which they attain around the end of their first year of life (Lewis & Brooks, 1978). On the other hand, there is a claim for the existence of basic emotions more or less from birth (3 to 4 weeks old), which undergo developmental changes according to the child's mental growth (Oster, 1978).

The assessment of emotions also changes with the child's age. The best way to assess infants is through the observation of facial expressions and body movements, but once the child attains mastery of language, more complex tasks can be used, such as matching, answering questions or playing. With children over 7 years old, questionnaires offer a wider range of possibilities, and from this age onwards there are also specific tools for assessing each different emotion.

FUTURE PERSPECTIVE AND CONCLUSIONS

As it is well known, emotional life is the key to understanding the world in early childhood. Although emotions are an important subject in

Table 2. Instruments for assessing children's development

Name	Author	Age (Years)	Applicant
Early Learning Accomplishment Profile* (LAP)	Glover et al., 1978	0–3	Psychologist
Minnesota Infant Development Inventory	Ireton & Thwing, 1980	1–16	Psychologist
Battelle Developmental Inventory* (BDI)	Newborg et al., 1988	0–8	
Early Screening Profiles	Harrison et al., 1990	2–6	Parents, teachers, caregivers
Carolina Curriculum for Infants (AGS)	Johnson-Martin et al., 1991	0–2	Psychologist
Assessment Evaluation and Programming System (AEPS)	Bricker, 1992	0–6	Parents, psychologist
Denver-II	Frankenbrg, 1992	0–6	Psychologist
Bayley Scales of Infant Development-II (BSID-II)	Bayley, 1993	0–3	Psychologist

Source: From del Barrio (2002).
*The most useful instruments for assessing emotions.

Table 3. Emotional competence screening tools

Name	Author	Tasks	Age
Denver Developmental Screening Test (DDST)	Frankeburg et al., 1971	Interactive play and Mother separation	18–54 months
Tool Use Task (TUT)	Matas et al., 1978	Free-play, cleanup, reunion, separation	18–54 months
Minnesota Pre-school Affect Check-list (MPAC)	Sroufe et al., 1984	Peer interaction	3–6 years
Hawaii Early Learning Profile (HELP)	Parks, 1992	Play, living activities	0–3 years
Functional Emotional Assessment Scale for Infancy and Early Childhood (FEASIE)	Greenspan, 1992	Family, clinician and caregivers interaction	18–42 months
Pre-school Socio-affective Profile (PSP)	La Freniere & Dumas, 1996	Social interaction with family and peers	3–6 years

Source: From del Barrio (2002).

psychology, up to now less research has been carried out on this important aspect, having a corresponding negative effect on assessment. Much more research is required in order to improve the assessment of emotional development.

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RELATED ENTRIES

Development (General), Development: Psychomotor, Development: Language, Development: Intelligence/ Cognitive

DIAGNOSIS OF MENTAL AND BEHAVIOURAL DISORDERS

INTRODUCTION

Mental and behavioural disorders have been the object of many classifications, from the Greek Antiquity during which they were divided into mania, melancholia, phrenitis and lethargia, to the most recent diagnostic manual, the DSM-IV, published in 1994.

The purpose of medical classifications is to divide the population of patients into distinct and homogeneous sub-groups, by using as criteria the observed symptoms and, if it is known, their cause, in order to choose the most adequate therapy. The process leading to the attribution of a given patient to one of the sub-groups constitutes the diagnosis. Sub-groups defined by a specific pattern of symptoms are called syndromes. The term disease is theoretically reserved to those defined by a common aetiology, although it has often been applied to purely syndromic entities. Today, psychiatry uses the more vague term Disorder for both. Several Syndromes may originate from the same cause and, conversely, a single syndrome may have diverse aetiologies.

HISTORICAL PERSPECTIVE

The first general classification of mental disorders appeared in the second half of the 18th century. Its author, Boissier de Sauvages, had compiled all the descriptions proposed since Antiquity and presented them according to the formal structure introduced in the botanical classification by his friend Linnaeus. It had little influence on modern psychiatry which began around 1800 with Pinel. During the greatest part of the 19th century, the main contribution of the psychiatrist consisted in the accurate description of syndromes. They belonged mainly to those aspects of mental disorders later known as psychoses, which led to the commitment to asylums. Among the less severe psychological manifestations, the neuroses, a term coined by Cullen to emphasize what he considered to be their hypothetical aetiology: a dysfunction of the nervous system, and whose main forms were hysteria, hypochondriasis, and later neurasthenia, were studied by neurologists like Charcot and the character peculiarities, formerly the object of descriptions by writers and moralists, constituting today the personality disorders were incorporated into psychiatry only at the end of the century.

Between 1883 and 1917, in the eight successive editions of his Textbook, Kraepelin elaborated progressively the classification whose main outlines are the basis of the future ones. His aim was to describe separate diseases, each defined by its cause, its psychopathological mechanisms, and by its clinical manifestations. He postulated in each one a strict correspondence between the three levels. In most cases he had to evoke only hypothetical causes, but affirmed that, because of its postulates, the classification based on the clinical manifestations would not be modified when the aetiology would be later proved, provided that one would not only take into account the transversally observed symptoms, as in the syndromic perspective, but also 'the developmental conditions, the course and the outcome of the individual disorder'. Kraepelin's classification distinguished four main groups of disorders:

1. those whose origin was a proven anomaly of the brain structure, either acquired as in the dementias, or congenital as in mental retardation;
2. the psychoses, for which the postulated and endogenous origin, possibly metabolic or hereditary, the isolation of their two main forms, Dementia pracox – later renamed by Bleuler Schizophrenia. And manic-depressive psychosis being the most often evoked contribution of Kraepelin;
3. the neuroses of psychogenic nature; and
4. the personality disorders, relatively permanent anomalies related to constitutional

factors. In the following decades, many modifications were introduced in this general scheme, such as the expansion of the concept of neurosis under the growing influence of psychoanalysis.

MODERN CLASSIFICATION SYSTEMS

Many of those modifications were restricted to a national or ideological school and this led to many difficulties to communication between specialists, even if they used the same terminology: the low-inter-raters reliability of the psychiatric diagnosis was demonstrated by many experimental studies. Efforts towards a consensus came mainly from two organizations. The World Health Organization (WHO) published periodically an International Classification of Diseases (ICD) which included a chapter on mental disorders. Initially, only an enumeration of the names of the disorders, it included only with its ninth revision (1975) a glossary giving a short description of the characteristics of each one. The American Psychiatric Association began in 1952 for the benefit of its members to publish a Diagnostic and Statistical Manual (DSM) which contained a glossary added to the terms recommended.

The third edition of this Manual (DSM-III) published in 1980 constitutes a fundamental step in the history of psychiatric classifications. Although initially intended to be used only by the American psychiatrists, it acquired rapidly such a world wide influence that the ICD-10 (1992) has practically adopted its positions. It was succeeded by a revised edition (DSM-III-R) in 1987 and by the DSM-IV in 1994 which have retained its main features. The classification is strictly categorical, this being a reaction against the antinosologism which had prevailed in the preceding decades, especially in the United States, under the influence of psychodynamism and, according to its authors, in this respect a return to the Kraepelinian medical tradition. Each disorder is characterized by a pattern of diagnostic criteria, generally constituted by the presence of a definite number of precisely defined symptoms, obviously influenced in their presentation and mode of utilization by statistical psychology and by the computer assisted diagnostic procedures. The criteria are usually of a purely descriptive nature. The DSMs exclude from nosology any not objectively demonstrated aetiological concepts: in practice their categories are for the most part only syndromic, a situation specific to psychiatry. Among the many consequences, one of the most notable is the disappearance of the concept (and term) of neurosis, the justification being that it implied for many an aetiology based on purely hypothetical psychological conflicts. Most of the former neurotic disorders belong now to the group of the Anxiety Disorders, defined by the existence of anxiety as the prominent symptom. But for that reason, Hysteria has been excluded from the group, the manifestations formerly reattached to it being attributed, according to their objective characteristics, to the newly constituted groups of the somatoform and of the dissociative disorders.

Another originality of the DSMs has been the introduction of the multi-axial system. Possibly useful information about a given patient are coded of five axes. The diagnostic category to which he belongs is reported on Axes 1 and 2, the last one being reserved to the personality disorders and to mental retardation. This disposition facilitates the description of the frequently occurring situation in which an Axis 1 disorder develops in a patient affected by one of the permanent mental abnormalities of Axis 2. Axis 3 records the general physical conditions potentially relevant to the understanding and management of the mental disorder. Axis 4 in the same perspective the psychological and social problems, and Axis 5 the general assessment to the level of global functioning, of the patient. Despite its striking originalities, despite the introduction of many new categories and sub-categories in order to increase the homogeneity of each one, the basic structure of the Kraepelinian nosology can still be recognized in the DSM-IV. It is true that the ICD-10 is slightly more conservative in its technical aspects – its multi-axial system is simpler – and in its vocabulary – the term neurosis has been retained – but the categories and their criteria are very similar.

Finally, it can be stated that the DSM-IV and ICD-10 are presently by far the most commonly used diagnostic manuals, one is now nearing a general consensus in the classification of mental and behavioural disorders.

FUTURE PERSPECTIVES AND CONCLUSIONS

However, this classification is the object of criticisms. If its interraters reliability is recognized, the purely descriptive nature of most of the diagnostic criteria is considered by many as a too superficial approach, and its growing complexity does not result in an evident increase of its validity. A classification is basically a technique of condensation of information. But such a condensation can be obtained in a completely different way by using a dimensional model of the type developed by psychologists in the description of personality. Whereas a classification regroups the individuals according to their characteristics, the dimensional model regroups empirically, using habitually the statistical method of factor analysis, those characteristics into a small number of linear dimensions. Each subject can be described in a simplified way by his position on each of them, by his dimensional profile. This model is commonly used in the description of the normal and pathological personality, has been introduced in psychiatry in the construction of the rating scales and is even proposed by the DSM-IV for the specification of the patients receiving the diagnosis for schizophrenia by their attribution to one of the sub-categories of the disorder. The substitution of the dimensional model to the categorical one seems particularly advisable in the group of Personality Disorders in which the present categorical approach is obviously inadequate, and the whole of mental pathology had even been considered by the authors of the DSM-IV. Such a fundamental change has been provisorily rejected for reasons of tradition – the various branches of medicine use the categorical model – and for practical ones: the researchers have not yet reached an agreement of the best system on dimensions to be used. Future developments will improve those flaws.

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RELATED ENTRIES

Applied Fields: Clinical, Classification (General, Including Diagnosis), Clinical Judgement

DIAGNOSTIC TESTING IN EDUCATIONAL SETTINGS

INTRODUCTION

Diagnostic testing in education refers to an in-depth assessment of pupils' learning difficulties, whatever their causes. The way to conduct such an assessment is not obvious. An essential distinction should be made between an assessment that focuses on performance and an assessment that focuses on competence. The first section clarifies this distinction. The second and the third sections analyse the usefulness and the limits of each of these two levels of assessment.

TWO LEVELS OF DIAGNOSTIC TESTING: PERFORMANCE AND COMPETENCE

In the field of linguistics, Chomsky (1965) made a fundamental distinction between performance and competence. Performance refers to the use of language in functional situations. Competence refers the underlying system of rules mastered by the speaker. The speaker's competence cannot be observed directly. This is only inferred from the speaker's performance, which imperfectly reflects

his competence. This distinction between performance and competence is essential for the diagnosis of learning difficulties. The diagnostic testing can focus on the quality of the behaviours produced by a subject – the performance – (e.g. the correctness of a text reading) or on the cognitive abilities underlying these behaviours – the competence – (e.g. the mental processes used when reading a word). Diagnostic tests are very different if they target the assessment of performance or competence.

Performance tests are basically a-theoretical, in the sense they do not refer to any model of the mental activity being at work in the items. The test items are usually selected on the basis of an accurate definition of the knowledge domain to be assessed and on a specific description of the behaviours corresponding to the mastery of a particular knowledge. The validation of the performance test items relies on experts of the domain who judge the pertinence of the selected items with regard to the learning goals.

On the other hand, competence tests rely on models of cognitive processes involved in the items. To validate these tests, the pertinence of the items chosen as indicators of the mental processes to be measured should be proved. Are the selected tasks involving the intended processes, and only these? Validation of the competence tests is often difficult because the cognitive activities involved in the items are never straightforward. Even apparently very simple tasks involve rather complex cognitive processes (e.g. Longstreth, 1984). Since a pure measure of the intended processes does not exist, the interpretation of the scores in competence tests is often difficult. Moreover, the models underlying the competence tests are only partial and temporary representations of the mental reality. Therefore, the difficulty of building and interpreting such tests could stem from model shortcomings.

DIAGNOSTIC TESTING THAT FOCUSES ON PERFORMANCE

There are two main arguments for using performance tests to diagnose learning difficulties. The first is that the performance measurement guarantees the ecological validity of the diagnostic testing. Performances are useful behaviours allowing subjects to cope with everyday problems. When the diagnostic assessment only focuses on mental processes, there is a risk of unduly emphasizing disabilities without any real consequences for the subject's environmental adaptation. The second argument for using performance tests is that their items match the teaching goals. Performances are essential information for appraising the child's adjustment to the school demands. Referring to school demands avoids describing an imperfect performance, but corresponding to a sufficient performance at a given school level, as an indication of learning disability. Learning is a step-by-step process. It is essential to distinguish between what is related to the normal learning process and what is related to disability.

Unfortunately, as performance tests are built without any reference to a model of the cognitive functioning, they do not open to an in-depth understanding of the observed phenomena. As Snow and Lohman emphasized (1988: 268), 'item writers are more likely to be content specialists working from test specifications that bear no relation to the specifications of relevant psychological theory'. The items of the performance tests are more often a sample of relevant content domain knowledge, but not of learning. Consequently, the scores are not keys for really understanding success or failure. They do not provide a sound foundation for identifying learning disabilities and how they might be corrected.

Another problem with performance tests is the interpretation of the discrepancy between the observed score and the expected score. For example, according to the DSM-IV (American Psychiatric Association, 1994), one of the criteria for 'reading disorder' is a reading achievement, measured by a performance test, below expectation. This criterion is inaccurate. When does a discrepancy between an observed score and an expected score allow one to talk about learning disabilities? Usually, a 2-year delay with regard to the expected score (expressed on the grade-equivalent score scale) is considered as a criterion of learning disabilities (Kavale & Forness, 1995). Such a criterion is arbitrary, but there is no way to determine a more appropriate criterion using a performance test. The best answer to this problem is to refer to an identified disorder of the cognitive processes relating to the low

observed score. For that purpose, a competence test is required.

DIAGNOSTIC TESTING THAT FOCUSES ON COMPETENCE

Historically, the Piagetian theory is the first reference to an assessment that focuses on competence (Inhelder, 1943). The Piagetian model was very appealing to practitioners during the 1960s and the 1970s. Today, it is less popular, but it is still used for the diagnosis of mathematical learning disorders. The Piagetian theory provides a particularly strong conceptual framework for understanding the construction of the logical structure of thought. It is especially helpful for understanding the development of certain concepts, like the concept of number. In this case, it focuses the diagnostic assessment on logical operations that constitute the roots of the concept of number. Diagnostic tests developed in reference to the Piagetian theory allow one to go further than the sole report of success or failure, and enable one to catch the person's way of thinking. Unfortunately, the tests based on the Piagetian theory are not without shortcomings. Although these tests are strong from a theoretical viewpoint, they are often weak from a psychometric viewpoint. Standardization and norms of the tasks used for diagnostic testing are generally inadequate. But, the main methodological problem refers to the validity of the tasks used for assessment. Are Piagetian tasks measuring what they are intended to measure, and only that? When a test is focused on competence, empirical evidence is required to prove that the selected tasks have correctly measured the targeted competence. Numerous studies on Piagetian tasks have shown that this requirement is often imperfectly met.

For more than twenty years, cognitive psychology has provided another framework for diagnostic testing that focuses on competence. In comparison with the Piagetian theory, cognitivist models try to describe the complexity of information processing without limitation to the logical components alone. They pay more attention to the representations and to the kind of knowledge used by the subject. Particularly, the concepts of declarative and procedural knowledge, and the relationship between the two, have been widely applied to understand school learning. This goes together with great attention paid to the level of automatism of procedures, which is appraised via the speed of process and/or the resistance to interference from other tasks performed simultaneously.

Some of the competence tests developed within the cognitive psychology framework try to assess general procedures, applying to a wide range of tasks. For example, the *Kaufman Assessment Battery for Children* (K-ABC; Kaufman & Kaufman, 1983) was designed to assess the simultaneous and sequential processing. Defects in these processes seem to be the root of some learning disabilities. Unfortunately, the K-ABC, as other tests assessing general procedures, raises some questions about its validity and its usefulness. Diagnostic tests, which focus on more specific procedures, seem to be the more promising. This is the case of tests measuring the procedures involved in the reading of words. These tests are built on componentional models, which organize the processes involved in oral reading. The effectiveness of each component is appraised using very specific tasks. The score for each task needs to be interpreted in relation to the scores for the other tasks. These tests provide specific information, but they are generally more valid than tests assessing general procedures and, consequently, are more useful for practitioners.

FUTURE PERSPECTIVES

Research in cognitive and neuropsychology has improved sharply our knowledge of the mental processes involved in school learning. We have now powerful models to explain how children read words or memorize multiplication tables. These models can also be used to understand learning disabilities. Diagnostic tests built on these models are progressively available (e.g. the *Test of Phonological Awareness*, Torgesen & Bryant, 1994). In the near future, the development and publication of such tests will accelerate.

However, all learning disabilities cannot be understood through very specific models of mental processes. Some problems are related to more general cognitive processes involved in a wide range of learning tasks. Using only tests focusing on very specific processes, there is a

risk to miss some important cognitive problems. Consequently, in the future, practitioners will also need tests assessing broad cognitive processes, but these tests will be built on stronger models than in the past. The *Revision of the Leiter International Performance Scale* (Roid & Miller, 1997) and the *Cognitive Assessment System* (Naglieri & Das, 1987) illustrate of this trend.

CONCLUSIONS

The assessments that focus on competence give more interesting information for special education than the assessments that focus on performance. The purpose of diagnosis is not only to quantify success and failures but it is also, and above all, to understand the meaning of the observed performance. For such an understanding, we need to refer to models of learning and cognitive functioning. These models allow us to really interpret the observed scores and to provide useful information to effectively help children with learning disabilities.

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Jacques Gregoire

RELATED ENTRIES

Applied Fields: Education, Classification (General, Including Diagnosis), Clinical Judgement, Psychoeducational Test Batteries

DYNAMIC ASSESSMENT (LEARNING POTENTIAL TESTING, TESTING THE LIMITS)

INTRODUCTION

This entry discusses the characteristics and procedures of dynamic assessment and learning potential testing, differentiating these approaches from testing-the-limits. The entry will briefly discuss examples of dynamic assessment procedures that have been developed by researchers in a number of countries, as well as developing applications and evidence for validity of these approaches.

Dynamic assessment is a generic term for approaches to assessment that are characterized by inclusion of interactions between the assessor and learner during the course of the assessment. These are sometimes referred to as learning potential or interactive assessment procedures because the information derived from the interaction relates to what the learner is able to accomplish with the help of a more experienced collaborator, going beyond independent functioning. This extension beyond the current level of functioning operationalizes the concept of potential. The focus of the assessment is on the learner's responsiveness to the interaction-as-intervention, and the level of

functioning of the learner following, rather than preceding, this interaction. Dynamic assessment assesses the learner in the process of learning, as well as the learning processes per se.

Dynamic assessment goes far beyond testing-the-limits. In testing-the-limits, assessors typically make minor changes in the administration of tests that typically have standardized scripted instructions. The intent is to explore what the learner can do if, for example, given more time, or if the vocabulary were more accessible. Testing-the-limits does not look at the process of learning or explore how problems were solved or errors made and then overcome, or redefine level of performance in terms of abilities demonstrated following the provision of scaffolded interventions. An exception to this is the work by Carlson (1995), who refer to their dynamic assessment approach as testing-the-limits. The work of these researchers documented the impact of assessor's elaborated feedback and learner's verbalization during the course of problem solving as potent factors in facilitating problem solution. Their approach to dynamic assessment emphasizes these types of interactions during the course of assessment interactions.

The theoretical bases for dynamic assessment derive primarily from the works of Vygotsky (1978) in Russia, and Feuerstein and his colleagues (Feuerstein, Rand & Hoffman, 1979) in Israel. Vygotsky's description of the 'zone of proximal development' and his advocacy for determining both the zones of actual and proximal development have served to describe the nature of dynamic assessment as providing information not only about what the learner can accomplish independently, but, also, what the learner can demonstrate with the help of a more experienced collaborator. Feuerstein et al.'s work has provided both detailed elaboration of the nature of the interactions that need to take place in order to facilitate learning, as well as the design of a specific dynamic assessment procedure to operationalize these ideas.

MEASUREMENT DEVICES

Since Feuerstein's work, along with significant parallel developments in Germany (Guthke, 1992), there has been considerable research and development of dynamic assessment procedures. Five approaches to dynamic assessment have served as models for most of the work that has developed during the late twentieth century. These include the work of Feuerstein et al. (1979), Budoff (1987), Campione and Brown (1987), Carlson (1995), and Lidz (1991).

Feuerstein's remains the most clinical and intuitive. Using a battery of tests, many of them designed by André Rey, though also including the Raven's Progressive Matrices and a modification of the Arthur Stencil Designs Test, Feuerstein's Learning Potential (now Propensity) Assessment Device adds an interaction component to each of the tests. Learner performance is analysed in terms of an array of cognitive deficiencies and responsiveness to the interactions of the assessor that follow the expressed needs of the learner during the course of the assessment.

Budoff's learning potential assessment uses some of the same and similar tests as Feuerstein, but differs in both procedure and purpose. While Feuerstein's approach provides detailed descriptive information about the problem-solving nature of the learner, Budoff designed his procedure to address issues of classification, specifically misclassification of children as mentally retarded. This approach provides standardized, scripted instructions for all learners. The content of the script addresses principles and strategies of problem solution, and learner response is analysed in terms of ability to profit from this experience.

Campione and Brown initially designed their approach to dynamic assessment as an attempt to operationalize Vygotsky's notion of zone of proximal development. Therefore, their approach was specifically an attempt to represent a theory of assessment. These researchers designed a graduated prompting approach, during which learners who did not succeed in solving a problem received a standard set of predetermined hierarchically ordered series of hints that increasingly approached total task solution by the assessor.

Carlson (1995), as described above, offer a testing-the-limits approach, where learners are asked to verbalize their problem solutions, and where they are provided with ongoing elaborated feedback regarding their performance.

Finally, Lidz (1991) combined dynamic with curriculum-based assessment to link the assessment with the learner's actual curriculum. This can be done either clinically, offering embedded interventions responsive to the behaviours of the learner during the course of the assessment, following a neuropsychological processing model, or by use of structured scripts that provide principles of problem solution and relevant strategies to all learners regardless of their specific functioning.

The procedures available at the time of writing this entry were many, and included (see chapters in Lidz & Elliott, 2000 for detailed descriptions, research, and case examples of each): The Leipzig Learning Test and Adaptive Computer Assisted Intelligence Learning Test Battery, both described by Guthke and Beckmann, Swanson's Cognitive Processing Test, Hessels' Learning Potential Test for Ethnic Minorities, Karpov's dynamic assessment of the level of internalization of children's problem-solving activity, Buchel and Schlatter's Analogical Reasoning Learning Test, Jensen's Mindladder Model, Resing's Learning Potential for Inductive. Reasoning in Young Children, Gerber's Dynomath, the Evaluacion del Potencial de Aprendizaje by Fernandez-Ballesteros and Calero, Kahn's Dynamic Assessment of Infants and Toddlers' Abilities, Tzuriel's Cognitive Modifiability Battery (plus three other instruments developed by the same author), and The Application of Cognitive Functions Scale by Lidz and Jepsen. These procedures, with summary information, appear in Table 1.

There have been criticisms of dynamic assessment approaches as lacking evidence of reliability and validity. The emphasis of some approaches to dynamic assessment on change and the plasticity of the learner presents challenges to traditional evidence of both reliability and validity; however, the research literature addressing these issues has increased, and the evidence, for example, of increased validity of post test compared to pretest scores is available (e.g. Guthke, Beckman & Stein, 1995).

FUTURE PERSPECTIVES

Development of dynamic assessment approaches and research concerning issues of dynamic assessment have become an international enterprise. It is a relatively recent phenomenon that the researchers and procedure designers are aware of each other's work and are in communication with each other. Dynamic assessment has many faces and many diverse applications. It seems that there will never be just one thing called dynamic assessment, yet there are shared characteristics of these approaches. The future is likely to see increasing development of new procedures to meet various needs and applications, as well as increasingly sophisticated research on existing approaches. The future will also likely include increased dissemination of these approaches to practitioners, who will need exposure to these practices during their preservice training, and not just during brief workshops or inservice experiences. The influence of the thinking and attitudes generated by dynamic assessment are already apparent in the narratives, and occasionally the practices, of new, more traditionally psychometric procedures released by major publishers. Practitioners from different domains, such as psychology, education, and speech/language, are becoming increasingly aware of dynamic assessment, and are developing a common vocabulary and point of view regarding approaches to assessment, while still remaining within their area of expertise. The more emphasis there is on linking assessment with intervention and on proportionate representation of learners from diverse backgrounds in specialized services, the more need there will be for dynamic assessment approaches. Yet assessors need to continue to be aware of the information yielded by these procedures, just as they are of any other approach to assessment, and apply them when appropriate.

CONCLUSIONS

Dynamic assessment is a relatively recent addition to the assessment repertory. It represents not just approaches to conducting an assessment, but an attitude toward the learner and toward the learning experience as well. The value of observing learners during the course of learning, and viewing learning outcomes as open-ended and malleable, is an important contribution of these approaches, and consonant with evidence regarding neurological processing of the human

Table 1. Dynamic assessment models (See, Lidz & Elliott, 2000)

Test	Author(s)	Population	Content	Intervention	Properties
Adaptive Computer Assisted Learning Test Battery (ACIL) (German)	Guthke & Beckmann (Germany)	Grades 5 through 9	Three independent short term learning tests: sequential figures, number sequences, and analogies	Computerized adaptive assistance with feedback, prompts, and additional tasks; assesses need for assistance	Norms for regular and high achieving students. Satisfactory prediction of school grades. Factor analysis yielded a learning ability factor
Analogical Reasoning Learning Test (ARLT) (French)	Schlatter & Buchel (Switzerland)	Children and adults with mental retardation with mental age between 3 and 7 years	2×2 analogical matrices in figurative and geometrical modalities, constructed in wooden box	Standardized hierarchical hints based on research relevant to nature of error	Maintenance and transfer scores. Distinguishes between gainers and non-gainers. Evidence of discriminant and predictive validity, internal consistency, test–retest stability
Application of Cognitive Functions Scale (ACFS) (English)	Lidz & Jepsen (USA)	Children functioning between ages three through five years	Six process-oriented subtests tapping preschool curriculum demands and a behaviour rating scale	Semi-scripted teaching related to process demands of subtests	Documented pre to posttest gains, predictive validity, discriminant validity and reliability
Cognitive Modifiability Battery (CMB) (English)	Tzuriel (Israel)	Children in kindergarten through fourth grade	Manipulable materials with tasks tapping six areas of seriation, pattern reproduction, analogies, sequences (levels 1 and 2), and memory	Mediation-based teaching involves focusing attention on important dimensions, explanation of rules for problem solution, applying relevant strategies, and practice with sample items	Can be used clinically, or formally scored. Yields all/none or partial scores. Evidence provided internal consistency, construct and predictive validity
Dynamic Assessment of Infants' and Toddlers' Abilities (DAITA) (English)	Kahn (USA)	Infants and toddlers	Follows administration of standardized approaches. Uses items refused or failed on these procedures. The Hawaii Early Learning Profile Activity Book is recommended	Mediation-based clinical intervention	Clinical, qualitative information regarding children's level of functioning and responsiveness to intervention. Guidelines provided for rating child's 'cognitive actions' and parent's mediating interactions. Yields descriptions of child's functioning, parent's current repertory, and suggestions for intervention

Dynamic Assessment of the Level of Internalization of Problem-Solving Activity	Karpov & Gindis (USA)	Children 6 to 7 years of age	Analogical reasoning using shapes and figures cut from construction paper	The child is taught to solve problems at the simplest, visual-motor level and tested for transfer to higher levels	Findings from a series of Russian studies provide evidence for discriminant validity, intra-individual cross-domain consistency, and predictive validity
Dynomath (English)	Gerber (USA)	Secondary students with learning disabilities	Multidigit multiplication, simple multiplication retrieval and spatial-procedural knowledge	Series of prompts contingent upon errors, following principles of 'intelligent tutoring'	Computerized assessment of speed and accuracy. Computer generated report regarding individual's profile regarding retrieval speed and accuracy, time utilized, errors made, and prompts required. Evidence regarding test–retest reliability and face validity
Evaluacion del Potencial de Aprendizaje (EPA) (Spanish)	Fernandez-Ballesteros & Calero (Spain)	Ages 10 years through adult with average or below ability	Based on Raven Matrices. Training uses 68 matrix problems on 132 slides (stimulus and response slides), some from Budoff's research	Structured training procedure with items parallel to Raven. Provides dialogue aimed at generalization, incorporating feedback, elicited verbalization, and strategy analysis. Two training sessions between pretest and posttest	Scores for pretest, posttest, and gain leading to gainer/non-gainer classification and error analysis. Evidence provided regarding effectiveness of training, reliability, and predictive validity
Learning Potential Test for Ethnic Minorities (LEM) (Dutch)	Hessels (The Netherlands)	Ages 5 through 8 years; focus on minorities	Classification, word–object association, recognition and naming, number series, syllable recall and figurative analogies	Train-within-test model; incorporates repetition, non-verbal feedback or demonstration	Assesses extent of benefit from help. High reliability, minimized bias, satisfactory construct validity, good short term predictive validity
Learning Potential Test of Inductive Reasoning (LIR) (Dutch)	Resing (The Netherlands)	Children ages 7 and 8 years	Inductive reasoning through verbal analogy and visual exclusion. Intended to supplement intelligence test	Graduated hints based upon research literature task analysis of cognitive components necessary for task solution. Involves six training sessions between pre–post testing	Rubric regarding amount (number of hints) of help needed during training to criterion for each session. Scores also for posttests, training time, type of hints, child's justifications for solutions. Preliminary norms available, with more in preparation. High internal consistency. Evidence supporting construct, discriminant, and predictive validity

(continued)

Table 1. Continued

Test	Author(s)	Population	Content	Intervention	Properties
Leipzig Learning Test (LLT) (German)	Guthke & Beckmann (Germany)	End of first grade	Puzzles; classification tasks	Graduated hints	Good discriminant and concurrent validity; satisfactory reliability
Mindladder: Computer Assisted Modifiability Enhancement Techniques (CAMET) (English)	Jensen (USA)	Students in primary grades through college	Computerized presentation and record keeping. Wide range of reasoning and academic skills, including matrices, reading, associated recall. Functions as both an assessment and training program	Mediations provided by assessor in response to needs of learner, for example provision of feedback, strategies, and promotion of meaning	Graphs regarding time spent, retention, and performance efficiency. Information added to 150 item inventory regarding intellective and non-intellective dimensions. Preliminary research shows positive effects of program involvement on achievement
Swanson–Cognitive Processing Test (S-CPT) (English)	Swanson (USA)	Ages 4,5 through adult	Eleven subtests assessing working memory	Standardized prompts	Normed. Yields initial, gain, and maintenance scores. High internal reliability; good discriminant validity
Testing the Limits (English/German)	Carlson & Wiedl (USA/Germany)	Children and adults with range of learning difficulties. Also, series of studies with schizophrenics	Template of dynamic format on pre-existing tests. With schizophrenic participants, used Wisconsin Card Sorting Test	Emphasis on verbalization of task solution by learner and elaborated feedback by assessor	Series of studies documented effectiveness of the two interventions on learning outcome. With schizophrenic patients, studies show differential ability to profit from intervention that informs rehabilitation planning

brain as well. The challenges of establishing the reliabilities and validities of these approaches are increasingly being addressed, with a substantial body of research literature available addressing these issues.

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RELATED ENTRIES

Applied Fields: Education, Applied Fields: Clinical, Applied Fields: Gerontology, Intelligence Assessment (General), Cognitive Plasticity, Mental Retardation, Children With Disabilities, Learning Disabilities

EATING DISORDERS

INTRODUCTION

Anorexia nervosa (AN), bulimia nervosa (BN) and binge eating disorder (BED) are complex disorders in which a great variety of factors are implicated. Due to this complexity, a great diversity of instruments is required to collect the data needed to complete the initial assessment, to design the treatment plan, and to evaluate the outcomes. The aim of the initial assessment must be to gather information not only about weight and eating behaviour, but also about all the factors that are related to the onset, course and maintenance of the disorder. It is necessary to have in mind that a variety of professionals may collaborate in the care of these patients. Different levels of assessment are needed to complete the evaluation of eating disorders (see Table 1). First of all, a full physical examination should be preformed and laboratory analysis should be determined before the psychological assessment begins. For making treatment decisions, it is very important to know the patient's nutritional state, vital signs, physical and sexual growth and development, the cardiovascular system, evidence of dehydration, lanugo, salivary gland enlargement, etc. This knowledge is especially important in AN patients with great weight loss or in BN patients with a high frequency of vomiting. Then, attention must be paid to weight and the history of the eating disorder, the eating behaviour, binge eating and compensatory behaviours such as vomiting, misuse of laxatives or diuretics, fasting and/or excessive exercise. More specific factors like body image, cognitive concerns, emotional state and comorbility with other disorders, especially affective and anxiety disorders, obsessive-compulsive disorder, personality disturbance and substance abuse, should be analysed too. It is very important to remember that these eating disorder patients frequently deny their problem. In consequence, it will be necessary to gather information from other family members and from different instruments on the same topics to validate the data. To reach all these goals, a great variety of instruments are required. A full review of these instruments can be found in Allison (1995), Rosen and Srebnik (1990) and Saldaña (1994).

BODY WEIGHT ASSESSMENT

Information on a patient's weight is very important especially in AN patients in which diagnostic criteria are related with underweight. There are several indexes, which allow us to know if a person is normal weight, underweight or overweight. Commonly accepted indexes are the index of relative weight (RWI) and the Quetelet index or Body Mass Index (BMI). Both of them are used for diagnostic criteria, the former in the DSM-IV (APA, 1994) and the last in the ICD-10 (WHO, 1992). However, the most recommended index is the BMI which can be calculated by the following formula [BMI = Weight (in kg)/height (in m)^2]. A BMI

Table 1. Levels of eating disorders assessment

Levels of assessment	Goals	Ways of assessment
First level	To make treatment decisions: hospitalization, day-care treatment, and outpatient treatment	Complete physical examination. Body weight assessment (Body Mass Index)
Second level	To establish good rapport and to develop therapeutic relationship with the patient To assess: • History of eating disorder • Eating behaviour and eating habits • Compensatory behaviours • Emotional states while eating • Worries about food and eating • Physical activity	1 Clinical interview 2 Semi-structured interviews: • Eating Disorders Examination (EDE) • Yale–Brown–Cornell Eating Disorders Scale (YBC-EDS) • Structured Interview for Anorexic and Bulimic Disorders (SIAB) 3 Self-report questionnaires: • Eating Attitudes Test (EAT-40, EAT-26) • Eating Disorders Inventory 2 (EDI-2) • Eating Disorders Examination Self-Report Questionnaire (EDE-Q) • Questionnaire of Eating and Weight Patterns (QEWP) 4 Self-monitoring records 5 Family interview
Third level	To differentiate between the features of eating disorder patients and those of the body dysmorphic disorder To assess: • Body image dissatisfaction • Body image disturbance • Worries about weight and figure • Desire to lose weight	1 Interviews • Shape concern and weight concern EDE subscales • Body image and slimness ideal SIAB subscale 2 Self-report questionnaires • Body Shape Questionnaire (BSQ) • Body dissatisfaction EDI subscale • Cuestionario de Influencia del Modelo Estético Corporal (CIMEC)
Fourth level	To assess other disorders comorbility: affective and anxiety disorders, obsessive-compulsive disorder, personality disturbance and/or substance abuse	1 Clinical interview 2 Semi-structured interviews 3 Self-report questionnaires

between 20 and 25 represents normal weight, a value above 25 overweight, between 18 and 20 mild underweight and below 17 severe underweight. In the ICD-10, a BMI below 17.5 is the diagnostic criteria for AN. BMI is a good index that not only informs about patients' weight but also on their nutritional status.

ASSESSMENT OF EATING HABITS AND COMPENSATORY BEHAVIOURS

The assessment of these important factors should be done through different instruments. Interviews, self-report questionnaires and self-monitoring records that are completed by patients.

Interviews

First, interviews are used to establish a good rapport and develop a therapeutic relationship with the patient, and to gather information about the principal features of eating disorders. For clinical purpose, clinicians can develop an interview to assess which is the eating pattern of the patient. The questions must permit knowledge of the type of food, quantity and frequency of eating, eating style, restrained eating and fasting. Also, it is necessary to ask about forbidden food and level of anxiety that provokes eating those forbidden food, binge eating episodes, feeling of loss of control while eating, nutritional knowledge and attitudes towards eating. Type and frequency of compensatory behaviours, such as vomiting, misuse of diuretic and/or laxatives, excess of physical activity and fasting, must be assessed too. However, several semi-structured or standardized interviews have been developed for clinical and research purposes. They permit assessment of the eating habits and compensatory behaviours of patients with eating disorders in addition to the associated psychopathology. The interviews used more frequently are the Eating Disorder Examination (EDE; Cooper & Fairburn, 1987), the Yale–Brown–Cornell Eating Disorders Scale (YBC-EDS; Mazure et al., 1994; Sunday et al., 1995), or the Structured Interview for Anorexic and Bulimic Disorders (SIAB; Fitcher et al., 1991). These instruments – even though they are different – measure the features of the eating disorders, and they have helped to increase the reliability in the assessment of symptoms. Special training is needed to correctly use these interviews.

The EDE is a semi-structured interview developed to assess eating disorder psychopathology. The aim of the last version of this interview (EDE-12.0; Fairburn & Cooper, 1993) is to measure, through 22 items, the presence and severity of eating and compensatory behaviours during the most recent 4-week period (28 days) and in the last 3 months. In addition, the EDE-12.0 assesses the associated disturbances of the subject in cognitions and attitudes towards weight, food and body image. The EDE-12.0 has four subscales, Restraint, Shape Concern, Weight Concern, and Eating Concern, and provides operational DSM-IV diagnosis. The scales score range from 0 (no pathology) to 6 (extreme severity of pathology). Several studies have evidenced the interrater reliability and validity of the EDE. Recently, Rizvi et al. (2000) have provided data showing test–retest reliability of this instrument. One important advantage of the EDE is that it permits gathering of extent information about binge eating behaviour.

The YBC-EDS is a semi-structured, clinician-administered interview. It includes a 65-item symptom checklist plus 19 questions, covering eighteen general categories of rituals and preoccupations related to eating disorders. This interview has been found to be reliable and valid when measuring type and severity of eating disorder symptomatology.

Finally, the SIAB assesses a wide range of symptoms that are frequent in different types of eating disorders. The third revision of the SIAB (Fichter et al., 1998) permits assessment of eating disorders following DSM-IV and ICD-10. The SIAB contains six subscales: (1) body image and slimness ideal, (2) general psychopathology and social integration, (3) sexuality, (4) bulimic symptoms, (5) measures to counteract weight gain, substance abuse, fasting, and (6) atypical binges. This interview has showed good internal consistency for five of their six components and its interrater reliability is also good (ranging from 0.86 to 0.96).

Self-Report Questionnaires

Although it is not possible to confirm a diagnosis through these instruments, they offer several

advantages: they permit validation of data gathered through the interview, they are less time consuming and they can be used at community studies for screening purposes. The following are the most recommended self-report instruments. Most of them are used in Europe, America and Australia and have been adapted to different languages.

The Eating Attitudes Test (EAT-40; Garner & Garfinkel, 1979), and its brief 26-item version (EAT-26; Garner et al., 1982), is a self-report that permits assessment of symptoms and concerns characteristic of eating disorders. Patients answer in a 6-point scale (from never to always). The EAT permits, through three scales (oral control, diet and bulimia), discrimination of BN and AN. Both forms of the EAT (EAT-40 and EAT-26) have good psychometric properties. There is a general agreement about the use of these self-reports for screening purposes.

The Eating Disorders Inventory 2 (EDI-2) is the more recent version of the Garner et al. (1983) self-report for eating disorders. It was developed to assess the behavioural and cognitive characteristics of anorexia and bulimia nervosa. Three of its eight subscales have a special value for the diagnosis of BN: drive for thickness, bulimia and body dissatisfaction. The remaining five subscales are related to secondary symptoms of the disorder.

The Eating Disorders Examination Self-Report Questionnaire (EDE-Q; Fairburn & Beglin, 1994) is a 41-item self-report instrument adapted from the EDE; it contains the same four subscales as the EDE. It may be an alternative to clinical interviews and has shown a high predictive value to detect eating disorder cases. The EDE-Q has good psychometric properties because it has showed excellent internal consistency, test–retest reliability, and concurrent validity in several studies with community and clinical populations.

Finally, the Questionnaire of Eating and Weight Patterns (QEWP; Spitzer et al., 1992, 1993) was developed exclusively for the identification of binge-eating disorder (BED) patients. It consists of 13 items that focus directly on the behavioural criteria of BED, such as the amount of food eaten, the duration of eating episodes, and the experience of loss of control while eating. The QEWP scores and classifies respondents with BED and BN. Its psychometric properties are promising; it correlates moderately with BED diagnoses based on structured interview.

Self-Monitoring Records

The primary goal of the self-monitoring records is to complete the data gathered by interviews and self-reports. The information that a subject provides through the daily record of her/his eating behaviour will be of great value to decide the treatment plan and to assess recovery. Clinicians have to ask patients to record their daily food intake and the variety of food that they eat. If patients inform about binge–purge episodes, they have to record the frequency, duration and time of day the binge–purge sequence occurs. The affect and cognition associated with the sequence (before, during and after the binge episode), and the type of compensatory behaviours used, including excessive physical activity, must be recorded too.

Self-monitoring data present many reliability problems. It is necessary to train patients to record their behaviour; however, training is not sufficient to avoid the frequent mistakes that patients commit. They forget to record behaviours that from their point of view are not considered relevant, they underestimate or overestimate the amount of food eaten in a binge. Also they estimate imprecisely the time they spend practising physical activity or they hide how many laxatives they have used. In spite of that, self-monitoring is of great value at initial assessment, during treatment, and post-treatment assessment.

ASSESSMENT OF BODY IMAGE

The assessment of body image requires a differentiation between the features of eating disorder patients and those related to the body dysmorphic disorder. For the purpose of this review, we will only mention the two principal categories that form the focus of the assessment of body image in eating disorder patients. First, the assessment of the feelings and attitudes towards the own body image, and second, the perception and estimation about silhouette and figure. There are several instruments that allow

us to know the degree of body dissatisfaction and disturbance that the subject experiences as a consequence of her/his negative body image, and the subject's perception of the body, silhouette and figure. Research has shown inconsistent results on the perceptual component of the body image construct. In some studies, patients with eating disorders seemed to overestimate their body sizes, while other studies have not met differences between normal samples and eating disorder samples. Treatment outcomes have shown no differences between the studies in which patients are trained to correctly estimate their body size, and those studies where training was not done. Due to these inconsistencies, we will only analyse some of the instruments related to feelings and attitudes towards body image.

Interviews

They are a direct way to know about a subject's attitudes and emotions toward her/his body image. Self-reports do not permit evaluation of the details of this kind of information. The interviews we mentioned before, EDE and SIAB, contain questions related to the assessment of this area. For example, two EDE subscales (shape concern and weight concern) are related to worries about silhouette and weight. Also one SIAB scale (body image and slimness ideal) assesses these concerns.

Self-Report Questionnaires

One can expect that this area is easy to assess through self-reports; however, there are so many questionnaires related to body image evaluation, which confirms the complexity of the topic assessment. The Body Shape Questionnaire (BSQ; Cooper et al., 1987) was developed to rate the degree of body dissatisfaction in eating disorder patients. It has 34 items rated in a 6-point scale, and measures attitudes towards body image: body dissatisfaction, fear of becoming fat, low self-esteem due to the appearance and desire to lose weight, and weight and figure preoccupations. The BSQ has very good psychometric properties, and permits discrimination between normal samples, those worried about their body image and eating disorder patients.

From a cultural perspective, Toro et al. (1994) have developed the *Cuestionario de Influencia del Modelo Estético Corporal* (CIMEC), which measures the importance given by the subject to the aesthetic body model proposed by social signs (movies, magazines, advertisements, etc.). The CIMEC has 26 items; it has good psychometric properties and a high prediction value between normal and anorexic samples.

Finally, some of the questionnaires developed to assess eating disorder contain subscales to assess body image disturbance. This is the EDI case, which includes the body dissatisfaction subscale. The nine items of this subscale rate the beliefs about body size. The body dissatisfaction subscale has showed internal consistency indexes between 0.90 and 0.91 and has proved a good concurrent validity with the BSQ.

FUTURE PERSPECTIVES

During the last two decades, research has contributed to the advancement in the eating disorder assessment. However, we would like to point out some of the topics that, in our opinion, have to be investigated during this first decade of the new millennium. First, it is necessary to develop sensible instruments to discriminate the subtypes of AN and BN, full eating disorders syndrome vs. partial syndrome, and the non-purgative subtypes of BN and BED. Second, it will be important too to develop and validate new instruments related to different phases of the eating disorder patients' treatment, especially in AN subjects. For instance, it should be possible to measure readiness to recover in AN, and motivational issues relevant to eating disorders. Recently, Rieger et al. (2000) have presented the Anorexia Nervosa Stages of Changes Questionnaire, that may be the first step on this new area of research. Other topics that should be studied are the behavioural and psychological features of patients, which facilitates one to pass from their nutritional rehabilitation to their psychological treatment, etc. Finally, it is very important to come to a certain agreement about the criteria employed to measure treatment outcome, and to develop and validate a unique instrument that could be extensively used by researchers and clinicians.

CONCLUSIONS

As we have shown all through this entry, assessment of eating disorders is a complex task, that requires the employment of different kinds of instruments. To gather all the necessary information, several health professionals have to work together at this task. It is also important to know that there are different levels of assessment, as shown in Table 1, in which those professionals have to take part to make treatment decisions. The results of the complete physical examination plus the information obtained through the interview, self-report questionnaires and self-monitoring records will allow a good picture of the patient's state to be drawn. However, it will be of great significance to combine these data with the experience and the clinical judgement of the clinician.

During the last two decades, much has been done on eating disorders assessment, especially in the development of sensitive instruments to detect the idiosyncratic characteristics of these disorders. This is particularly true with those instruments developed for initial assessment. However, in our opinion, clinicians and researchers have to arrive to a consensus to determine the specific instruments to employ at each level of assessment. Likewise, time has come to spend great efforts in other relevant topics of eating disorders. Motivational factors in general, progress during treatment, criteria of recovery, and specific instruments to assess treatment outcomes could be some of those topics.

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RELATED ENTRIES

Applied Fields: Clinical, Applied Fields: Health

EMOTIONAL INTELLIGENCE

INTRODUCTION

In a 1961 book of literary criticism, Van Ghent noted that certain characters within Jane Austen's *Pride and Prejudice* possessed 'emotional intelligence' (EI) in comparison with others (1961: 103). She referred to EI as '... emotionally informed intelligence – or shall we say, that intelligence which informs the emotions ...' (Van Ghent, 1961: 107). At roughly the same time, the term EI began to appear in psychological and medical articles, dissertations, and within books. The term was typically mentioned in passing, and not described or explained in any formal sense. Still, the term 'emotional intelligence' was too intriguing to disappear while, at the same time, too self-contradictory to be clearly useful as a scientific concept.

In 1990, two articles were published that first employed the EI label for a clearly specified set of findings in the scientific literature. The theoretical article, 'Emotional Intelligence', made the case that a coherent intelligence existed that was concerned with the emotions (Salovey & Mayer, 1990). Emotional intelligence was said to involve the ability to reason with emotions, and the capacity of emotions to enhance intelligence. Evidence for EI was collected from the areas of clinical psychology, artificial intelligence, aesthetics, and non-verbal perception. A pattern was present, it was argued, that indicated a heretofore overlooked human ability. The other, empirical, article provided a demonstration that emotional intelligence could be measured as an ability (Mayer, DiPaolo & Salovey, 1990). Precursor measures in the area of non-verbal behaviour had mostly failed at identifying any meaningful, consistent individual differences (Buck, 1984). The 1990 article reported new measurement procedures by which consistency was greatly improved.

Emotional intelligence would probably thereafter have evolved slowly if it had not been for the science journalist Daniel Goleman, who was working on a book about social and emotional learning. Goleman entitled his book 'Emotional Intelligence', to reflect the work mentioned above. At the same time, he defined EI very broadly, in part, probably, so that the concept would cover the large number of studies he discussed. His lively popularization became an international best-seller and generated popular interest in the idea, and ultimately, further scientific interest in it as well.

The popularization, and the media reports about it, were accompanied by sensationalistic claims for the predictive power of emotional intelligence that had not been present in the scientific literature. 'Compared to IQ and expertise,' wrote Goleman of EI (1998: 31), 'emotional competence mattered *twice* as much.' At least some of the early scientific literature, and some popular rejoinders, as well, seemed aimed at debunking those unsupported (and, to serious researchers, embarrassing) claims (Davies, Stankov & Roberts, 1998; Newsome, Day & Catano, 2000).

Additional popular books and tests were hurriedly produced so as to capitalize on the faddish interest surrounding emotional intelligence. Most of these further altered the definition of emotional intelligence until it no longer bore any specific relationship to either emotion, intelligence, or their combination. Capitalizing on the media attention was alluring, however, and so tests that were originally designed to measure empathy, well-being, alexithymia, and optimism were said to measure emotional intelligence – or even renamed as emotional intelligence measures, despite the fact that their content could hardly be distinguished from many other general tests of personality. Later on, these theories and tests became known as 'mixed models' of EI because they mixed in a seemingly haphazard collection of whatever the authors thought would predict success – from 'diversity tolerance' to 'conscientiousness'. Work on the original, ability model of emotional intelligence also progressed. The current status of these theories can be illustrated with a consideration of the measurements available. These will be examined next.

TESTS AND OTHER MEASUREMENT DEVICES

Today, there have developed four approaches to measure emotional intelligence: self-report (focused and mixed), observer report, and ability testing (see Table 1). These will be dealt with in turn.

Self-Report

A number of self-report measures of EI exist. One relatively focused scale of emotional intelligence is the 33-item measure by Schutte and her colleagues (Schutte et al., 1998). Like other scales in this area, this one asks questions on the order of 'How accurately do you perceive your emotions?' and 'How empathic are you?'. Although the scale is self-report, it attempts to gauge ability at EI.

Self-report scales of mixed-model (i.e. popular) conceptions of EI are fairly numerous. For example, the Bar-On EQi was originally labelled a measure of well-being (Bar-On, 1997). In

Table 1. Four approaches to measuring emotional intelligence

	Self-report		Observer report Mixed-model	Focused ability measure
	Focused	Mixed-model		
Relevant test	Emotional Intelligence Scale (Newsome et al., 2000)	Emotional Quotient Inventory (Bar-On, 1997)	Emotional Competencies Inventory (Boyatzis et al., 2000)	Mayer–Salovey–Caruso Emotional Intelligence Test (MSCEIT V. 2) (Mayer et al., in press)*
Representative subscales of the test	Overall emotional intelligence (no subscales)*	Emotional Self-Awareness*	Emotional Self-Awareness*	*Perceiving Emotions
		Interpersonal Relationships*	Self-Control*	*Using Emotions to facilitate thought
		Problem Solving*	Achievement Orientation*	*Understanding Emotions
		Stress Tolerance*	Empathy*	*Managing Emotions
		Happiness*	Leadership*	
Full test reliability	$\alpha = 0.90$	$r = 0.85$ (test–retest)	(No overall scale score reported)	$\alpha = 0.92$
Subscale reliabilities	No subscales	$\alpha = 0.69$–0.86	$\alpha = 0.73$–0.91	$\alpha = 0.73$–0.89 (for branch scales)
Scale arrangement is factor valid	Yes	No, but alternative factor analyses are provided	Partially	Yes

*Psychometric data for the MSCEIT V. 2 may change slightly as the manual is still undergoing modification as of this writing.

addition, its scales bear close resemblances to other personality scales. For example, the EQi and the California Psychological Inventory (CPI) both have subscales of empathy, independence, and flexibility. Other subscales indicate overlap between the two tests as well. For example, the EQi measures self-actualization, reality testing, and impulse control, whereas the CPI measures self-acceptance, intellectual efficiency, and self-control. Current empirical findings indicate that such 'new' mixed-model scales of EI are largely reordered versions of pre-existing personality scales (e.g. Newsome et al., 2000).

Self-report scales, whether focused or mixed, suffer from several drawbacks. First, intelligence refers to the capacity to problem-solve. For that reason, the most valid way to assess the concept is through ability testing. Moreover, people are generally poor judges of their abilities, and this is likely to be the case in the area of emotional intelligence too. For example, self-estimates of cognitive intelligence are almost unrelated to actual measured intelligence (Paulus, Lysy & Yik, 1998). To further complicate matters, both focused and mixed-model self-report measures of EI correlate very highly with scales of positive affect and attitude (e.g. $r = 0.60$ and higher) – although they possess some modest independent variance (Bar-On, 1997; Newsome et al., 2000). That is, when people feel happy, optimistic, and confident, they report they understand their emotions, whereas when they feel bad, they report being confused about their emotion. Thus, there is a confound in these measures which often is not dealt with in interpreting what they might or might not predict.

Observer-Rating Assessments

Boyatzis, Goleman, and Rhee (2000) have introduced an observer-rating scale of EI for a corporate audience. This measure asks informants to rate a target individual on their EI. Much of the data concerning the scale is proprietary (i.e. owned and kept confidential by the consulting firm Hay/McBer). Hence, other than scale reliabilities and some sketchy information about factor analyses, little is known of its properties. In general, observer ratings suffer from the same difficulties as self-ratings: that is, high emotional intelligence may be difficult to gauge, or even 'over the heads' of many raters. In addition, there is evidence that the ECI also correlates highly with pre-existing personality measures (Murensky, 2000).

Ability Testing

The two major ability measures in the area are both based on a revised model of EI that divides it into four areas or branches (Mayer, Salovey & Caruso, 2000):

Emotional Perception and Expression

The capacity to perceive emotions in oneself and others, as well as in aesthetics; the ability to express emotion accurately.

Emotional Facilitation of Thought

The ability to use emotions to facilitate and inform thinking.

Emotional Understanding

The ability to understand the meanings of emotions, their likely transitions, blends, and progressions.

Emotional Management

The capacity to manage or regulate emotions for personal and social growth.

Two tests, the Multifactor Emotional Intelligence Scale (MEIS) and the more recently developed Mayer–Salovey–Caruso Emotional Intelligence Scale (MSCEIT), were designed to measure the four-branch model described above (Mayer, Caruso & Salovey, 1999; Mayer, Salovey & Caruso, 2002). The first, exploratory, EI ability tests had focused on emotional perception (Mayer et al., 1990). A typical test question asked people to identify the emotional content of a photograph of a face, or an abstract design. Thus, a test-taker might look at a face and be asked 'How much anger is present in the face' and answer on a five-point scale, where 1 is anchored by 'no anger' and 5 is anchored by

'much anger'. Several criteria were explored for identifying the correct answer on such a test. Most commonly, correct answers are identified by studying the endorsements of a group of general test-takers, and then weighting answers according to what is most commonly chosen by the group. Alternatively, one can use the endorsements of emotions experts rather than average test-takers. These methods generally converge (Mayer et al., 1999).

Items measuring the emotional facilitation of thought take two forms. Some such items ask people to integrate emotions with other sensations, as in: 'How "hot" is envy?' – to which test takers might answer on a Likert scale anchored by: '1: extremely cold' or '5: extremely hot'. Other such items ask people what mood might be best to enter into when thinking of new career directions. To answer this question, participants might choose from among four alternatives such as: *happy*, *angry*, *envious* or *calm*.

To gauge their understanding of emotions, participants are asked to choose the best definitions of emotion terms, or, for other items, to identify which two emotions might blend together to form a third. For example, they may indicate that *dislike* and *disgust* blend together to form *contempt*.

Finally, emotion management tasks ask people to read vignettes and respond in ways that will bring about specific emotions or moods. For example, participants might select what actions might preserve a person's happy mood.

The best factor structure for EI is still a matter of some dispute, and, given the nature of factor analysis, is likely to remain so for a while. One group of researchers argue that EI forms a global *g*, which they refer to as g_{ei}, and that it can be further broken down into the four factors representing the four-branch model of EI (perception, facilitation, understanding, and management; Mayer et al., 1999). Others have argued for two factors (Ciarrochi, Chan & Caputi, 2000). Factor analysis is a matter of preference and it is possible that either of these are viable interpretations.

Full-scale ability measures of EI are just a few years old, and yet a fair amount is already known about their predictive validity. Such EI measures are fairly distinct from measures of general intelligence and from self-report measures of empathy (correlating with both at about the $r = 0.35$ level) (Ciarrochi et al., 2000; Mayer et al., 1999). More generally, they are distinct from a variety of general personality measures such as the Big Five, and other tests. That is, ability tests of EI appear to measure a new psychological construct that was not measured in applied settings before. There has been a focus on examining EI in children and college students, and there, mounting evidence indicates that they predict a lowered degree of violence and problem behaviour (Formica, 1998; Rubin, 1999; Trinidad & Johnson, 2002).

FUTURE PERSPECTIVES

Self-report and rater-report scales of EI overlap substantially with existing measures of personality. The ease of use of such scales makes it unlikely they will disappear soon, but their ease of use must be balanced against the difficulty of interpreting exactly what they are measuring that is new, and the rationale behind whatever conception of EI they employ. Ability scales of EI increasingly appear established and validated as measures of a new construct. A few remaining measurement controversies involve EI's factor structure, and the best criteria for correct answers. Researchers are now examining what EI, measured as an ability, predicts. If it does, indeed, predict lower levels of violence and problem behaviour among school children then it may be of considerable importance to assess. It might well make similar predictions of lower problem behaviours in adults, as well. Moreover, if the relationship is causal, then it may make sense to teach emotional knowledge to those who lack it (Elias et al., 1997).

CONCLUSIONS

Emotional intelligence is a promising new type of intelligence for which sound ability-based measures now exist. The attribute – measured as an ability – is distinct from earlier discovered intelligences, as well as from earlier-measured motivation- and emotion-related personality traits. Early research with such scales suggest that they may be of value for predicting lowered

tendencies (among those higher in emotional intelligence) toward problem behaviours such as alcohol and drug abuse, and lowered levels of interpersonal violence. Further research is needed to more fully explore these relationships and understand the causal factors and directions involved.

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RELATED ENTRIES

Intelligence Assessment (General), Prosocial Behaviour, Social Competence, Emotions

EMOTIONS

CONCEPTUAL ISSUES

Psychologists distinguish among several interrelated constructs that are each associated with the everyday use of the word 'emotion'. The presumably most fundamental concept is that of 'affect'. Affect has been characterized as the first stage of an organism's reaction to stimuli, an experiential process that precedes and is possibly independent of those processes labelled as 'cognitive' (Zajonc, 2000). Affect is a process in which subjective, evaluative information is derived from the flow of perception. Affects can be consciously experienced as 'feelings', and are often described in terms of pleasure, displeasure, and degree of activation. Affective feelings are thought to play a key role in the judgements, preferences, and behavioural action patterns critical for survival.

Affect is closely linked to 'mood', which is most often conceptualized as a sustained affective experience. Mood can be thought of as a comparatively stable affective state that is not necessarily aroused by a particular event. Researchers have found that mood is correlated with particular personality traits, an association which may contribute to the stability of overarching affective dispositions throughout life.

What most psychologists refer to as 'emotions' are feeling states that are both briefer and more intense than moods. A necessary component of emotion assessment is the measurement of affect, its fundamental ingredient. Emotion assessment quite often also involves measuring cognitive, physiological, and behavioural response domains (see Figure 1).

THE DESCRIPTION OF AFFECT

Some theorists posit that affect is not a cognitive process per se, but is better conceptualized as a rather primitive and irreducible psychological experience. Nevertheless, cognitive representations of affective experience are made. One fruitful approach to the measurement of affect has thus been to consider the interaction of affect with its cognitive representation. One assumption underlying this approach is that everyday language – especially emotion-related words – is replete with affective meanings that can be described along two or more dimensions.

The dimensional perspective offers a simple yet powerful measurement strategy that enables the scalar representation of phenomena that are clearly experienced but not fully captured with language. Different interpretations have been provided for the mathematical solutions used to derive affect dimensions. For example, in his analyses of emotion-related words, Russell (1979) proposed two bipolar dimensions to describe affective experience: a valence dimension anchored at either end by strong pleasure and displeasure, and an arousal or activation dimension ranging from low to high levels of arousal (*cf.* Watson & Tellegen, 1985). As these dimensions were specified to be uncorrelated, they can be represented in a two-dimensional, Cartesian space. The resulting circumplex model of emotion-related words is applicable across various languages, and provides researchers and practitioners alike with a way to measure and represent the affective feeling states and associated behaviours.

Commonly used self-report measures of affective experience include the Affect Circumplex (Larsen & Diener, 1992), the PANAS (Watson, Clark & Tellegen, 1988), and the Self-Assessment Manikin (SAM; Lang, Bradley & Cuthbert, 1995). Measures are also available to assess comparatively trait-like components of affect, including intensity (e.g. Bachorowski & Braaten, 1994) and expressivity (Kring, Smith & Neale, 1994). These and other measures can be used, for instance, in detailed examinations of the structure of consciously perceived affective experience, and to monitor change in response to therapeutic intervention.

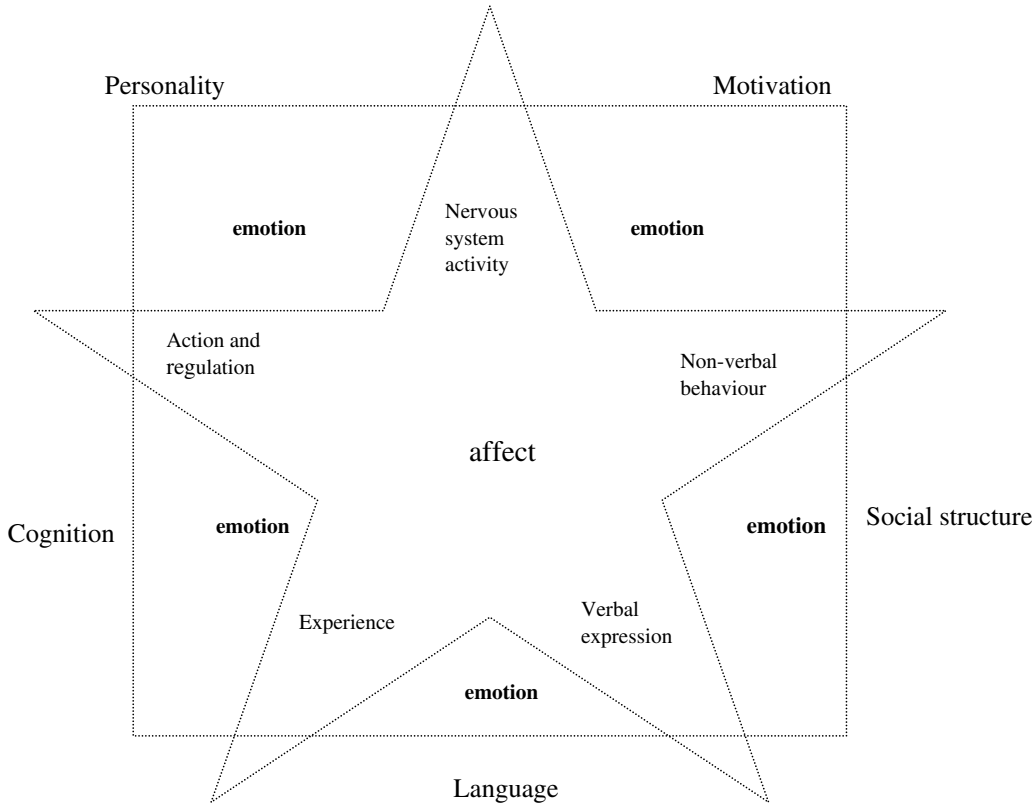

Figure 1. A conceptual map for assessment strategies on emotion and affect. The position of the categories does not exclude other possible combinations. Personality, motivation, social structure, language and cognition are related issues that should be taken into account in any assessment strategy. The figure represents emotion as an object that overlaps with and is grounded in affect. Affect and emotion can be described through different sets of variables using both dimensional and categorical approaches.

CATEGORICAL APPROACHES

Dimensional approaches to affective experience are challenged by perspectives that treat emotions as discrete phenomena that arise from activity in specific neural pathways and that have characteristic experiential, expressive, and behavioural consequences. The resulting 'affect programmes' are held to have high adaptive value, or to have at least had adaptive value during evolutionary history. A classic example of this approach relies on the construct of 'basic emotions' (e.g. Ekman, 1992). Although there is debate about what is meant by an emotion being 'basic', common to this perspective is the belief that a small number of emotions account for a large proportion of emotional experience.

Basic emotions are brief, rapid, and involuntary. Lists of these emotions differ, but typically include at least anger, fear, sadness, disgust, surprise, and joy. Basic emotions are often assessed by choosing the one of seven or so words that best describes individuals' reactions to a given situation. These responses might then be used to identify emotion-specific physiological patterns, or to anchor particular kinds of behavioural responses to experienced emotion. Some investigators have used this perspective to study perceptions of expressive reactions in efforts to demonstrate commonalities in basic-emotion processes across cultures.

FACIAL AND VOCAL EXPRESSIONS OF EMOTION

By far, the most widely examined aspect of expressive behaviour is activity in the facial

musculature. Electromyography provides an objective yet somewhat intrusive means of describing both visible and non-perceptible isolated facial movements through the detection of aggregated action potentials from underlying muscles (see Wagner, 1997). Comparatively unintrusive methods involve coding observable changes in facial musculature activity. Popular coding systems from a categorical perspective are Izard's MAX and AFFEX (Izard, 1979; Izard & Dougherty, 1980) and Ekman and Friesen's FAST (Ekman, Friesen & Tomkins, 1971) and FACS (Ekman & Friesen, 1978). MAX, AFFEX, and FAST systems enable coders to make global judgements of different facial configurations. The time-intensive FACS is a comparatively micro-level measurement tool used to code the activity of 'action units', which are highly specific regions of the facial musculature. Facial coding systems that rely on a dimensional approach to emotion expression are also available (Kring & Sloan, 1991). Dimensional systems involve less training and are less time-intensive than those systems that code for discrete expressions.

There is as yet no firm evidence that prototypic expressions of basic emotion are necessarily produced during even intense emotional experiences. Recent findings have given rise to a lively debate about the ways in which facial expressions are linked to emotion, and particularly about the roles of social context and self-regulation in emotion-related expressions (Russell & Fernández-Dols, 1997).

Although receiving substantially less attention than that given to facial expression, vocal expression is another expressive behaviour linked to emotional experience. Most empirical studies have studied the acoustics of stock phrases produced by individuals asked to speak as if they were experiencing particular emotional states. While providing suggestive data, it is unclear whether outcomes obtained with these strategies generalize to naturally occurring instances of emotion-expression through the vocal channel. More informative work will necessarily involve studying the vocal acoustics produced during naturally occurring emotional states.

Measurement of emotion-related vocal expression involves acoustic analysis. The most commonly measured acoustic cues are those associated with the fundamental frequency (F_0) of speech, which corresponds to the rate of vocal-fold vibration and is perceived as vocal pitch. F_0 has been shown, for instance, to be relatively high during the experience of fear, anger, and joy, but to be comparatively low during the experience of sadness (see Johnstone & Scherer, 2000). Other promising measures include those associated with the filtering properties of the vocal tract.

Given well-established connections between speech acoustics and various aspects of vocal anatomy and physiology, researchers have been able to make fairly detailed predictions about vocal changes in response to particular emotional states. As exemplified by the work of Scherer (e.g. Scherer, 1986), most investigators have relied on basic-emotion frameworks to shape their thinking about vocal expression of emotion. However, the most parsimonious account of the available data is that expression in the vocal channel is associated with arousal, and to a lesser extent the valence of experienced emotion (Bachorowski, 1999).

LAY DESCRIPTIONS OF BASIC EMOTIONS

Some investigators have explored the associations between lay descriptions of basic-emotion experiences and their cognitive, behavioural, and somatic consequences. This approach assumes that individuals can provide fairly accurate retrospective reports about the cognitive and behavioural concomitants of emotional events. Retrospective studies of this nature may also be useful for understanding how individuals encode and remember emotional events. A different perspective has led some investigators to pursue the core meaning of basic-emotion words either through the 'semantic primitives' thought to occur in all languages (e.g. 'want', 'bad', 'cause'; Wiertzbicka, 1995), or through the over-arching dimensions used to summarize emotion words in different languages (Frijda, 1986).

Overall, studying the everyday language of emotions has provided insights concerning the universals of emotion-related experience, but has also led to debate about the validity of the conclusions being drawn. Two pivotal concerns are the extent to which individuals' introspective

accounts provide veridical descriptions of their emotional experiences, and the extent to which meaning varies from culture to culture, thereby dooming to failure the search for universal descriptions of emotions (Shweder, 1991).

BASIC EMOTIONS AND NERVOUS SYSTEM ACTIVITY

A number of investigators have attempted to identify the associations between basic emotions and highly specific patterns of autonomous nervous system (ANS) activity. For instance, Levenson et al. (1990) provided data to indicate that anger, fear, and sadness, but not disgust or surprise, are associated with heart rate acceleration, whereas skin conductance increases are associated with fear and disgust but not happiness and surprise. These kinds of results are used to support the hypothesis that discrete emotional experiences are associated with specific patterns of ANS activity. Others have taken a different stance, arguing that valence and arousal dimensions provide a better account of ANS responding than do discrete emotions (e.g. Lang, Greenwald, Bradley & Hamm, 1993). Outcomes from a recent meta-analysis indicate that the latter interpretation is more consistent with the available evidence (Cacioppo, Bernston, Larsen, Poehlmann & Ito, 2000).

Given rapid technological advances, investigators have become increasingly focused on identifying the neural processes involved in the perceptual and experiential components of emotions. Central nervous system (CNS) patterns of emotion-related activation have been examined through the use of electroencephalography (EEG) for some time. This tool has been especially useful for testing hypotheses concerning activity in lateralized approach- and withdrawal-related emotion systems. For example, and consistent with hypotheses concerning approach-related motivation deficits in depression, both currently depressed and remitted individuals are more likely to show relative left frontal hypoactivation when compared to non-depressed controls (e.g. Henriques & Davidson, 1990).

More recently, a variety of neuroimaging techniques have become available. A crucial assumption underlying imaging methods is that the brain regions involved in a given perceptual or behavioural task are more active than uninvolved regions. For instance, capitalizing on the assumption that functional activity is associated with increase in blood supply, positron emission tomography (PET) techniques can be used to measure regional blood flow. Using a much different technology, functional magnetic resonance imaging (fMRI) also capitalizes on haemodynamic responses in response to stimulus or task demands. These and other techniques have given scientists an opportunity to identify the neural substrates underlying both normal and disturbed emotional processes.

EMOTIONS AS PROCESSES

Well-deserved attention has recently been given to the construct of 'emotion regulation', itself a set of processes used to shape emotional experience and expression. Empirical work has shown that emotion-regulation strategies such as reappraisal, occurring early in the emotion-generative process, and suppression, occurring relatively late in the emotion-generative process, have functionally different effects on emotion experience, memory, and physiological responding (Gross, 2001). This kind of work underscores the fact that emotional processes are inherently plastic, varying with both individual differences and situational constraints. The conceptually related construct of 'emotional intelligence' highlights the role of individual differences in emotion perception, experience, and expression (Mayer, Caruso & Salovey, 2000). Although a systematic approach to the measurement of emotional regulation involves a number of pragmatic difficulties and conceptual ambiguities, self-report inventories for this purpose are available (e.g. Gross & John, 2002).

FUTURE PERSPECTIVES AND CONCLUSIONS

There are many avenues to assessing emotion, including self-report, facial expression, vocal expression, and measures of central and

peripheral physiology. The choice of measures is typically dictated not only by pragmatic constraints, but also by the theoretical perspective held by individual investigators. Further advances in emotion assessment will likely require some sort of rapprochement between current theoretical dichotomies. Of these, distinctions between categorical and dimensional perspectives, and between approaches that treat emotion-related expressions as veridical readouts of internal states versus those that approach these signals as strictly social displays, are two of the most salient areas of debate. Rather than being antithetical, outcomes from some empirical studies have shown there is clear merit in giving explicit attention to both perspectives. These kinds of results indicate that further elucidation of emotional processes – including their assessment – will benefit from inclusive measurement strategies.

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RELATED ENTRIES

Personality Assessment (General), Attitudes, Applied Fields: Psychophysiology

EMPOWERMENT

INTRODUCTION

Empowerment is both a multilevel (individual, group, organizational, community) and a multidimensional (intrapersonal, social, behavioural, organizational and community) construct. It has been defined as a process through which people, organizations and communities gain mastery over their own affairs. Empowerment is a construct that links individual competencies, existing helping systems and proactive behaviours to matters of social policy and social change. The individual experience of empowerment includes a combination of self-acceptance and self-confidence, social and political understanding and the ability to play an assertive role in controlling resources and decisions in one's community. Psychological empowerment can be described therefore as the connection between a sense of personal competence, a desire for, and a willingness to take, action in the public domain (Zimmerman & Rappaport, 1988).

In the last decades the concept of empowerment has been widely used cross-culturally in five different domains: politics, adult education, health, management and organizational and community psychology (Piccardo, 1995). In this entry, I will briefly describe how the construct of empowerment has been applied in different fields, and how it has been defined and assessed at the individual, group, organizational and community levels.

In politics, the construct was first proposed in the context of the civil rights and women's liberation movements of the 1960s. It meant giving more legal, political and economic power to people who had less access to valued resources. Since then, empowerment has become one of the main aims of all intervention programmes carried out in developing countries or in disadvantaged areas of rich nations. Empowerment has become a key concept also in the environmental movement and in many projects aimed at fostering the rights of oppressed groups (Francescato, 2000; Human, 1990).

In the field of adult education, empowerment has become a cornerstone in lifelong learning projects, aimed at favouring personal growth and at increasing active participation of trainees in defining training goals and processes. Empowering in education means shifting the power from teacher to trainees, so these can make the choices that are more relevant to their emancipation (Bruscaglioni, 1994).

In the health field, empowerment has been used to indicate the process by which patients become less dependent on doctors, acquire the skills and knowledge necessary to take care of their health, and become aware of the social and environmental factors impinging on their individual well-being. (Hess, 1984; McWhirter, 1991; Pasini & Francescato, 2001; Wilkinson, 1996).

In management and organizational psychology empowerment has been used to promote a shift in organizational values, moving away from bureaucratic paternalistic culture and promoting an entrepreneurial-emancipatory environment which allows workers to participate more in

decision making, and to share risks and rewards (Putnam, 1991; Piccardo, 1995).

In community psychology, empowerment is a value orientation for working in the community, that directs attention to promoting wellness instead of preventing illness, identify strengths instead of cataloguing risk factors and enhance assets instead of solving problems. According to Zimmerman (2000) empowerment is a continuous variable, a developmental construct that can change over time, and it is context and population specific. Finally, empowerment is an individual-level construct when one is concerned with intrapersonal and behavioural variables, an organizational-level construct when one is concerned with resource mobilization and participatory opportunities and a community-level construct when sociopolitical structures and social change are involved. Three concepts can be applied across levels of analysis to understand empowered processes and outcomes for individuals, groups, organizations and communities: control, critical awareness and participation. Control refers to perceived or actual capacity to influence decisions. Critical awareness refers to understanding how the power structures operate, how decisions are made, causal agents influenced and resources mobilized. Participation refers to taking action promoting desired outcomes.

The variegated characteristics of the empowerment construct make measurement difficult, in fact most existing tools assess primarily individual empowerment and only a very few group organizational or community empowerment.

ASSESSING INDIVIDUAL EMPOWERMENT

Several scales have been constructed to measure empowerment at the individual's level. Zimmerman and Rappaport (1988) used eleven indices of empowerment representing personality, cognitive and motivational measures, and examined in three studies the relationship between empowerment and participation in community activities and organizations. In each study, individuals reporting a greater amount of participation scored higher on indices of empowerment. Building on Zimmerman and Rappaport's indices and adapting them to an Italian context, Francescato and Perugini (1997) constructed a 'Scala Di Empowerment' (SE) and tested it on 1568 men and women, aged 17 to 70.

Confirmatory factor analyses were conducted to evaluate the internal structure of the scale and the reliability of its score. Results provided evidence for convergent and discriminant validity for 3 subscales: political engagement, leadership and self-efficacy. Further studies (Francescato & Burattini, 1997; Francescato et al., 2000) showed that men were generally more empowered than women, with the exception of women holding political office or working in unions or police, that young people become more empowered after an experience in tutoring young children and taking part in other community projects, confirming the link already found in American studies between empowerment and participation.

Akey et al. (2000) have validated a Psychological Empowerment Scale (PES) using 293 SS. The results of the confirmatory factor analysis showed four subscales underlying the PES: (1) attitudes of control and competence, (2) cognitive appraisals of critical skills and knowledge, (3) formal participation in organization and (4) informal participation in social systems and relationships.

Qualitative tools can also be used to assess individual empowerment. Francescato et al. (2001) have used personal narratives to assess individual empowerment. Using 172 life stories it was found that one could assess levels of locus of control, self-esteem, self-efficacy, resilience, self-awareness and action motivation, and these were related to levels of empowerment measured by scales (SE). Kieffer (1984) has used interviews on life experiences to assess individual empowerment. Self-control and acquired responsibility through concrete life experiences were correlated with psychological empowerment.

ASSESSING GROUP EMPOWERMENT

Narratives have been used by Gone et al. (1999) and Mankowski and Rappaport (2000) to both assess and promote group empowerment in various settings. Rappaport suggests that community psychologists should help transform personal and community tales of terrors into tales of joy. Francescato et al. (2000) have

used movie scripts to measure the empowerment level of various groups within an organization or a community. For instance, asking students, teachers, staff and parents to write a script about their schools allows one to detect patterns of hopefulness or helplessness, preferred solutions to problems, locus of control for each group and similarities and differences among groups. Movie scripts have also been used to evaluate the effect of empowerment training programmes with students from 240 high schools.

ASSESSING ORGANIZATIONAL EMPOWERMENT

Zimmerman (2000) distinguishes between empowering organizations that provide opportunities for its members to gain control over their lives, and empowered organizations which are successful in their mission and can influence community decisions.

Several authors have attempted to measure some single aspects of organizational empowerment. Florin and Wandersman (1990) have constructed organizational level measures of incentive and cost management and examined their relation to organizational viability and empowerment. Many organizational consultants and industrial psychologists have constructed scales that measure organizational variables that are related to empowerment (Moos & Lemke, 1984; Spaltro, 1977; Muchinsky, 2000). We lack, however, a complex measure of organizational empowerment. An attempt in this direction has been made by Francescato and Tancredi (1992). They have created a tool called multidimensional organizational analysis that involves people on all hierarchical levels of an organization. Together they analyse their organizational functioning across four dimensions (structural-strategic, functional, psychoenvironmental and cultural). Weak and strong points are outlined for each dimension and organizational empowerment levels are measured accordingly. Different narratives and preferred visions of the future are then formulated and organization members negotiate change priorities. This tool can be used both to make organizations more empowering and empowered (Francescato & Morganti, 1997).

ASSESSING COMMUNITY EMPOWERMENT

Again, at the community level of analysis, empowerment can be conceptualized as empowering or empowered or both. An empowering community provides residents with opportunities to exert control, develop and practise skills, and participate in community policy making. An empowered community is one that initiates effort to improve community life, has good links with regional, national and international policy making bodies.

In Italy, Martini and Sequi (1988), Francescato, Leone and Traversi (1993), Francescato (2000), and, in Austria, Ehmayer et al. (2000), have developed a methodology called 'community profiling' to both assess and promote community empowerment. Strong and weak points are diagnosed for seven profiles: territorial, demographic, economic, service, institutional, anthropological and psychological. Techniques of data gathering vary from profile to profile, and include walks, drawings, movie scripts, narratives, jokes for the more subjective profiles and a series of hard indicators for the first five profiles.

FUTURE PERSPECTIVES AND CONCLUSIONS

At the individual level, empowerment can be assessed reliably through both qualitative and quantitative data. However, only a few prevalently qualitative methods have been developed to assess empowerment at the group, organizational and community level. Moreover, since empowerment is used to measure both a process of empowering, and an outcome (empowered individuals, organizations, etc.), we need to develop better tools to assess both aspects of the construct.

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RELATED ENTRIES

Personality Assessment (General), Self-Efficacy

ENVIRONMENTAL ATTITUDES AND VALUES

INTRODUCTION

The emergence of societal awareness of environmental problems was quickly followed by efforts to assess individuals' concerns about environmental quality. Over a thousand published articles reporting empirical investigations of environmental attitudes, beliefs, values, etc. have

been published in the past few decades. These studies have employed a huge variety of differing techniques to assess aspects of individuals' concern for the state of the environment, or 'environmental concern', leading some observers to see the literature as hopelessly disorganized (Heberlein, 1981: 242). The goal of this entry is to clarify the conceptual foundations of environmental concern and review major assessment techniques employed to measure it.

CONCEPTUAL AMBIGUITIES: 'ENVIRONMENT' AS AN ATTITUDE OBJECT

Heberlein (1981: 242) noted that, 'The great difficulty with even thinking about environmental attitudes is the ambiguity of the object itself', and the situation has been exacerbated by the changing nature of environmental problems. Air and water pollution were salient in the 1960s and 1970s; toxic wastes, energy shortages, acid rain, and hazardous technologies emerged in the 1970s and 1980s; followed by deforestation, biodiversity, ozone depletion and climate change in the 1990s. Overall, the problems have become less localized and visible, making their awareness more dependent on media and other information sources than on first-hand experience. These trends make the assessment of environmental attitudes even more challenging than Heberlein suggested. Yet, it is possible to provide an overview of empirical research on 'environmental concern', the term typically used in the empirical literature (Dunlap & Jones, 2002).

CLARIFYING THE MEANING OF 'ENVIRONMENTAL CONCERN'

Environmental concern refers to the degree to which people are aware of environmental problems and support efforts to solve them and/or indicate a willingness to contribute personally to their solution. Researchers investigating environmental concern must inevitably choose from a wide range of environmental issues or substantive topics and from the numerous ways in which concern over these issues/topics can be expressed by respondents. Consequently, environmental concern is a construct consisting of two conceptual components: 'environmental topics' and 'expressions of concern' (Dunlap & Jones, 2002; Gray, 1985).

The environmental component represents the substantive content of environmental concern, and is operationalized by the particular topic (e.g. acid rain) or set of topics (e.g. pollution) or broad topic (e.g. environmental degradation) chosen by the researcher from the potential pool of environmental issues. The concern component represents the way in which environmental concern is operationalized via the particular manner employed by the researcher to elicit people's expressions of concern about environmental issues (Dunlap & Jones, 2002).

The Environmental Component

The environmental component varies considerably in empirical studies because the potential pool of environmental phenomena is vast. For example, we can treat the phenomena that constitute the biophysical environment – atmosphere (air), hydrosphere (water), lithosphere (land), flora (plants) and fauna (animals) – as comprising a biophysical facet. Or, we can distinguish among different outcomes of human activities on the biophysical environment, such as resource depletion versus conservation, pollution generation versus abatement, and development versus preservation, and treat these elements as a biophysical facet. Each represents a way of organizing the enormously complex universe of biophysical properties into a manageable set of elements that comprise conceptually meaningful facets which can be employed in measures of 'environmental concern' (see Dunlap & Jones, 2002 on facet theory).

Several other facets such as the spatial (local to global) and temporal (past, current, and future) dimensions of environmental problems have also been found useful in representing important properties of such problems (Dunlap & Jones, 2002: 488). The resulting complexity of the environmental component helps account for the huge diversity in existing measures of environmental concern. Studies of environmental concern often fail to consider these important features, and inconsistent findings stem from the many ways biophysical, spatial, temporal, and other facets of the environmental component are

haphazardly combined in measures of environmental concern.

The Concern Component

The second major source of variation in environmental concern research stems from the ways in which investigators conceptualize the 'concern' component of the construct. Two major approaches exist: the first is based on efforts to examine policy relevant aspects of environmental problems, and the second applies various forms of attitude theory when examining individuals' assessment of these problems.

The 'policy' approach is used in studies that conceptualize the concern component based on the investigator's understanding of environmental problems and their policy implications. Although not grounded in attitude theory, these studies have nonetheless yielded important insights into the public's concern for environmental quality by assessing perceptions of the seriousness of environmental problems; their major causes; support for various solutions; pro-environmental behaviours; etc. Use of such items is common in studies of public opinion toward environmental issues, but in in-depth surveys as well.

The 'theoretical' approach is used in studies that conceptualize the concern component based on the investigator's theoretical knowledge of the nature of beliefs, attitudes, intentions, and behaviours and their theoretical and empirical relationships. Although fewer in number, these studies of environmental concern draw explicitly on various forms of attitude theory. They typically conceptualize the concern component in terms of the classical tripartite conceptualization of 'attitude' as consisting of affective, cognitive and conative dimensions (Gray, 1985).

The cognitive expression of environmental concern is usually treated as the beliefs and/or knowledge an individual has about environmental problems. The affective expression of concern involves an emotive and evaluative element which is synonymous with a narrow conceptualization of attitude and tap personal feelings or evaluations (good–bad, like–dislike, etc.) about environmental issues. The conative expressions of concern reflect a readiness to perform, or a commitment to support, a variety of actions that can potentially impact environmental quality. Some researchers also include a behavioural expression of concern representing the actual or reported pro-environmental actions (Dunlap & Jones, 2002).

Summary Typology

Given the diverse ways in which both the environment and concern components of the construct 'environmental concern' can be conceptualized, it is not surprising that one finds enormous diversity among existing assessments of individuals' levels of concern for environmental quality. A typology of efforts to conceptualize and measure environmental concern can be developed by dichotomizing attempts to conceptualize/measure both the environment and concern components. First, studies can focus on a single environmental issue or substantive topic (the preferred term) or on multiple topics; second, studies can focus on a single expression of concern or on multiple expressions.

Putting these two together yields a four-fold typology of potential measuring instruments: (1) Multiple-topic, multiple-expression instruments that examine phenomena such as beliefs, attitudes, intentions, and behaviours concerning various environmental topics; (2) Multiple-topic, single-expression instruments that measure beliefs, attitudes, intentions, *or* behaviours across a range of substantive topics; (3) Single-topic, multiple-expression instruments that measure beliefs, attitudes, intentions, and behaviours toward specific topics such as population or air or water pollution; and (4) Single-topic, single-expression instruments that measure beliefs, attitudes, intentions, *or* behaviours concerning a specific topic like global warming. The next section briefly reviews examples of these varying techniques.

SELECTIVE REVIEW OF EXISTING MEASURES

Maloney et al.'s (1975) early effort to develop a measuring instrument for environmental concern grounded in attitude theory remains the most comprehensive assessment technique available. It includes multi-item measures of ecological knowledge, affect, verbal commitment, and actual commitment. While each measure thus focuses on a single expression of environmental concern

the items within them cover a wide range of environmental topics, making the overall instrument a multiple topic/multiple expression assessment technique. A more recent example of this technique, also based on attitude theory, is Kaiser et al.'s (1999) effort to measure environmental knowledge, behaviours, and attitudes.

Other researchers have developed similarly broad assessment techniques based more on a policy approach, developing measures that focus on key issues and topics but are not designed explicitly to tap the cognitive, evaluative, and conative components of attitudes. Van Liere and Dunlap (1981) include measures of support for environmental regulations, support for environmental spending, and reported pro-environment behaviours as well as measures of attitudes toward pollution, resources, and population. The overall instrument thus represents a multiple topic/multiple expression assessment technique. More recently Klineberg et al. (1998) have used a similar assessment strategy, measuring environmental-economic tradeoffs, perceived seriousness of pollution, pro-environmental behaviours, and ecological worldview.

The above efforts achieve reasonably comprehensive coverage of both environmental topics and expressions of concern via the use of multiple-topic, multi-item measures, but Weigel and Weigel (1978) achieve the same thing with a single measure. Their widely used scale includes items tapping a range of topics and reflecting cognitive, evaluative and conative expressions of concern.

One finds examples of multiple topic/single expression measures of environmental concern in two ways. First, individual measures within the Maloney et al. (1975) and Kaiser et al. (1999) instruments represent good examples, as each includes items tapping a single expression (or attitudinal component) but several environmental topics. Second, several researchers have developed individual measures that cover a range of topics but employ a single expression of concern. Examples include numerous efforts to develop measures of pro-environmental behaviours (e.g. Seguin et al., 1998).

Similarly, single topic/multiple expression measures can be found within the instruments developed by Van Liere and Dunlap (1981) and Klineberg et al. (1998) – represented, e.g., by the pollution scales in each – as well as in studies that have developed single measures such as McCutcheon's (1974) early population control scale.

Finally, good examples of single topic/single expression measures are rare, because sets of items focused on a single topic often encompass both the cognitive and evaluative dimensions of attitudes. However, Bord et al.'s (2000) recent study of global warming includes measures of both knowledge about the causes of global warming and support for governmental action to combat global warming.

ADDITIONAL COMPLEXITIES AND MEASURES

Asssessments of environmental concern are even more varied than noted above because of additional sources of variation (Dunlap & Jones, 2002). For example, some measures achieve broad coverage of environmental phenomena via items that tap a wide variety of environmental topics, as exemplified by the Weigel and Weigel (1978) scale. Others achieve broad coverage by including items focusing on 'environmental' problems, quality and protection (e.g. Guagnano & Markee, 1995). The latter approach has the advantage of avoiding the use of specific environmental topics that become dated as new issues emerge, a problem with the Maloney et al. (1975) and Weigel and Weigel (1978) measures.

The continual emergence of new environmental problems reinforces the idea that modern societies are causing major 'ecological deterioration', and has made measures assessing the overall relationship between humans and the environment popular. Indeed, the earliest such measure, Dunlap and Van Liere's (1978) 'New Environmental Paradigm Scale', has become the most widely used measure of environmental concern. The original NEP Scale and a recent revision (Dunlap et al., 2000) assess beliefs about the balance of nature, limits to growth, and anthropocentrism (representing a multiple topic/single expression measure) and are widely regarded as measures of environmental/ecological 'consciousness'. Similar measures are beginning to appear, most notably Thompson and Barton's (1994) measures of 'ecocentric' and 'anthropocentric' attitudes.

Table 1. Well-established and widely used measures of environmental concern

1	Maloney, Ward and Braucht's (1975) 'Ecology Scale' Consists of four subscales measuring 'Verbal Commitment', 'Actual Commitment', 'Affect', and 'Knowledge'. Each found to be internally consistent and possessing face and known-group validity.
2	Weigel and Weigel's (1978) 'Environmental Concern Scale' Consists of 16 items focusing on the cognitive, affective, and conative aspects of several environmental topics. Found to be internally consistent and possessing test–retest reliability, known-group and predictive validity.
3	Dunlap and Van Liere's (1978) 'New Environmental Paradigm Scale' (revised in Dunlap et al., 2000) Consists of 12 items focusing on cognitions about the balance of nature, limits to growth, and anthropocentrism. Found to be internally consistent and possessing known-group validity.

CHOOSING AN INSTRUMENT

There is an endless variety of approaches to assessing individuals' concern for environmental quality stemming from the wide range of potential ways of conceptualizing and measuring the two components of environmental concern. Unfortunately, the vast majority of available instruments have never been used in replications, and only three have been widely used and their validity and reliability established. These are the Maloney et al. (1975), Weigel and Weigel (1978) and Dunlap and Van Liere (1978) measures (see Table 1). All are becoming dated, and only the last has been updated (Dunlap et al., 2000). Nonetheless, the first two represent good examples of theoretically grounded and psychometrically robust measures whose content in terms of environmental topics can be updated, and they should therefore be consulted at least until newer assessment techniques such as Kaiser et al.'s (1999) become widely replicated and validated.

FUTURE PERSPECTIVES AND CONCLUSIONS

Researchers interested in assessing environmental attitudes should carefully specify the environmental phenomena under investigation, and then decide on which aspects of concern they wish to measure (attitudes, beliefs, behavioural intentions, etc.), before choosing items and designing measuring instruments. They should also consider using existing measures that have been found to possess validity and reliability whenever possible, as replications are crucial in building a solid knowledge base regarding environmental concern.

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RELATED ENTRIES

Attitudes

EQUIPMENT FOR ASSESSING BASIC PROCESSES

INTRODUCTION

Cognitive processes as information processing, reasoning, and the awareness of subjective experiences are unobservable. Usually the objects of cognitive research are reconstructions derived from controlled observations of settings, instructions and stimuli as well as from responses such as motor reactions, decisions, kinds of trials in problem solving and verbal reports (Monsell & Driver, 2000). The main goal is to describe sequences of steps in cognitive functioning with respect to genetic, skilled and actual causes of the occurrence of responses and their chaining.

GENERAL REMARKS ON MEASURES IN COGNITIVE RESEARCH

Cognitive behaviour is *setting*-dependent. Effects of bodily position (unusual or rotated views) are observed for recognition effects and for the extent of optical illusions. Certain environmental circumstances in a study phase (classroom setting, weightlessness) might be part of elaboration and associative chaining.

Instructions on how to deal with a target stimulus can be given in a multitude of ways. Mostly they act as a cue to prime certain associations in preparing how target information should be processed. The simplest kind of cues are so-called peripheral cues which are close to the target in space and time. Symbolic or exogenous cues are more remote from the stimulus features; mostly verbal instructions are used in these cases. Effectiveness of instruction is often strengthened by a training phase up to a compliance criterion.

Stimuli are certain changes in the environment, affecting one or more senses. Because cognitive research is mostly based on assumptions on a sequence of cognitive operations (mental chronometry), a precise control of stimulation is needed, such as time relation to cues, onset, extent and comprehensibility. Standardized stimulation needs suitable devices, such as monitors, earphones, or skin stimulators.

Experiments are often designed to measure knowledge or ability, or to measure concomitants (such as emotional, psychophysiological, or neurological processes), or to measure time up to the correct response. Sometimes, frequency or types of errors or the ways of responding are assessed. To avoid uncontrolled influences by chance, reaction is usually restricted by instruction. Choice reactions can be restricted by forced choice and can be realized between two or more alternatives.

An elementary decision is to decide dichotomously as between confirmative or non-confirmative (signal detection theory – SDT). In this case, four response classes are considered (hits, misses, correct rejections and false alarms), usually according to fixed criteria (right or wrong). To evaluate performance in SDT paradigms, a large number of responses and special procedures are required (Snodgrass & Corwin, 1988). Most of cognitive research is done by the use of certain materials for testing failures and errors. Apart from psychophysiological methods of error processing,

evaluation and back propagation of failures (e.g. automatic feedback presentation by PC) is commonly used in research on concept formation.

Responding is most restrictive in so-called go–no go paradigms. An often-used example is the odd ball paradigm. Here, usually two classes of stimuli are presented for go–no go in a time series, instances of one class with a low frequency.

Responses can be realized by verbal or by nonverbal output, e.g. movements. In both cases, special equipments for response detection are used, especially in time-critical designs. Motor responses such as writing, drawing, or marking with a cross are often required. Sometimes one has to move a joystick, to press a handle or a key, or has simply to move a finger. In measuring reaction times, movement detection and evaluation are serious problems.

Special equipment is needed to measure reactions accompanying desired responses, such as *eye movements*, psychophysiological or neurological events, indicating global or side aspects of information processing (e.g. Furedy & Ben-Shakhar, 1991). Moreover, studies using biomedical indicators have to be appropriately designed. Physiological responses such as *electrodermal responses* or the BOLD-response in *functional Magnetic Resonance Imaging* (fMRI) need time to abate before the next stimulation. Sometimes a number of responses have to be aggregated to assess noisy parameters, such as event-related potentials or EEG background activity, or in long-lasting physiological measures, such as *Positron Emission Tomography* (PET).

ASSESSMENT PRACTICES IN SPECIAL AREAS OF COGNITIVE PSYCHOLOGY

Measurement in Topographic Research and Hemispheric Interaction

A great part of research in cognitive neuropsychology is done in biomedical settings and in animal experiments. This is to find out principles of the functional brain architecture to get a theoretical frame for the architecture of cognition. One of the main goals is the functional specialization of certain brain areas as revealed by deep recording or stimulation techniques.

Apart from the microscopic functional architecture, cognitive processes do not always affect both hemispheres. Differences in cognitive performance (as global vs. routinized verbal processing) depend sometimes on the involvement of one or both hemispheres. Manipulation of hemispheric stimulation can be done by lateralized visual probes or *dichotic tasks* (simultaneous stimulation of both ears by different stimuli). Reaction times in right or left handed responses reveal direct processing in one hemisphere or callosal relay to the contralateral side (*cf.* Zaidel, 1983). This can be interpreted as topographically specialized and often time requiring processing.

Perception, Attention, and Imagery

Sensory mechanisms and encoding processes are usually a domain of psychophysics and psychoneurological cooperation. To stimulate particular areas, certain patterns of stimuli are used (such as an animated checkerboard for area V5). Trickier are questions concerning attention, because they are closely related to cortical self-regulation of activity. Exogenous or automatic attention can be analysed only with respect to interacting processes in lower (e.g. thalamic) levels, i.e. with respect to concurrent environmental information. Here, short time (tachistoscopic) presentations are required as well as the exact control of a stimulus onset asynchrony (SOA) (*cf.* Pesce Anzeneder & Bösel, 1998). Endogenous or concept driven attention and phenomena of active perception (as revealed by familiarity ratings) are closely related to backpropagations and re-entries from higher level processing (such as from the associative areas of the working memory), with respect to intentions, instructions and memory standards (*cf.* Bösel, 2001). Apart from performance data, parameters of electroencephalography (event-related potentials, slow EEG rhythmicity, gamma waves for binding phenomena) are used to indicate particular changes of significance in feature processing.

Imagery can be seen as brain activity without sensory stimulation, but often localized in the same areas. In agreement with the neurological assumptions on automatic and endogenous attention, reasons for imagery under instruction, in drug action, in psychopathology, or in dreaming are frequently analysed by the use of

biomedical methods (Transmagnetic Stimulation [TMS], neurochemical alterations).

Priming, Working Memory, Long Term Memory

Recognition tests can be done in the form of familiarity tests (such as lexical decision) or in n-back paradigms. *Recall* is mostly tested by free or choiced naming. To evaluate recall performance and understanding of complex facts as, for example, empathy performance in the social field, special arrangements such as the Sally-and-Anne-experiment are required, and formal aspects of the report have to be considered. Short term memory span has to be assessed by an item set presented within a short time interval as well as with respect to a short retention interval between learning and test. It is assumed that encoding complex information needs time, which can be tested by encoding speed. Because chunking capacity is a predictor of consolidation, some particular test materials are used as well in testing short term memory as in testing long term memory, e.g. character sets or arrangements of block-tapping. The product of memory span times encoding speed reveals capacity of short term memory. Testing *learning and re-learning* performance needs study trials with respect to learning criteria. Testing of implicit memory requires decisions on features, such as of artificial brain scans, or lexical decisions on character strings fixed on so-called artificial grammars. An experimental manipulation of attention and re-learning performance can be done by variation of minor attended additional stimuli, as realized in double tasks paradigms (where performance is measured with respect to a receiver–operator-curve ROC) or by minimal changes of instruction in repeating learning trials (such as done in testimony experiments or to increase the memory set). Particular inventories are used to assess variables of personality assumed to influence cognitive performance, such as intelligence (for example measured by Progressive Matrices).

Categorical Thinking, Decision-Making, and Language

Assessment in testing categorical thinking depends on the chosen theoretical model and the intended field of application. Models of categorical thinking are often based on processing simulation programmes, such as in LISREL or in parallel distributed processing systems (PDP). For instance, in reading disabilities, models of artificial intelligence (AI) are used to explain the aetiology of psychopathology (Plaut & Shallice, 1993). Models of decision-making in AI use expert systems and fuzzy set algorithms.

For testing basic neuropsychological abilities, more simple questionnaires or particular materials are often required, such as the Clock Test or the Token Test. Special equipment is needed for auditory or visual stepwise presentation in sentence comprehension. Phonograms or time-spectrograms are used to detect onset and other formal parameters of verbal responses, such as sentence accent and prosodic components.

Voluntary Action and Problem Solving

In the early times of experimental psychology, timing was done by watching harmonic motions, e.g. of a tuning fork. By the use of such methods, difficult time measures are possible up to now, such as watching rotating lines on an oscilloscope to measure the onset of a voluntary action (Libet et al., 1983). Most parts of problem solving research (such as the use of the Tower of Hanoi) can be understood as investigation of the features of working memory as enumerated by Norman and Shallice (1986).

In applied fields, sometimes choice reaction apparatus are used, up to simulations of real work settings with the opportunity to particularly control stimuli and responses, even by registration of certain biological data.

THE MINIMAL COGNITIVE LABORATORY

The careful investigation of verbal and behavioural data is a basal requirement, even recommended in preparation of experiments or examinations requiring neuropsychological methods. This kind of investigation could be done in a minimal cognitive lab with features as follows.

The rooms for cognitive assessment have to be free of noisy air, light or sound contaminations. Stimulus presentation, procedure control, and response registration should be done with the aid of a computer. The monitor should not be too inert (as in the case of most flat screens) and have highest monitor frequencies. Hardware features as graphic and sound cards should match the requirements of the task. Software systems are available for a lot of cognitive paradigms; an experimental run time system for self-fixed experiments is usually required. A crucial point is equipment for detection of the exact time of stimulus onset and response, because of the unpredictable timing when using a windows standard socket. Programming language and operating system should have real time features. Further, a package of statistical routines is required. Technical personnel should be trained for PC hardware and software administration as well as for checking experimental settings, such as times for image change and response registration.

FUTURE PERSPECTIVES AND CONCLUSIONS

As true as in other psychological fields, cognitive measurement requires reliable prediction of certain cognitive functions, i.e. undisturbed occurrence and valid detection. To ensure this requirement, clear conditions, simple responses, and short time arrangements are attended. In this way, often plain behaviour such as cued recognition or sentence comprehension is known to be influenced by a number of factors causing alternative sequences of particular processes.

As a consequence, it is necessary to make the predictions more precise and to extend the control of variables in the cognitive field, including acquisition of supportive variables. Apart from ocular movements or vegetative responses, both brain imaging and brain potentials are valuable methods for detecting cognitive components as well as the time course of cognitive processing.

Further research requires an improvement in resolution and pattern analysis with regard to topography and time, and a sophisticated combination of methods in cognitive research. This will advance our knowledge on how processing units indicated by different methods interact in causing cognitive phenomena.

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RELATED ENTRIES

Brain Activity Measurement, Cognitive Processes: Current Status, Psychophysiological Equipment and Measurements, Theoretical Perspective: Cognitive, Applied Fields: Psychophysiology

ETHICS

INTRODUCTION

Wherever people live and work together, they evaluate their own actions and those of others as good or bad, justified or unjustified, fair or unfair, and they ascribe to others and to themselves in particular situations the responsibility for doing what should be done and not doing what should not be done. The entirety of the rules that these evaluations follow in everyday life is characterized as morality. Anyone publicly violating them incurs the disdain of the others. Insofar as people acknowledge the existence of moral rules, they also judge themselves before their own conscience. Moral rules therefore have a high status in subjective experiencing, thinking, and acting. Morality, however, can also be misused in order to give others a bad conscience. It can likewise be employed as a weapon to question the privileges of others or to defend one's own privileges. Finally, it can be used to create solidarity with others.

Moral rules can also find their way into national laws. But not all national laws have a moral basis. Whoever can be shown to have violated national laws must usually reckon with sanctions of the state, such as fines or prison terms. Finally, in addition to the rules of morality and the laws of the state, there are standards or norms, such as those of associations or professional organizations (American Educational Research Association, American Psychological Association, and National Council on Measurement in Education, 1999; International Test Commission, 2000). These prescribe how the members of these organizations are to conduct themselves during the performance of their professional activities. Anyone who can be demonstrated to have violated these rules is threatened in the worst instance with expulsion from the professional organization, which in some countries can have legal consequences, namely, one can be prohibited from carrying out one's professional activities.

In the following, the term 'ethics' will be elucidated and the two main fields of ethics will be introduced. Then the main participants in the assessment process will be introduced and their ethically justifiable responsibilities and rights will be worked out against the backdrop of fundamental theories of normative ethics. This will then be followed by a presentation of the positions taken by the critics of normative ethics. In conclusion, the practical implications of professional codes of behaviour will be shown.

ETHICS AND ITS BRANCHES

Ethics is a discipline of scientific philosophy (Frankena, 1963). It is concerned with evaluations. It is divided into two branches – meta-ethics and normative ethics. Meta-ethics examines the language of evaluation, the meaning of the evaluative terms, of evaluative standards and of their logical implications. A core insight of meta-ethics, which is called the Humean Law after the Scottish philosopher, states that no normative statement can logically follow solely from a descriptive statement: no findings, for example, on a person's intelligence, permit, in and of themselves, a statement concerning the moral value of that person and of that person's dignity. Normative ethics examines the moral rules of groups and societies, national laws or standards of voluntary organizations. These norms are rationally examined on the basis of universal principles. The object of normative ethics is thus the rational examination of norms and the universally binding justification of principles.

A STAKEHOLDER ANALYSIS

In order to be able to determine the ethical responsibility and obligatory duties of the people involved in psychological assessment, it will be necessary in the following subsections to go into the question of the most important actors, the

so-called stakeholders (Lindsay, 1996; Airaksinen, 1998; Carroll & Buchholtz, 1999), and their interests.

The Stakeholders

Scientific Psychology

Psychological science is in competition with other sciences for the distribution of resources and reputation. It develops universal standards of professional competence and provides for the education and training of future psychologists. Like all other sciences, psychological science is involved in the social construction of reality. It creates social realities by means of its constructs (such as the intelligence construct; Johnson, 1998). The social importance of these constructs is substantiated by the prestige of the science and of the profession. The modification and further development of assessment constructs rests in the hands of the sciences. It thus has an influence on the social consequences that result from the spread of their constructs and methods.

Test Developers

Persons or small groups develop the procedures of psychological assessment for scientific purposes or for a fee on behalf of a commercial client. Considerable costs are often involved in the development and validation of assessment procedures. The developers, however, if they are working commercially, have an interest in low development costs and a broad, long-term application of their procedures, hence the professional quality of the procedures developed and the financial investment to be spent developing them are frequently stuck together in a reciprocal trade-off relationship.

Distributors

The publishing companies and the distributors of assessment procedures are interested in their broad and long-term application. The lower the costs of development are, the lower the prices can be for the assessment procedures being offered, and the more widely they can be marketed. The scientific reputation of procedures likewise contributes in a positive way to their marketability. The distributors therefore like to market products with a scientific reputation. They have no genuine interest, however, in selling particular assessment procedures only to one particular profession or in limiting it at all to members of particular professions, since that would reduce the size of the potential market.

Professional Associations

The professional psychological associations represent the interests of working psychologists. They try to strengthen their position in the competition with other professions in society. One of their strategies is to develop competency profiles with exclusive status. A part of this is also the claim that, as a profession, on the basis of education, training and professional competence, their members have the exclusive right to use particular assessment procedures. To achieve this objective, they can try to ensure that the customers of psychological assessment, the persons analysed and the public, as well as governmental bodies, have confidence in their professional competence and their observance of particular standards. To do this they develop codes of conduct for their members.

Customers

The customers of psychological assessment can be businesses or organizations, schools or universities, other professions (e.g. physicians), courts, particular state institutions, scientific institutes, etc., to name only those that are most important. They are interested in their commission being carried out in a reliable, valid, and quiet fashion, with no unpleasant side-effects for themselves, the customer. Often customers have a limited understanding of psychological assessment and their assessment objectives are not sufficiently specified. The assessment findings are nevertheless frequently used by customers as the basis for making a decision.

Assessors

The psychological assessor draws up the overall concrete assessment plan. In general, this person works on his or her own responsibility without instructions from anyone else. To carry out the assessment plan, and to evaluate and communicate the results, this person may make use of

assistants who follow his or her instructions. As a rule, the psychological assessor is assigned the responsibility for their selection and activity. He or she strives to fulfil his or her contracts to the satisfaction of his or her customers so that he or she will be entrusted with new tasks to perform. Generally, he or she earns at least a part of his or her livelihood through this activity. In so doing, he or she finds himself competing with members of other professions or other non-professional suppliers. The parameters of the competition could be the following: costs, side-effects, quiet performance, loyalty to the customer, reputation, and acceptance by those affected. Often, membership in professional organizations is a prerequisite for practising certain activities.

Examinees

Persons are often the object of psychological assessment – however, this is not always the case. Workplaces, machines, animals, medicines or programmes, for example, can also be examined. If persons are being examined, their participation can be voluntary or involuntary. In either case, the circumstances of the examination itself are usually connected with a high degree of power asymmetry to the disadvantage of the examinees. Moreover, as a result of the standardized procedure the possibilities for reaction on the part of the examinees are often drastically limited. The examination can occur partially or completely announced, unannounced, or falsely announced. The affected person may or may not be informed of the results. Finally, the affected person, depending on the case and situation, may or may not have any influence on the examination's consequences. The assessment process can also have a considerable impact on the individual's current well-being, self-concept, self-esteem and respect from others, as well as future professional and social chances. The examinees often react to the examination with a reduced willingness to cooperate as well as deliberate withholding and filtering of information.

Coaching

To improve the individual examinee's chances of doing well on the examination, there exists coaching. This comprises either people or literature that, on the basis of alleged or actual professional or insider knowledge and for a fee, prepares the future examinee for the assessment procedure.

Legal Guardians

In the event that the examinee is unable or is not permitted to make his or her own decisions (children, the elderly, the handicapped, prisoners), other persons or courts give permission for the examination and evaluate the potential consequences for the examinee.

The State

Frequently, the state not only acts as the customer of psychological assessment, such as in school and court, but also directly regulates the assessment process and the evaluation of its results by means of orders and prohibitions.

The Public in General

Finally, in the public in general, there exist certain expectations and moral notions about how assessment procedures should be conducted and what consequences they should have and for whom. These notions are transported and formed by the mass media. If the assessment practice supposedly or in fact deviates from these expectations and moral guidelines, and this becomes known to the public in general, the affected assessor, the institution that has commissioned him, his or her professional association, as well as the governmental regulatory authorities are placed under a considerable amount of pressure to justify themselves. If the actors involved are unable to give a satisfactory justification, they lose their public legitimation. Yet, because the other actors are essentially dependent upon public legitimation, they often develop so-called legitimation facades. In their external self-portrayal they demonstrate a high degree of conformity to public expectations, which frequently, however, do not correspond with actual practice (Haney & Madaus, 1991). This, however, is not a peculiarity of the assessment process, but can be observed in all actors who require public support for their work.

The Ethically Justifiable Responsibilities of Stakeholders

As this stakeholder analysis shows, a complicated tangle of interests and expectations, which must be assessed and evaluated in terms of their ethical justification, are woven around psychological assessment. An overview of the central theories of normative ethics is provided by Velasquez (1998: 67–163; more exhaustively in Chadwick, 1998).

In accordance with the contractarian approach, all of the implicit or explicit contractual relations of the actors involved can be examined as to whether or not they had arisen voluntarily, as to whether the contractual partners had beforehand received a true and accurate disclosure of all of the relevant facts of the matter, and as to whether any unethical performance or consideration had been contractually agreed upon. In this sense, one can understand the so-called ethical codes of many professional psychological organizations. They make clear what professional psychologists expect of the other actors in the assessment process and describe explicitly their own ethical commitments.

The contractarian approach, however, is not fundamental in terms of ethics. In the first place, not all of the relationships in the assessment process are voluntary contractual relationships and, secondly, although in the contractarian approach it is a precondition that nothing unethical may be agreed upon, the contractarian approach cannot itself determine these unethical facts. The relationship between wards and their guardians cannot be based on contractual principles, but must be based on principles of care. Accordingly, the person whose duty it is to give assistance has to act in the best long-term interests of the person in his care. Following the theory of fundamental human rights, the relationships between the actors should also be examined as to whether they are compatible with the fundamental human rights of individuals; in other words, dignity, freedom, life, privacy, rational self-determination, as well as physical and emotional integrity.

Good reasons, however, can also be given for limiting basic rights, such as personal freedom or the voluntary nature of an assessment. Rule-utilitarianism demands that this does not occur arbitrarily, but only according to certain well-justified rules. What, however, is a well-justified rule? Discourse ethics (Habermas, 1990) answers as follows: every legitimate norm for the regulation of the relationships among various stakeholders must meet the condition that the consequences and side-effects that in each case result or can be expected to result from its universal observance for the satisfaction of the interests of each stakeholder can be accepted by all affected parties (and such effects preferred to the known alternative regulatory possibilities).

According to this view, individual stakeholders (e.g. professional groups) cannot one-sidedly establish standards that can rightly claim to be ethical standards (Ladd, 1991). Thus, in a democratic state in which the rule of law prevails, it is the parliament that often assumes the task, after the various stakeholders have been heard, of passing laws that bring into balance the interests and basic rights of individuals as well as the public interest. To prevent any misunderstandings, it should be pointed out that this does not mean that every legal regulation of duties in the assessment process is ethically justified. It simply means that in a state in which the rule of law prevails, the parliament is the actor that has the best chances of moderating a rational discourse among stakeholders.

CRITICISM OF NORMATIVE ETHICS

The critics of normative ethics are of the opinion that a universally binding justification of ethical principles is impossible. Instead, they say, the acceptance of these principles is based on a frequently implicit decision which is not susceptible to further rational justification (Weber, 1949). This commitment to ultimate principles or values – as in communitarianism (Moon, 1998), a recently much-discussed variant of the so-called decisionism in normative ethics – is based on the anchoring of people in particular communities. From this point of view, the values and ideals of psychological assessment are also merely group standards that can, but need not, be accepted, such as rationality, empirical support for assertions, impartiality, openness to revisions, and the acknowledgment of limits to one's own competence. They are directed against a magical way of viewing the world (e.g. astrology, tarot,

palmistry or pendulums), the unexamined clinging to traditions (because it has 'always been' done like that, it will also be done like that in the future) and habits (e.g. the decisive private job interview with the boss), political claims to power and personal or political wishful thinking. Because of this value basis, psychological assessment is frequently attacked politically by groups with other value bases. In the former Soviet Union at the time of Stalinism there was even a general ban on the use of psychological tests.

In defending normative ethics against the reproach of decisionism, it has been pointed out by discourse ethics (Habermas, 1990) that any person who argues that there are no universally binding ethical principles has already contradicted himself, because anyone who argues, in doing so, acknowledges that he wants, solely on the basis of an understanding of his arguments, to move his interlocutor to accept his own position. He has thus, however, already accepted the principle of discourse ethics, according to which a norm is only valid if it has been accepted by a consensus arrived at through free and rational argumentation.

FUTURE PERSPECTIVES

Laws and codes of conduct must necessarily be formulated in a universally applicable way, because it ought to be possible to subsume under them as many groups of cases as possible and because they ought to provide a regulation as well for facts and circumstances that were not yet known at the time the standards were promulgated. The American Psychological Association (APA) therefore did not just adopt a code of conduct, but published and continued to develop an extensive systematic collection of concrete cases (Eyde et al., 1993) to illustrate the application of this code. Moreover, this collection of cases has been drawn up in such a way that it can be used in the education and training of future psychological assessors. This approach is highly commendable since no rule contains its own conditions of application. In order to apply rules sensibly, one also needs to be aware of the circumstances and the relevant limiting conditions. To guarantee the observance of its code of conduct, the APA set up a professional tribunal as well and passed rules of procedure for it (Ethics Committee of the American Psychological Association, 1996).

In order to attain an ethically justifiable practice of psychological assessment, the following steps are therefore necessary: development of legal and professional standards in the dialogue by all and for all of the stakeholders participating in the assessment process, collection and documentation of typical sample cases, training of the persons involved and in particular of beginners, as well as the establishment of legal and professional procedures to monitor the observance of standards in individual cases.

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RELATED ENTRIES

Decision, Standard for Educational and Psychological Testing, Assessment Process

EVALUABILITY ASSESSMENT

INTRODUCTION

Programme evaluation is a common practice in public and private organizations in the western world. It is an essential step, and the final one when actions are carried out to solve a social problem. Rossi and Freeman (1993) defined programme evaluation as *the systematic application of social research procedures for assessing the conceptualization, design, implementation, and utility of social interventions programs* (Rossi & Freeman, 1993: 5).

However, before evaluating a programme, we must inquire about the need for the evaluation. Wholey (Wholey, Scanlon, Duffy, Fukumoto & Vogt, 1970; Wholey, 1983, 1987) described this question as evaluability assessment.

The concept of evaluability assessment emerged in the context of the problems Wholey and his colleagues experienced when they were working at the Urban Institute of Washington in the early 1970s. These problems were of two main types. First, stakeholders' resistance to co-operate in the evaluation, and second, the limited use of evaluation outcomes for the improvement of the programmes (Wholey et al., 1970). In short, evaluation was difficult due to stakeholders' resistance and was not useful because its outcomes did not help to bring about changes in the social interventions.

Subsequently, Wholey (1983, 1987) developed the concept further, identifying four problematic areas that increase the difficulty of programme evaluation. Such areas are:

1. A lack of definition of the problem addressed, the programme intervention, the expected outcomes of the programme, and/or the expected impact on the problem.
2. A lack of a clear logic of testable assumptions linking expenditure of programme resources, the implementation of the programme, the expected outcomes (to be caused by that programme), and the resulting impact.
3. A lack of agreement on the evaluation's priorities and its intended uses.
4. The inability to make decisions on the basis of evaluation information.

Wholey himself established concrete problems to identify the evaluability assessment process associated with these four areas. Such problems are poor programme definition, misjudgement to implement the programme, lack of establishing realistic objectives, and contradictory presence of non-expected effects. In this regard, we can use the definition reached by the author:

> Evaluability assessment is a diagnostic and prescriptive tool that can be used to determine the extent to which any of these four problems exists

and to help ensure that such problems are solved before decisions are made to proceed with any further evaluation. (Wholey, 1987: 78)

EVALUABILITY ASSESSMENT: USES

Smith (1989) identified two steps in the carrying out of evaluability assessment, and three possible uses of it, depending on moments and objectives. According to the steps, firstly, evaluability makes a contribution to the guarantees and technical credibility of the programme. Secondly, evaluability assessment determines the plausibility and feasibility of the programme and its evaluation. In conclusion, the two old problems that Wholey and his team pointed out are discussed: the knowledge of the easiness and feasibility of the evaluation and the knowledge of the utility of the evaluative process.

As regards the uses of evaluability assessment, the first of them should be its use as a summative tool or as a preliminary step in evaluating the effectiveness or the programme's impact. The second use is as a formative tool to decide what can be changed to make the programme more evaluable. The third use is as a planning tool to define objectives, identify actions for attaining those objectives and find the appropriate resources for implementing such actions.

Smith (1989) arrived at a wide and comprehensive definition of this process:

> Evaluability assessment is a diagnostic and prescriptive tool for improving programs and making evaluations more useful. (Smith, 1989: 1)

In accordance with this definition, Smith (1989) attempts to answer several questions about the programme, for example: (a) What is it? What are its components? (b) Why do it? What are its expected outcomes? (c) How does it start? What is the logical first step, second step, etc? (d) How did someone else do it? The answers to these questions lead to making decisions about whether or not to carry out the programme evaluation. In brief, evaluability assessment attempts to answer the following question: 'To what extent can a programme be evaluated?'

However, where do we draw the line between programmes that can be evaluated and those that cannot? Some authors have tried to establish a sequence of criteria to indicate such limits (Rutman, 1980; Muscatello, 1988; Fernández-Ballesteros & Hernández, 1995).

EVALUABILITY CRITERIA

Berk and Rossi (1990) defined the existence of four evaluability criteria:

> An impact assessment is impossible without well-formulated program objectives (...) A second criterion for evaluability is that program content be well specified (...) A program's impact may be estimated only if it is possible to credibly approximate what would have happened to the targeted recipients in the absence of the program (...) Finally, effectiveness evaluations are often the most difficult kinds of evaluations, requiring highly trained personnel and, sometimes, large sums of money. (Berk & Rossi, 1990: 72–73)

Even though the authors did not explicitly say so, it would seem that these criteria have different weights. Thus, it has been considered that a programme that fails to specify its objectives in a clear way cannot be evaluated. (Weiss, 1972; House, 1980; Rutman, 1980)

EVALUABILITY ASSESSMENT INSTRUMENTS

Shadish (1986) stresses the need to answer questions about the programme before the beginning of the programme evaluation: what are the concerning dimensions in the evaluative process, to which precision have such dimensions been defined in the planning, design, and implementation of the programme? The specification of such dimensions and their precision are relevant criteria on which to base a decision about whether or not to evaluate a programme.

Muscatello (1988) developed a sequence of evaluability dimensions from a formal and rational perspective. Such dimensions are: Completion Time, Costs of Materials, Staff Costs, Resistance, Programme Purpose, Programme Maturity, Programme Definition, Measurement Validity, Measurement Reliability, Administrative Constraints, Political Constraints, and Legal Constraints. The judgement on each of these areas is made by means of a 5-point scale. Although Muscatello did not show empirical data, his proposal is useful to organize the gathered information in the evaluability assessment.

Fernández-Ballesteros and Hernández (1995) developed an assessment device: the 'Listado de Cuestiones Relevantes en Evaluación de

Programas' (LCREP: 'Programme Evaluation Relevant Questions Form'; Fernández-Ballesteros & Hernández, 1995). The LCREP is a 53-item questionnaire with a Yes/No/Do not know format. Each item is related to one out of twelve dimensions. Eight of these theoretically relevant dimensions are linked to the policy cycle (*Need assessment*, *Objectives established*, *Programme quality*, *Programme definition*, *Implementation level*, *Design feasibility*, *Quality of data collected*, and *Context information*) and four of them are related to potential evaluation constraints (*Acceptability*, *Evaluator implications*, *Purposes for evaluation*, and *Costs*). Three scores can be obtained from the LCREP. First, Direct score: the number of total items answered 'Yes' or 'No' in the expected way (0–53). Second, Rating scale scores: each dimension can be assessed by means of a 5-point rating scale. Third, Weighted scores: using rational criteria, each item is weighted. Evaluators should have a basic but adequate knowledge of the policy cycle and the evaluation context before they administer the LCREP.

Several studies have been carried out to obtain the inter-judge agreement using the LCREP (Fernández-Ballesteros et al, 1989; Fernández-Ballesteros, 1992). Prior to the evaluation of five programmes, six evaluators responded to the LCREP individually for each programme after examining documents about the programmes and conducting interviews with the client, policy-makers, managers, and other stakeholders. Authors obtained significant correlations (phi coefficient) item-by-item in 86.6% of the comparisons ($p < 0.005$). Nevertheless, using the rating scale scores only 26% of the comparisons were significant ($p < 0.01$). Finally, there were strong relationships (Kendall W Test) between dimensions scores (weighted scores and rating scale scores) throughout the programmes. 'Purposes and evaluation' and 'Costs' were the dimensions with least agreement. 'Programme quality', 'Programme definition', 'Implementation level' and 'Quality of data collected' were the most consistent dimensions.

The LCREP appears to be potentially useful: (1) in order to help the evaluator make a rational decision about whether or not the programme should be evaluated, (2) as a tool in planning programme evaluation, (3) in order to assess potential sources of problems that may be relevant during the evaluation process, and (4) to guide the evaluator through the first stage of the evaluation process.

FUTURE PERSPECTIVES AND CONCLUSIONS

Evaluability assessment should be the first step in programme evaluation. Accordingly, evaluability assessment must be incorporated into programme planning and design as an evaluation strategy. Moreover, the shortcomings of programme planning mentioned by Wholey could be overcome if evaluability assessment were used as a guide for programme design. Hence, the development of evaluability assessment instruments would be improved. The final goal of evaluability assessment should be to improve evaluations and increase their reliability and usefulness.

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RELATED ENTRIES

Evaluation: Programme Evaluation (General), Needs Assessment

EVALUATION: PROGRAMME EVALUATION (GENERAL)

INTRODUCTION

The relation between psychological assessment and programme evaluation is a reciprocal one: a great many programme evaluations, especially in the educational and mental health fields, use some kind of psychological test, or other psychological methodology such as focus groups, in order to gather data; and, on the other hand, any systematic use of psychological assessment is a programme and hence a candidate for programme evaluation. For example, the use of test-based, simulation-based, or explicit psychological assessment by a clinician in the hiring or promoting process needs to be, and has occasionally been, evaluated seriously, since the impact on the bottom line (and other matters) is in fact quite variable, despite the intuition of many psychologists that it will be positive. Of course, any other changes in procedures at an organization, such as its treatment of customers, or new hires, or minorities, are also good subjects for evaluation, which often yields surprising and potentially useful results. What follows provides coverage of some of the major developments in the field of programme evaluation across the past few decades, during which the national association (American Evaluation Association) has gone from zero to more than 3000 members, and the number of analogous associations in other countries from zero to about 30. It only sketches the details of the actual process of programme evaluation, which is extremely complex in many cases.

PERSPECTIVE ON PROGRAMME EVALUATION

Evaluation can be defined, following the dictionaries, as the systematic determination of merit, worth, or significance (hereafter, m/w/s).[1] Programmes are just one type of target for this process (all targets for evaluation are known as evaluands; when a person or their work – two different though related matters – is being evaluated, the term evaluee is often used). Programme evaluation is thus best understood as one branch of the *applied field* of evaluation: other examples of evaluation that are relevant to readers of this work includes personnel assessment itself, product evaluation (e.g. of test instruments, Scantron alternatives, focus group software), policy studies (e.g. of legislation for controlling drug abuse or programmes claimed to reduce obesity), performance evaluation (e.g. the SAT), and proposal evaluation (e.g. at NSF or NIH) are some others. There are in all about 20 named fields of applied evaluation, many of them outside science but entirely disciplined, e.g. the jurisprudence of appellate courts; others are without significant validity, e.g. aesthetic evaluation of modern art; yet others have partial validity, e.g. literary criticism, where in some genres the plot has to avoid inconsistency.

Two branches of applied evaluation are relatively novel as studies, although ancient practices, and of great importance: (i) meta-evaluation

(the evaluation of evaluations), and (ii) intradisciplinary evaluation (the evaluation of methodological entities within a discipline, e.g. data, experimental designs, interpretations). The first of these is important because it demonstrates the self-referent nature of evaluation and, taken seriously, is the field leading to an answer to The Question That Must Be Answered, namely who evaluates the evaluator? The second is important because it makes a farce out of the doctrine of value-free science, since this kind of evaluation, no different in its logic from any other kind, is part of what every psychologist (and other scientist) has been taught for longer than there has been a doctrine of value-free science. To put it bluntly, the difference between science and pseudo-science is the difference between good evidence, good data, good hypotheses, good inferences, etc., and their bad counterparts, which is of course an evaluative difference. Hence, the idea that there was something scientifically improper about evaluation is absurd.

The existence of intradisciplinary evaluation also shows that evaluation skill does not transfer readily between applied fields, since social science PhDs, who originated the value-free doctrine, could not recognize its inconsistency with their own practice. Thus, there were and are sophisticated evaluators who denied the legitimacy of evaluation, hence lacked any skill at meta-evaluation. Meta-analysis, by the way, is quite different: it is the synthesizing of multiple studies of the same or closely related phenomena; the studies might be, but usually are not, themselves evaluative, i.e. their conclusions are typically about descriptive or causal matters, not about merit/worth/significance.

The valid fields or parts of applied fields that make up the widespread disciplined practice of evaluation are characterized by the same underlying logic, and the study of that logic constitutes the *logical theory of evaluation* (sometimes also seen as part of the philosophy of evaluation), a study that has only emerged in quite recent years, whereas the modern phase of programme evaluation – i.e. the period when something like an autonomous applied discipline emerged – began to bloom in the 1960s, much later than the applied field of personnel assessment or product evaluation.

There are also *empirical theories of evaluation*, which are also often referred to as theories of evaluation. For example, there are theories about the circumstances under which the results of (programme) evaluations are influential in policy making, and theories about the personalities or backgrounds of evaluators that use certain models of evaluation.

Programme evaluation is not a simple extension of applied psychology, although it uses many of the tools developed in applied psychology, perhaps most obviously because it necessarily involves combining the results of observation, measurement, and calculation with multiple relevant values, usually starting with needs assessment. Not only the combinatorial process but the latter process, needs assessment are research tasks for which psychologists get little or no training. In fact, competent performance of programme evaluation requires many further skills (more on this below), although it can, and often must, use many of the same ones as well. Of course, as one would expect in such a new field, some of the practice in the field is far from competent by reasonable professional standards, although it is moving in that direction and often performed by those with strong credentials in related fields – sociology, economics, and accounting, as well as management and psychology. There is indeed a set of professional standards, in terms of which such judgements can be made: it was first formulated and published 20 years ago by a committee representing half a dozen professional societies, and since then even more widely endorsed (*The Program Evaluation Standards*, 1994).

In (logical) evaluation theory it is argued that the discipline of evaluation is of a particular kind, a transdiscipline. These are distinctive in that they not only have an autonomous study area and several applied fields, but one of their most important functions is to provide tools for use in some or all other disciplines. Statistics is a transdiscipline that immediately springs to the mind of an applied psychologist, and perhaps measurement would also qualify; in many other areas such as engineering, design is the or a key transdiscipline, and in all areas, logic qualifies. The latest candidate is 'informing science' which is essentially the art or science of presentation, i.e. the organization of knowledge for use and understanding.

PRECURSORS OF PROGRAMME EVALUATION THEORY

Now the transdisciplinary theory of evaluation did not explode into a theoretical vacuum, despite the

taboo on the legitimacy of the subject expressed in the widely accepted doctrine of value-free social science. Every field of applied evaluation, e.g. product and programme evaluation, had developed a proto-theory in response to the practical necessity for optimal distribution of resources, e.g. money, scholarships, places in the freshman class, support for the needy. We long ago learnt that looking critically at our own practices, while often reviled as idle theorizing by practitioners, is a major force towards improving practice. Since random distribution of scarce resources does not maximize the return from the relevant investment, evaluation of the alternative distribution approaches is a survival characteristic in the worlds of business, ecosystems, and personal affairs. It was inevitable that there be some attention to developing general principles of good practice, the embryo of most theories. In personnel assessment, these theories included views about the importance and testability of character, skills, dispositions, abilities, nature/nurture, personality, etc. In programme evaluation, they were much more like conventional theories, as we shall see in a moment.

The most serious problem for developing any general accounts, however, was that the social sciences were acting out the century-long farce of the value-free doctrine, although every person in the social sciences was not only evaluating, with some degree of competence, student work, candidates for jobs, papers for journals, and previous work for emulation, extension, or refutation, but also, in their own research, the quality of data, experimental designs, and instruments. Hence, those who might be seen as the most qualified candidates for developing a theory of evaluation were effectively banned from working on that job site. Unfortunately, this meant that the infant evaluation theories, developed by practitioners for their own domains, were reinventing the wheel, repeatedly getting trapped in the same fallacies, etc. What was needed was at least one good theory of one field of evaluation, and some kind of theory of evaluation as a whole.

In the event, it was the field of education rather than the social sciences that first drew attention to the possibility of a highly disciplined study under the heading of (educational) programme evaluation. Tyler deserves some of the first credit, but he was quickly joined and improved on by Stufflebeam, Cronbach, Provus, Stake, Wolf, and a number of others. An excellent account of this process is given in Worthen, Sanders, and Fitzpatrick (1996). The first general theories of programme evaluation turned up here, often implicit in the theories of educational programme evaluation, along with improvements in standard practice. The US was the centre of much of this early activity, but Scandinavia and the UK were active at about the same time if rarely on the same scale.

EARLY THEORIES OF PROGRAMME EVALUATION

The first of these theories sprang out of the early practice of evaluation, which reflected the need of legislators and programme managers for feedback on the success of their programmes. Thus they identified programme evaluation with whether the programme did what it was supposed to do. This is still a popular substitute for serious programme evaluation, though it's only what serious evaluators would now call programme monitoring. In midstream and at the end of a programme (if it had one), the key questions were 'On Time? On Task? On Budget?' Good questions indeed, and crucial for managers, but not the real core of serious evaluation. However, they became the basis for one of the first 'evaluation models', the Discrepancy Model, due to Malcolm Provus (1967). The methodology of this approach involved three steps: identifying programme goals, converting them into testable claims, and then doing an empirical study to discover the extent to which these goals (educational, social, fiscal, etc.) had been met; the report simply focused on that issue. This approach was and is particularly attractive to social scientists who were brought up on the value-free doctrine because it avoids making any value judgements at all, by merely using those of the client, and converting the evaluation into an empirical exercise. We gradually came to see that this omitted too much of importance to count as serious determination of the m/w/s of the programme. During the programme's run, it should be seen as monitoring; at the end, it is no more than an accountability exercise, both of them worthy but limited undertakings.

To begin the list of shortcomings, there was the explicit rejection of any study of the inevitable and often crucially important unanticipated effects of

the programme (side-effects) or of the unanticipated impactees (side-impacts). These were quite often so serious that they led to programmes being cancelled; more rarely they saved programmes that were not achieving their goals, but doing something else that was valuable instead. Then there were crucial issues about whether the programme actually met the needs of the targeted population, or just what someone *thought* were the needs. And there were proper questions about the ethicality of the way the programme operated, e.g. about sexism or racism in its personnel policies; and about the legality of its operation; and about the adequacy of the scientific basis for its justification. And more questions about cost then come up when you're simply looking at the programme's spending vs. its budget; for example, problems about the non-money costs of the programme (morale, time, space, expertise, etc.) and little matters such as whether there exist other and better or cheaper ways to produce the same results.

Eventually, the core of programme evaluation came to be seen as centred on five factors: Outcomes, Process, Costs, Comparisons, and Generalizability (which includes exportability, durability, transferability, etc., and is close to what Don Campbell called external validity). Now, the interpretation and application of these checkpoints is quite complex, as can, for example, be seen from the lengthy discussion of just one of them in the best monographs on cost analysis (e.g. Levin & McEwan, 2001). To the treatment of each must be added the complex further topic of synthesizing them, first with the relevant values, and eventually into an overall conclusion, as is often necessary, e.g. in ranking candidates for jobs or admissions, or programmes for funding. We'll spell out a little more of this process in a moment, but first it is time to look at the underlying theory of evaluation, which provides an essential clarification of the key concepts.

As these further relevant dimensions of evaluation emerged from practice and reflection on practice, other models of programme evaluation began to emerge. Some of these were checklist models, e.g. Stufflebeam and Scriven (2001), some focused on particular processes, e.g. transactional, adversary, empowerment, or the theoretical foundations of the programme. A good survey of this complex developmental process is provided by Worthen, Sanders and Fitzpatrick (1996).

A GENERAL THEORY OF EVALUATION

It was not until the late 1980s that the idea of a general, i.e. all-encompassing, discipline of evaluation was put forward (Scriven, 1991). Earlier efforts at a general theory of values or valuation by philosophers under the heading of axiology or deontic logic did not lead to any significant payoff for practice. The general theory of evaluation involves a small set of concepts, and some principles involving them, described below. What it does not cover, of course (since it is a theoretical discipline), is the extremely complex field of evaluation methodology and praxis, with which every evaluation practitioner is necessarily involved – people doing psychological assessment as well as those doing programme evaluation – and the empirical theories of evaluation, including the psychology of evaluation, the sociology of the profession and its clients, and its economics. The intensely practical nature of programme evaluation affected the development of theories of programme evaluation in what might be thought of this second phase of their development, the phase that went beyond mere local generalizations.

THE LOGIC OF EVALUATION

Serious evaluation is, as indicated above, the attempt to determine m/w/s in as systematic and objective a way as is possible. (m/w/s are roughly the same, respectively, as quality, value, and importance.) There are at least forty other terms in the language that are approximately equivalent to or involve these, at least in some contexts: evaluation is a deeply rooted part of human life and thought. The first conceptual point to make is that merit/quality does not, whereas worth/value does (in the most common usage), involve bringing in costs. Significance/importance involves bringing in a large number of contextual considerations, which differ hugely as between, e.g., discussions of what should count as significant events in Einstein's life vs. significant progress on a doctoral dissertation. This is not a sign of fatal imprecision, just of the high context-dependence of practical language, as used by scientists as well as citizens.

These three properties are the ones with which evaluation is concerned. What are the logical and practical processes in which they are involved,

i.e. how are they applied? There are four important types of systematic evaluation process that come into every applied field of evaluation: grading, ranking, scoring, and apportioning (a.k.a. allocating, distributing). All are part of common practices, but rarely defined precisely. In programme evaluation, as in personnel evaluation, one must try to clarify which of these is the required type of conclusion before designing an evaluation to reach that type of conclusion. All too often, clients – and sometimes evaluators – think that a particular test or study is going to yield grades (criterion-referencing) when at most it can yield ranks (norm-referencing).

There are also four 'natural types' of value claim that cross-cut the four processes, again familiar ones. These are (i) personal preferences ('X likes A'); (ii) market values, a hypothetical construct from group preferences ('This house is worth US$600,000'); (iii) contextually evaluative claims, which are intrinsically factual but in context evaluative (e.g. 'This drug abuse programme is very appealing to Native Americans, but not to Hispanics'); and (iv) the essentially evaluative claim, where the claim has a factual or logical foundation other than personal or group preferences. For example, such a claim might refer to a human need, e.g. 'Daily amounts of X units of Vitamin C are good for your health'; to the results of testing, e.g. 'Kathy is a better 400 m. runner than Joan'; or to mathematical standards, e.g. 'The right answer to the question asking for the square root of 81 is 9.' This is a type of claim which every one of us was taught to use as part of the language, as in 'It's very bad to say mean things about other people without good reason' (or, '... to conclude that causation has been established when all you have is evidence of correlation.') The claim that evaluation can lead to objective conclusions refers to this fourth type of value claim and is itself an essentially (a.k.a. intrinsically, definitionally) evaluative claim. Much of the scepticism about the legitimacy of evaluation was based on confusing type (i) with type (iv): but preference claims are not claims of intersubjective, testable, value. Of course, in some areas, e.g. wine-tasting or art criticism, many of what are put forward as objective evaluations are, in fact, nothing more than dressed-up preference claims; but one does not judge a field by its incompetents or physics would be in a sorry state.

With that basic conceptual primer under our belts, we are in a position to understand that the aim of programme evaluation is to establish type (iv) truths about the m/w/s of programmes with the same degree of scientific objectivity as truths about their causation. It's on balance a little harder because type (iv) claims usually include plenty of causal claims, whereas the reverse is not true (at least not in the same way). The five core dimensions of programme performance (process, outcomes, costs, comparisons, generalizability) are matched up to the values and standards from about a dozen sources that have substantial relevance and objectivity; and the integration of these five sub-evaluations, if required, is then done using a procedure called qualitative weight and sum. The sources of value, not all of substantial importance for every evaluation (but all must be checked to see if this is true), include: (i) needs of the impacted population, via a needs assessment; (ii) criteria of merit for entities of this type, from definitions, standard usage, and expert practice; (iii) legal and (iv) ethical requirements; (v) descriptive accuracy requirements (the 'index of implementation'); (vi) personal and organizational goals; (vii) professional standards, (viii) logical (e.g. consistency) requirements, (ix) legislative, (x) scientific, (xi) market, (xii) expert judgement, (xiii) historical/traditional/cultural standards. How can any of these value standards be objective? Well, the easy ones are matters of law, logic, science, and descriptive accuracy (is this evaluand an example of what it claims to be, e.g. Sloan's Reading to Write?). The ethics to use is normally the ethics embodied in our constitution and Bill of Rights, but in other cultures it will be somewhat different (this does not imply accepting ethical relativism). The needs assessment is a special part of evaluation, and a long way from wants assessment because needs are objectively determinable states of the individual and/or society, not mere wants; the need for children to imbibe vitamins is a good example of the difference, and cases from education or law enforcement illustrate the same point. Needs in those areas may be less easily determined but that's a measurement problem, not an essential problem with evaluation; the need for a child to learn to read, in our society, is no harder to demonstrate than the need for vitamins.

The reader will see that serious programme evaluation is a complex business, of which the

measurement and observation components are important but not the major part. They are just partners with the value analysis and combinatorial procedures. Beyond that cognitive content, it is also important to realize that, as with psychotherapy, the book learning is only part of good practice: various management, negotiating, and people skills are also involved, to a degree that varies, depending on the project and its context, from almost nothing to almost everything. Some enthusiasts argue that programme evaluation skill is essentially and necessarily a matter of people skills, but this is simply false. Much important programme evaluation is done as part of the routine work of the offices of legislative analysts and philanthropic foundations, by people sitting at their desks and studying data and reports. Of course, there is plenty of room and need for people skills in the broad domain of programme evaluation, just as there is room for them in the broad domain of statistics or game theory, without any need to suppose that either domain lacks solid logical foundations. At the moment, however, too much time is spent arguing about procedural matters such as the extent to which the staff of a programme under evaluation should take an active part in the evaluation. Those are interesting matters, but secondary to the question of the correct core logic for identifying the needed data and combinatorial procedures. The problem at the moment is that all the people skills in the world are no substitute for the getting the logic right, and that is still uncommon. For example, the standard 'commonsense' procedure for combining performance scores and weights to determine the most meritorious of several evaluands, which consists of allocating numerical values to the weights and standardizing the scores on a numerical scale (the so-called quantitative weight and sum approach), is in fact invalid. It presupposes an interval scale for the weights which is highly unrealistic. (A more detailed discussion of this will be found in Scriven, 1991.)

FUTURE PERSPECTIVES AND CONCLUSIONS

Evaluative conclusions, like explanatory and causal ones, can sometimes be mere matters of skilled observation (as when a chess master judges a move to be brilliant or injudicious), but in the case of programme evaluation they are much more likely to be matters of very complex inference. We have now reached the point where we know what the premises have to be – data about performance on certain specifiable dimensions, and values data of certain specifiable types – and it is now known how to get this data and how to combine the two types in order to get the required kind of conclusion. But there is still a long way to go in getting this into the formal training courses and standard practice of evaluators. Even identifying the dimensions along which performance is to be measured, i.e. the criteria of merit, is a special skill that has not yet been well attended to in most training programmes for evaluators; and the synthesis procedure, including weighting and resolving conflicts between competing values, requires new techniques that are hardly known in the evaluation community. We may look forward to increasing attention to these matters as evaluation matures.

We should also expect increasing payoffs from the application of the logic of evaluation to intradisciplinary evaluation in applied psychology. Of course, the 30-year history of the significance test controversy (Morrison, 1970) and the 20-year boom in meta-analysis illustrate how this has long been a latent theme in psychology, but there are many more opportunities and needs for it. An example is provided in Scriven (2001).

Beyond that, there are huge areas in the other disciplines, from history to economics, where intradisciplinary as well as programme evaluation have a high degree of applicability. And we should expect to see the fundamental principles trickling down into undergraduate and pre-college education, for evaluation is part of everyone's life, and changing the way in which people make choices between jobs or major purchase options offers a great deal of room for substantial improvement in the quality of life.

In the end, however, the greatest effect of programme evaluation, and evaluation theory in general, is that it will force social scientists and especially psychologists to treat ethics itself as a complex element in social science. This is a long overdue epiphany for psychology and an inevitable consequence of two forces: the work on game theory, decision theory, and evolutionary psychology, on the one hand, which forces one to see the

underlying rationale of ethics; and doing serious programme evaluation, on the other, which forces one to deal with ethics in the particular. In the long run, then, the future of psychology will be massively changed by the necessity for dealing with programme evaluation, and hence ethics, as an essential element in any serious attempt to make applied psychology useful.

Note

1 Amusingly, the great 20 volume Oxford English Dictionary (2nd ed.) (Oxford University Press, 1989), the doyen of them all, mistakenly reports that evaluation simply means determining real estate taxes. (I have registered a complaint, and had it accepted for the third edition; and its little brother, the Shorter Oxford a mere two volumes, has it more or less right.)

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RELATED ENTRIES

Evaluation in Higher Education, Evaluability Assessment, Needs Assessment, Outcome Assessment/Treatment Assessment, Outcome Evaluation in Neuropsychological Rehabilitation, Goal Attainment Scaling (GAS), Total Quality Management

EVALUATION IN HIGHER EDUCATION

INTRODUCTION

Although there are many different approaches to programme evaluation in higher education, there is nonetheless a general agreement regarding its main objective. Programme evaluation in higher education is the systematic process of obtaining relevant information which is then used to make decisions in regard to different university domains (i.e. research, services, teaching, departments, programmes, etc.). This decision-making process should be based on scientific methodology according to valid and reliable data. In addition, and under the premises of utility, feasibility, propriety, and accuracy, the results obtained should enable institutions to improve practices in order to achieve excellence in their activities and processes (Volkwein et al., 1995).

The implementation of programme evaluation in higher education is difficult for three reasons. First, due to the peculiar characteristics of university context, there is a low degree of institutional autonomy in decision-making, coupled with inefficient communication systems. Second, it is difficult to define programme evaluation in this complex context. Critical groups with different interests (researchers, administrative staff, teachers, students, etc.) have different evaluation objectives, which are not always measurable; it is sometimes difficult to determine who controls the evaluation process. Third, faculty or staff in units being evaluated are often fearful because evaluation can imply cutting back on resources (Ruby, 1990). These difficulties have brought about the need to develop procedures to obtain a continuous flow of relevant and useful information with regard

to university input, context, resources, processes, and results.

MAIN EVALUATION PRACTICES IN HIGHER EDUCATION

It is difficult to find an evaluation of the whole university; usually, evaluations are applied to specific faculties, departments, or programmes. The following four evaluation practices can be complementary and can even be used at the same time:

- Accreditation, which involves state or regional licensing of qualified colleges and universities to carry out their activities. Usually it is specific to studies and/or programmes. Through this process, predefined standards or criteria of performance are verified within institutions of higher learning.
- Self-studies, involving a process of evaluation through an institution's internal audience with the aim of moving towards a process of self-improvement. These studies stimulate self-observation as well as the detection of weaknesses within the system.
- Formalization of systems of indicators through the operationalization of the institutional objectives, processes, resources, contexts and results into observable quantitative or qualitative variables. By measuring these variables, information is obtained which allows for the assessment of the evaluated areas (Oakes, 1986; Chacón, Pérez-Gil, Holgado & Lara, 2001).
- '*Peer review*', in which a group of recognized experts in the field of university evaluation is asked to judge the merits of the institution under evaluation (Frazer, 1997).

In practice, a combination of the above evaluation practices are used. Thus, it is often found that an institution may use the peer review process while at the same time indicators are set up and viewed to counteract any possible subjectivity on the part of the peer reviewers. This mixture of evaluative practices implies that there is a high degree of flexibility in the application of different strategies and measurement instruments for obtaining data. The main measurement instruments used in these mixed evaluative practices are interviews, the analysis of written documents, application of systems of categories and field formats, as well as the use of semi-standard and standard evaluation instruments (Porter, 1991).

All of these approximations and alternative approaches to evaluation in higher education are framed within a global concept of institutional evaluation. Therefore, evaluation in higher education implies a global assessment of its educational, research, and management processes. When considering programme evaluation in higher education from this global perspective, and taking into account the low degree of institutional autonomy in decision-making, coupled with inefficient communication systems, the need for commitment on the part of the different parties involved in the evaluation process becomes paramount.

MAIN THEORETICAL EVALUATION MODELS IN HIGHER EDUCATION

The United States is the country which has traditionally most frequently used programme evaluation in higher education. The predominant programme evaluation model used in the United States is accreditation.

Although receiving public funding depends on accreditation, the process of accreditation in universities in the United States is voluntary. Programme evaluation in the United States does not always end with accreditation. The different stages of the accreditation process are as follows (Kells, 1988):

(a) Self-study/evaluation of the curricula/programmes offered by the university (although usually not all university programmes have to be accredited).
(b) The institution is visited by a group of experts which writes up a report according to given standards.
(c) The evaluated institution is allowed to comment on the report made by the technical accreditation committee.
(d) According to the results of the report, the accreditation committee grants the corresponding licence.

The programme evaluation model in higher education followed by most European countries is

that used in the Netherlands. Their main difference is that the European model does not end with the accreditation of a university or a programme. But, nowadays there is a tendency to implement the accreditation system in European universities, at least in certain university areas (i.e. health programmes that gives doctors licences, counselling, psychology programmes, or education programmes that give teachers licences). As seen in Figure 1, six stages can be clearly delineated in the model from the Netherlands:

(a) Internal evaluation: different types of data (statistics, opinions, input, process, and results indicators) are gathered and integrated into a global evaluation report by an internal evaluation committee.
(b) External evaluation: an external evaluation committee revises the internal evaluation report and then visits the institution being evaluated.
(c) Self-evaluation report: a final report is made based on the findings of the internal evaluation and the external evaluation committee. This report is then published and public notification is given.
(d) Meta-evaluation: in order to validate the process of evaluation and to provide a context for improvement plans, a large-scale analysis of the process of evaluation is carried out.
(e) Improvement project: different quality improvement activities are proposed in order to increase the quality of input, processes, and results of the evaluated institution.

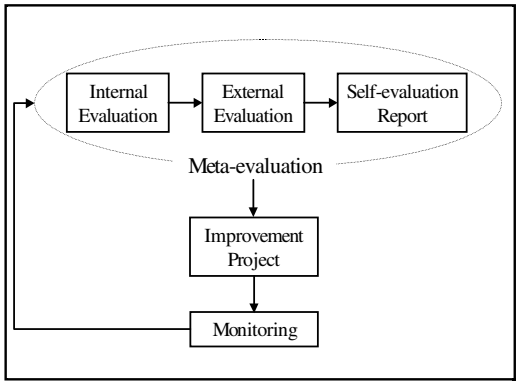

Figure 1. Evaluation model of higher education in the Netherlands.

(f) Follow-up and evaluation of the improvement project: the degree of implementation of the proposed improvement activities is evaluated, thus initiating a process of continuous evaluation of quality in higher education.

VIEWPOINTS OF QUALITY IN PROGRAMME EVALUATION IN HIGHER EDUCATION

As we have previously stated, the concept of quality as an evaluative reference is normally used to judge the different areas in higher education, and based on this judgement, actions are taken (Segers & Dochy, 1996; Chacón, Pérez-Gil, Holgado & Lara, 2001). There are three principal viewpoints of quality applied to programme evaluation in higher education.

First, the European Foundation for Quality Management (EFQM) focuses on eight areas in which to evaluate quality.

(a) Leadership: university authorities' commitment to transmitting a culture of quality management.
(b) Planning and strategy: how continuous improvement objectives are defined in order to subsequently translate them into concrete actions.
(c) Personnel management: the degree of personnel participation found in achieving improvements, in planning and in the development of human potential, in the process of assigning responsibility, in decision making, and in communication.
(d) Resources: identification, selection, use and maintenance of the available resources used to promote higher levels of quality.
(e) Processes: how to identify, evaluate, and improve key processes.
(f) Satisfaction level of the involved parties.
(g) Impact on society: to what extent are the demands, needs, and expectations of society met.
(h) Results/objectives achievement.

This European model has been standardized for education according to the rules of the International Standardization Organization (ISO). See also 'Total Quality Management' entry for a more extensive description of this model.

The other two models of quality evaluation delineate additional domains of quality. The Japanese evaluation model includes the following domains: policies and planning; organization and control; education and quality control implementation; quality information recording, transmission and use of quality information; analysis; standardization; quality control guarantee; results; and future planning. On the other hand, the American model of quality evaluation emphasizes leadership; information and analysis; quality planning; management and development of human resources; quality management in processes; operational results; and quality and client satisfaction.

In summary, quality evaluation of higher education should include different interrelated domains. Following the classic Stufflebeam's CIPP model, the evaluation of quality in education, research, and services in higher education should include the analysis of interrelated elements from context, input, processes, and products, all of which are considered as components from the same system. In addition, quality evaluation must strive to achieve the following conditions: obtaining comparable results; be feasible, be realistic and accepted by different audiences; be flexible; allow continuous evaluation; be oriented towards clients' demands; be oriented towards continuous improvements; be useful to the institution; and obtaining weighted quality domains (Benson, Hinn & Lloyd, 2001).

FUTURE PERSPECTIVES

Programme evaluation in higher education is going to be one of the most important applied areas of evaluation in the 21st century because evaluation will become a useful tool in developing cost-effective measures and in analysing the effectiveness of resources invested in higher education (Desautels, 1997).

Evaluation in higher education will be focused on international studies in order to compare quality evaluation and management systems between different countries (Brennan & Shah, 2000). These studies will be complementary to meta-studies of the evaluation processes in higher education in order to analyse their feasibility (Yorke, 1998).

Education and research will continue to be the most important domains evaluated in higher education, but quality management excellence will also play an important role (Heck, Johnsrud & Rosser, 2000). In addition, needs assessment in society will be in increasing demand in order to develop university services that respond to societal demands (Broadfoot, 1998).

CONCLUSIONS

The conceptualization of higher education has undergone huge changes. Currently, universities are considered to be complex systems requiring a large-scale analysis in order to respond to societal needs. Programme evaluation in higher education plays a key role in coordinating the interests of universities, social agents, and governments.

The concept of university quality has become the evaluative criteria of merit to make decisions regarding different university domains. In summary, programme evaluation in higher education endeavours to implement continuous improvement systems based on the systematic collection of data from the different university domains.

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RELATED ENTRIES

Applied Fields: Education, Evaluation: Programme Evaluation (General), Total Quality Management

EXECUTIVE FUNCTIONS DISORDERS

INTRODUCTION

Executive functions are those which regulate, control and direct human behaviour. Mental activity and human behaviour would not be possible without a system to control, organize and direct them. The executive system ensures that the different cognitive and emotional subsystems function in a coordinated way as they activate and deactivate the different functional circuits implicated in any human activity. The concept of executive function can be studied in Luria's (1966) *Higher Cortical Function in Man*, which was popularized in neuropsychology by Lezak (1976) and further developed by Fuster (1980) and Stuss and Benson (1986).

According to Lezak (1995: 42), executive functions are those abilities which allow an individual to function with independence, with a set goal, and with self-sufficient behaviour in a satisfactory manner. As long as the executive functions are intact, an individual may lose important cognitive abilities yet continue to be independent, constructively self-sufficient and productive. However, and no matter the state of the cognitive functions, should the executive functions become impaired, one is no longer able to care for oneself, to work for oneself or others, nor to maintain normal social relationships.

Executive functions are to be considered as different from the cognitive functions. The latter specifically refer to the reception and generation of information or to the stimulation received from any of the senses. Cognitive functions are attention, perception, language, memory, mental images, or higher motor functions. Executive functions are concerned with the organization of cognition and emotion and, when necessary, in their timing. Thus, cognitive impairment will especially affect the functional area involved, while executive impairment will affect the controlling functions and will therefore be reflected in a more general way in the individual's behaviour.

The anterior part of the brain is of extraordinary importance in the coordination and integration of the cognitive activity carried out in the posterior part of the brain. This is especially so with regard to the components of anticipation, initiating activity and even for decision-making. The frontal cortex is at the highest level within the hierarchy of the neural structures dedicated to the representation and performance of the activities of the organism. There are three prefrontal functions that ensure the integrity and purpose of all the novel and complex sequences of goal-directed behaviour. Two are chiefly based in the dorsolateral cortex (preparatory set and working memory) and the other in the orbital cortex (inhibitory control). The prefrontal cortex is the anatomical basis of these control functions, especially when active control is required during the process of learning a new activity. Once the activity becomes routine, the active control is

carried out by another brain area and not necessarily by the prefrontal cortex (León-Carrión & Barroso y Martín, 1997; Shallice, 1982).

A revision of the specialized literature concerning problem solving, planning, prospective, control and performance associates these functions with the frontal lobe due to how these functions are affected when injury is incurred in this area of the brain, and especially in the prefrontal areas (León-Carrión, 1997; Lezak, 1995).

The classic tests that have most commonly been used to assess these functions are the *Stroop Test* (Stroop, 1935; León-Carrión, 1998), sorting tasks such as the *Wisconsin Card Sorting Test* (Grant & Berg, 1948), category tasks such as the *Category Test* (Halstead, 1947), problem solving tasks such as in the different versions of the *Tower of Hanoi* (Anzai & Simon, 1979; León-Carrión et al., 1991; and León-Carrión, 1998) or maze tests such as the *Porteus Maze Test* (Porteus, 1959). A good set of clinical frontal tasks for frontal lobe deficits are those from *Luria/Christensen's Neuropsychological Investigation* (Christensen, 1975).

Currently, neuropsychologists specialized in clinical practice affirm that highly structured tests are not sufficiently sensitive to be able to detect deficits that are observed when evaluating goal directed behaviour. Given that this ability is best evaluated with the use of loosely structured tests in which the subject must work actively in order to discover their rules and principles, their use is encouraged by clinical neuropsychologists (León-Carrión, 1995).

THE STROOP TEST

The Stroop Test is of interest in evaluating resistance to cognitive interference. The test is based on the Stroop effect and consists of asking the subject to respond to only one of the parts of which the stimulus is made up, inhibiting the response to the other part. The subject is shown the name of a colour written in a colour different from the colour named and asked to say the name of the colour in which the word is written. For example, the subject may be shown the word RED written in green and the subject must respond by saying GREEN. The subject must therefore inhibit the reading process and activate the colour recognition process.

Some consider this to be a divided attention test. It is considered to measure the ability and speed with which the frontal lobes inhibit and activate. The different specialists who have presented the most relevant research done with this test agree that the different mechanisms of divided attention, the functioning of activation/inhibition mechanisms, and the functioning of the neurocognitive interference mechanism can be studied with it. Different authors have shown with neuroimaging techniques that the right frontal regions, in particular the right anterior cingulate gyrus (zones 23, 24, 32) and the right orbital zones (10 and 47), are involved during the Stroop Test (Bench et al., 1983; Pardo et al., 1990).

There are several different pen and pencil versions of the classic *Stroop Words and Colours Test*, which was originally designed to study perceptive interference. However, a computerized adaptation of this classic is included in the Seville Neuropsychological Battery (BNS) (León-Carrión, 1998). Eight subtests are used in the BNS to observe the following described mechanisms: (1) identification of monochromatic colours; (2) identification of blocks of colour; (3) identification of colour ignoring content (both eyes); (4) identification of content ignoring colour (both eyes); (5) identification of colour ignoring content (left eye); (6) identification of content ignoring colour (left eye); (7) identification of colour ignoring content (right eye); (8) identification of content ignoring colour (right eye).

THE WISCONSIN CARD SORTING TEST

The purpose of this test is to measure the capacity of abstract thought, concept formation, and cognitive flexibility, all components of executive function associated with the frontal lobe. Both the computerized and manual versions present subjects with four stimulus cards whose figures are different from the others based on criteria of form, colour or number of elements presented on the card. With the four cards displayed before him/her, the subject is shown one card at a time and must match it according to one of three different criteria of which s/he is not previously informed. After a pre-determined number of consecutive successful matches, the matching criteria is changed without informing

the subject, who is then obliged to change his/her matching strategies in order to achieve successful matches under the new criteria.

Clinical experience with this test has shown that subjects with frontal deficits generally exhibit large numbers of errors of perseveration and great difficulty in changing criteria, especially patients with left dorsolateral frontal lesions. The test requires the ability to recognize changes in conditions, and cognitive flexibility, in order to learn from experience and received information.

THE TOWER OF HANOI–SEVILLE

In following with the principle of using loosely structured tests, together with ease of correction and interpretation, the BNS has incorporated a computerized version of the *Tower of Hanoi*. Due to the modifications made, in this version the test receives the name of Tower of Hanoi–Seville (León-Carrión et al., 1991; León-Carrión, 1998). The trial consists of a transformation problem in which a final goal must be achieved by carrying out a series of non-routine movements in which ordered planning strategies and complex problem solving abilities must be applied. Subjects must establish a plan and then carry it out and reach the correct solution. This plan must include a global solution that is divided into various sub-solutions that are sequenced over a period of time in order to achieve the main objective. All of these planning abilities directed towards solving a complex problem are seriously affected in lesions affecting the frontal lobe after sustaining traumatic brain injury and can be observed in this task (Barroso y Martín et al., 1999).

The task consists of three parallel pegs that are numbered 1, 2 and 3 from left to right. There are discs of different sizes and colours (from 3 to 5, chosen by the tester) on peg number 1. These discs form a pyramid with the largest at the bottom and the smallest at the top. The goal of the task is to move the different discs by pressing the number key on the computer that corresponds to the number on the peg until a tower is formed that is the same as the original tower on peg number 3. In the Seville version of the Tower of Hanoi, two different types of administration can be observed, A and B. The difference between the two is that one allows the subject to be informed of the principles and rules of the task while the other does not. Administration type A best describes problem solving functioning given that the subject must discover the rules and principles of the task in order to correctly solve it.

CATEGORY TEST

The Category Test is included in the Halstead–Reitan Battery (Halstead, 1947) and according to its authors evaluates concept formation. The purpose is to determine a subject's ability to make use of both positive and negative information in such a way as to serve as a basis to modify activity or behaviour in order to correctly solve a problem or task. The original test consists of 208 stimuli displayed on a screen and a response panel related to the stimuli. The subject must mark the correct response associated with the stimulus being displayed. A sound will indicate whether the subject has chosen a correct or incorrect response. The test is divided into seven groups, each one of which must be completed. The sound is the feedback which guides the subject towards improved performance. Subjects with frontal lesions generally persevere in their errors and exhibit difficulties in finding the keys to the correct responses, as well as in making spontaneous cognitive changes in problem solving strategies.

OTHER TESTS FOR EXECUTIVE FUNCTIONING ASSESSMENT

One of the sub-tests of the *Halstead/Reitan Battery*, the Trail Making Test in part B, is considered to be a good indicator of the mental control associated with executive functioning. In this test, the subject must alternately join circled numbers to circled letters scattered over a sheet of paper, following a numeric and alphabetic sequence. Another test that is good for indicating frontal functioning is the *Porteus Maze Test*. Results with this test show that subjects with frontal lesions tend to become lost in the mazes and/or unable to find the exit, or have great difficulty in finding it. From a qualitative point of view, the *Luria/Christensen* tasks can be used for frontal lesions, especially the following: tapping rhythm, alternating figures or verbal regulation of motor movement.

FUTURE PERSPECTIVES AND CONCLUSIONS

The complex evaluation of all of the components of executive functioning is an important challenge to be addressed during the coming years. Conjoining neuroimaging, cognitive and behavioural testing will be an invaluable aid to neuropsychologists in achieving more complete and integrative instruments. The search for a frontal lobe battery has not as yet come to an end, although the theoretical aspects regarding executive functions are becoming more firmly established and current tests afford useful information both for diagnosis and rehabilitation.

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José León-Carrión

RELATED ENTRIES

Applied Fields: Neuropsychology, Voluntary Movement, Neuropsychological Test Batteries

EXPLANATION

INTRODUCTION

Psychological assessment serves several functions: classification, explanation, prediction, and decision aid. Classification means the assignment of the single case to be assessed to an element or category of a classification system, as shown by, for example, the DSM or the ICD. Prediction aims at an answer to the question of what will happen in the future, if the single case concerned is treated in specific ways. And decision aid means supporting the selection of an optimal

treatment for the single case, i.e. a treatment with the highest benefit or utility in the respective case. Finally, explanation as the topic of this entry is, generally spoken, a statement or account which makes what is to be explained clearer than it was before and promotes its understanding. What is to be explained in psychological assessment are the problems or disorders which occur in the single case concerned. If explanation is at stake, the assessment process can be construed as setting up and testing case-related idiographic hypotheses (Fernández-Ballesteros et al., 2001) which refer to the causes, reasons or conditions which brought about the problems or disorders. The well-confirmed idiographic hypotheses which hopefully come out at the end of such an assessment process make up the explanation or are at least an important part of it.

TYPES OF PSYCHOLOGICAL EXPLANATIONS

Explanations in psychological assessment can be of very different types. Bunge and Ardila (1987) distinguish the following ones for psychology in general: *Tautological explanations* refer to basic capabilities or mental faculties of a person (e.g.: Person *p* is able to imitate another person because of *p*'s vicarious capability). *Teleological explanations* refer to goals or purposes of a person (e.g.: Person *p* studied law in order to become a lawyer). *Mentalist explanations* refer to mental events of a person (e.g.: Person *p* developed a perversion because *p* suffered from an intrapsychic conflict between id and superego). *Metaphorical explanations* refer to analogies with physical or social processes, or with animals or machines (e.g.: In person *p* aggressive energy accumulates like heat in a steam boiler). *Genetic explanations* refer to the genetic endowment of a person (e.g.: Person *p* shows a high musical intelligence because *p* comes from a family of conductors and composers). *Developmental explanations* refer to stages or levels of biological or psychological development or to events in a person's past (e.g.: Person *p* suffers from social phobia because *p* was often rejected by his or her social environment in his or her childhood). *Environmental explanations* refer to external conditions and factors influencing a person (e.g.: The phobic symptoms of *p* are weakened because *p* is massively exposed to the threatening stimuli). *Evolutionary explanations* refer to the survival value of a behaviour or behaviour tendency of a person, its selective advantages or disadvantages (e.g.: Person *p* has a high pain threshold under duress because of its survival value). *Physiological explanations* refer to physiological, especially neurophysiological and endocrinological, processes and mechanisms of a person (e.g.: The depressive person *p* experienced an elevation of her or his mood because *p* took a cyclic antidepressant which increased the chemical neurotransmitter serotonin). *Mixed explanations* are combinations of two or more of the above mentioned types of explanation. Many explanations occurring in psychology are not pure cases of one type, but combinations of at least two types, i.e. they are mixed explanations. Especially in psychological assessment, mixed explanations are not an exception but the rule, since one-sided explanations usually provide only a partial answer to the problem concerned.

In the examples of the different types of psychological explanations, the relation term 'because' occurs. It links that which is to be explained to that which explains. A characterization of this relation is provided by the so-called *models of explanation*.

MODELS OF EXPLANATION

If explanation as a goal of psychological assessment is considered, the case formulation as the result of the respective assessment process can be conceived of as an explanation. This underlines the fundamental similarities between the process of psychological assessment in which idiographic hypotheses are tested and the process of scientific research in which the test of more general hypotheses is at stake. In both cases, explanation is an important goal. In reconstructing explanatory efforts in science, many different models of scientific explanation have been construed, especially in philosophy of science (*cf.* Salmon, 1989). Each model attempts to answer at least two questions: (1) What is (the structure of) an explanation? and (2) What is a good (proper, appropriate, adequate) explanation? Some answers to these questions which are

especially important to psychological assessment will be briefly outlined.

The Deductive-Nomological Model of Explanation

According to this classical view, an explanation is an *argument* which shows that the phenomenon to be explained can be inferred from certain other facts by means of specified general laws. This type of argument may be schematized as a deductive inference of the following form (*cf.* Hempel, 1965):

(D-NE) $L_1, L_2, \ldots, L_r$	General laws
$C_1, C_2, \ldots, C_k$	Statements of antecedent conditions
———	
E	Description of the empirical phenomenon to be explained

E as the description of the phenomenon to be explained is called the *explanandum* (*sentence*). The statements of antecedent conditions, which make assertions about particular facts, and the general laws together form the *explanans*, i.e. that which explains. Explanations of this kind are called explanations by deductive subsumption under general laws, or *deductive-nomological explanations*.

In an application to the domain of psychological assessment, the following correspondences would hold (*cf.* Westmeyer, 1972): the *explanandum* would be the description of the problem or disorder to be explained in the course of the assessment process; the *explanans* would be the case formulation, i.e. the set of confirmed case-related idiographic hypotheses; and the nomological hypotheses would be part of the knowledge base of psychological assessment.

D-NE gives an answer to the question, 'What is (the structure of) an explanation?' A comparison between this structure and the one underlying the examples of the different types of psychological explanations reveals that most of the latter are stated in an elliptical form, viz. 'E because of C'. The component C refers only to a subset of the antecedent conditions $C_1, C_2, \ldots, C_k$ that are required for a proper explanation of the explanandum E, and the general laws, if there are any at all, are totally omitted in the examples. Thus, explanations of the form 'E because of C' do not count as proper explanations.

To give an answer to the second question, i.e. 'What is a proper explanation?', requires the formulation of *conditions of adequacy*. In the case of the model of deductive-nomological explanation, there are four such conditions (*cf.* Hempel, 1965):

- (R1) The explanandum must be a logical consequence of the explanans, i.e. the explanandum must be logically deducible from the information contained in the explanans.
- (R2) The explanans must contain general assumptions or hypotheses, and these must actually be required for the derivation of the explanandum.
- (R3) The explanans must have empirical content, i.e. it must be capable, at least in principle, of test by experiment or observation.
- (R4) The sentences constituting the explanans must be well confirmed.

In an application of D-NE to psychological assessment, these conditions of adequacy would become evaluation criteria for the products of explanatory efforts in the course of an assessment process. But there are good reasons not to rely too much on this model of explanation. It is not easy to find convincing examples of deductive-nomological explanations in psychological assessment that display the proper structure and satisfy the conditions R1 to R4 because universal deterministic laws, as they are required by the model, are hard to find in this domain.

The Statistical-Relevance Model of Probabilistic Explanation

Whereas genuine nomological laws in psychology in general and psychological assessment in particular are an exception, if they exist at all, statements which describe *statistical regularities* between events are the rule. The knowledge base of psychological assessment is made up of statements of this kind. They refer to information

about conditional probabilities, differences in central tendencies, correlations, factor structures, etc. '85% of the persons who have a panic disorder and who undergo an exposure therapy experience relief from their symptoms' is an example.

If extended information about conditional probabilities is available, Salmon's (1989) *statistical-relevance model of probabilistic explanation* can be applied. An explanation of an event according to this model is an assemblage of factors that are statistically relevant to the occurence of the event to be explained, accompanied by an associated probability distribution. For a concrete example, see Salmon and Salmon (1979). Although this model has already been applied to the domain of psychological assessment (*cf.* Westmeyer, 1975), it is still too ambitious and requires more knowledge than is available in most cases of psychological assessment. Especially the probability distribution as the probabilistic equivalent to the nomological hypotheses in the deductive-nomological case goes well beyond the knowledge base of psychological assessment at the time being. But there is another model of explanation better suited to what psychological assessment demands and what it has to offer.

The Model of Aleatory Explanations

A more recent model of causal explanations of specific events is the model of aleatory explanation (see Table 1) introduced by Humphreys (1989). He agrees with Salmon that causal explanations are possible within the realm of chancy, or aleatory, phenomena. But in his model, in contrast to Salmon's, no probability value is assigned to an explanation. The demands on the knowledge base are much lower than in Salmon's model.

What is required for a proper explanation of a specific event Y in S at t are two lists of causes of Y, i.e. a list of *contributing* and a list of *counteracting causes*. In Humphreys' model, for something to be a cause it must invariantly produce its effect. But causes in this model are probabilistic causes, and they produce changes in the value of the *chance* of the effect. A contributing cause of Y produces an increase, a counteracting cause of Y a decrease in the value of the chance of Y.

This model seems to be applicable in various contexts within psychology. It takes account of the fact that psychological phenomena are usually the result of multiple causal influences. And it does not presuppose the existence of complete lists of all influences which, positively or negatively, affect a given outcome. Aleatory explanations are conjunctive. They can be improved by including additional probabilistic causes which may come up in further research.

In an application of this model to the domain of psychological assessment, the selected problem or disorder to be explained can be expressed as a property or a change in property of the single case concerned, i.e. the term 'Y' in Humphreys' model refers to the selected problem or disorder. The term 'S' refers to the single case concerned, and the term 't' to the time at/during which the problem or disorder occurs/is present in the single case concerned. The list 'Φ' in Humphreys' model refers to the set of positive diagnostic findings relative to the selected problem, whereas the list 'Ψ' refers to the set of negative diagnostic findings relative to the selected problem Φ and Ψ together constitute the case formulation.

A diagnostic finding is called a *positive diagnostic finding* relative to Y, if it refers to something which makes the occurrence of Y more probable (i.e. if it refers to a contributing cause of Y); it is called a *negative diagnostic finding* relative to Y, if it refers to something which makes the occurrence of Y less probable (i.e. if it refers to a counteracting cause of Y).

Table 1. The canonical form for causal explanations of specific events (*cf.* Humphreys, 1989, pp. 286 ff.)

Request for explanation: What is the explanation of Y in S at t?
Appropriate explanation: Y in S at t [occurs, was present] because of Φ despite Ψ.

Notes:
'Y' is a term referring to a property or change in property.
'S' is a term referring to a system.
't' is a term referring to a time.
'Φ' is a (non-empty) list of terms referring to contributing causes of Y.
'Ψ' is a (possibly empty) list of terms referring to counteracting causes of Y.

The ascription of these properties to diagnostic findings is part of the knowledge base of psychological assessment.

This model has already been applied to explanations within a theory of social interaction in small groups (Westmeyer, 1996) and has been recommended as an adequate framework for explanatory efforts in psychological assessment in general (*cf*. Westmeyer & Hageboeck, 1992).

FUTURES PERSPECTIVES AND CONCLUSIONS

Explanatory efforts in psychological assessment should rely on realistic and well established models of scientific explanation. These models provide answers to important questions such as: What is the structure of a case formulation, and how to differentiate an adequate case formulation from an inadequate one? Answers to these basic questions are rarely given in traditional discourses in psychological assessment. A profound discussion of these issues with regard to the models introduced in this entry could promote theory and practice of psychological assessment alike.

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RELATED ENTRIES

Classification, Decision, Prediction (General)

FACTOR ANALYSIS: CONFIRMATORY

INTRODUCTION

Fundamental to the factor analytic model is that some variables of theoretical interest cannot be directly observed; these unobserved variables are termed *latent variables*, or *factors*. Although latent variables cannot be directly observed, information related to them can be obtained indirectly by noting their effects on observed variables believed to represent them. The oldest and best-known statistical procedure for investigating relations between sets of observed and latent variables is that of factor analysis. In using this approach to data analyses, researchers examine the covariation among a set of observed variables in order to gather information on the latent constructs (or factors) that underlie them. Because factor analysis is concerned with the extent to which the observed variables are generated by the underlying latent constructs, strength of the regression paths from the factors to the observed variables (i.e. the factor loadings) are of primary interest.

There are two basic types of factor analyses: exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). EFA is most appropriately used when the links between the observed variables and their underlying factors are unknown or uncertain. It is considered to be exploratory in the sense that the researcher has no prior knowledge that the observed variables do, indeed, measure the intended factors. In contrast, CFA is appropriately used when the researcher has some knowledge of the underlying latent variable structure. Based on theory and/or empirical research, he or she postulates relations between the observed measures and the underlying factors a priori, and then tests this hypothesized structure statistically. More specifically, the CFA approach examines the extent to which a highly constrained *a priori* factor structure is consistent with the sample data.

Of the two factor analytic approaches, CFA is by far the more rigorous procedure. Indeed, it enables the researcher to overcome many limitations associated with the EFA model; these are as follows: first, whereas the EFA model assumes that all common factors are either correlated, or that they are uncorrelated, the CFA model makes no such assumptions. Rather, the researcher specifies, a priori, only those factor correlations that are considered to be substantively meaningful. Second, with the EFA model, all observed variables are directly influenced by all common factors. With CFA, each factor influences only those observed variables with which it is purported to be linked. Third, although each observed variable has associated with it a unique factor that comprises random as well as systematic error, the EFA model is incapable of taking this measurement error into account. The CFA model, on the other hand, allows for the quantification of this measurement error. Fourth, whereas in EFA the unique factors are assumed to be uncorrelated, in CFA specified covariation among particular uniquenesses can be tapped. Finally, provided with a malfitting model in

EFA, there is no mechanism for identifying which areas of the model are contributing most to the misfit. In CFA, on the other hand, the researcher is guided to a more appropriately specified model via indices of misfit provided by the statistical program.

Given the a priori knowledge of a factor structure and the testing of this factor structure based on the analysis of covariance structures, CFA belongs to a class of methodology known as *structural equation modelling* (SEM). The term structural equation modelling conveys two important notions: (a) that structural relations can be modelled pictorially to enable a clearer conceptualization of the theory under study, and (b) that the causal processes under study are represented by a series of structural (i.e. regression) equations. The hypothesized model can then be tested statistically in a simultaneous analysis of the entire system of variables to determine the extent to which it is consistent with the data. If goodness-of-fit is adequate, the model argues for the plausibility of postulated relations among variables; if it is inadequate, the tenability of such relations is rejected.

To assist the reader in better conceptualizing the CFA model, a more paradigmatic explanation of the procedure will be presented next. Consistent with the two aspects of SEM noted above, the graphical specification of an hypothesized CFA model will be described, and then this specification will be summarized in terms of its structural equations.

GRAPHICAL SPECIFICATION OF THE MODEL

CFA models are schematically portrayed as path diagrams through the incorporation of four geometric symbols: a circle (or ellipse) representing unobserved latent factors; a square (or rectangle) representing observed variables; a single-headed arrow (→) representing the impact of one variable on another; and a double-headed arrow (↔) representing covariance between pairs of variables. In building a CFA model, researchers use these symbols within the framework of three basic configurations, each of which represents an important component in the analytic process. We turn now to the CFA model presented in Figure 1, which represents the postulated 3-factor structure of burnout as tapped by items comprising the Maslach Burnout Inventory (MBI: Maslach & Jackson, 1986).

Based on the geometric configurations noted above, decomposition of this CFA model conveys the following information: (a) there are three factors, as indicated by the three ellipses labelled Emotional Exhaustion (F1), Depersonalization (F2), and Personal Accomplishment (F3); (b) the three factors are intercorrelated, as indicated by the two-headed arrows; (c) there are 22 observed variables, as indicated by the 22 rectangles (ITEM1–ITEM22): each represents one item from the MBI; (d) the observed variables load on the factors in the following pattern: items 1, 2, 3, 6, 8, 13, 14, 16, and 20 load on Factor 1; items 5, 10, 11, 15, and 22 load on Factor 2; and items 4, 7, 9, 12, 17, 18, 19, and 21 load on Factor 3; (e) each observed variable loads on one and only one factor; and (f) errors of measurement associated with each observed variable (err1–err22) are uncorrelated.

In summary, a more formal description of the CFA model in Figure 1 argues that: (a) responses to the MBI are explained by three factors; (b) each item has a non-zero loading on the burnout factor it was designed to measure (termed 'target loadings'), and zero loadings on all other factors (termed 'non-target loadings'); (c) the three factors are correlated; and (d) measurement error terms are uncorrelated.

STRUCTURAL EQUATION SPECIFICATION OF THE MODEL

CFA models can also be represented by a series of regression (i.e. structural) equations. Because (a) regression equations represent the influence of one or more variables on another, and (b) this influence, conventionally in SEM, is symbolized by a single-headed arrow pointing *from* the variable of influence *to* the variable of interest, we can think of each equation as summarizing the impact of all relevant variables in the model (observed and unobserved) on one specific variable (observed or unobserved). Thus, one relatively simple approach to formulating these equations is to note each variable that has one or more arrows pointing towards it, and then record the summation of all such influences for each of these dependent variables. Turning again to Figure 1, we see that there are 22 variables with arrows pointing

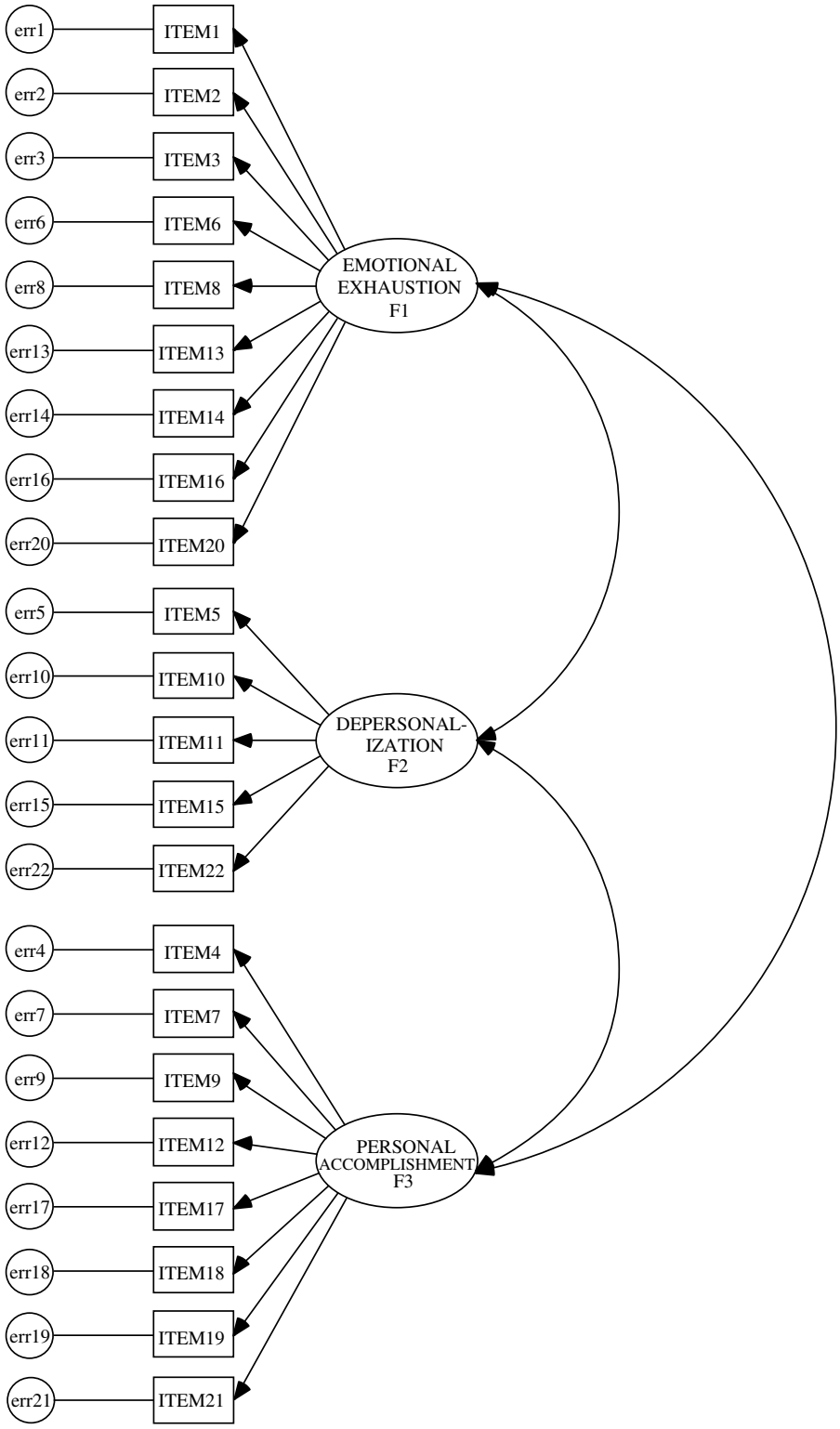

Figure 1. Example of a hypothesized CFA model.

towards them; all represent observed variables (ITEM1–ITEM22). Accordingly, these regression functions can be summarized in terms of 22 separate equations as follows:

$$\text{ITEM1} = \text{F1} + \text{err1}$$

$$\text{ITEM2} = \text{F1} + \text{err2}$$

$$\text{ITEM3} = \text{F1} + \text{err3}$$

M

$$\text{ITEM20} = \text{F1} + \text{err20}$$
$$\text{ITEM5} = \text{F2} + \text{err5}$$
$$\text{ITEM10} = \text{F2} + \text{err10}$$

M

$$\text{ITEM22} = \text{F2} + \text{err22}$$
$$\text{ITEM4} = \text{F3} + \text{err4}$$
$$\text{ITEM7} = \text{F3} + \text{err7}$$

N

$$\text{ITEM21} = \text{F3} + \text{err21}$$

Although, in principle, there is a one-to-one correspondence between the schematic presentation of a model, and its translation into a set of structural equations, it is important to note that neither one of these representations tells the whole story; some parameters critical to the estimation of the model are not explicitly shown and thus may not be obvious to the novice CFA analyst. For example, in both the schematic model (see Figure 1) and the linear structural equations cited above, there is no indication that the factor variances are parameters in the model. Indeed, such parameters are essential to all structural equation models and therefore must be included in the model specification. Likewise, it is equally important to draw your attention to the specified non-existence of certain parameters in a model. For example, in Figure 1, we detect no curved arrow between err1 and err2, which suggests the lack of covariance between the error terms associated with the observed variables ITEM1 and ITEM2.

FUTURE PERSPECTIVES AND CONCLUSIONS

It is important to note that only issues related to the specification of CFA models have been included here. Indeed, any testing of these models requires additional procedures that bear on model identification, model estimation, and assessment of model fit, as well as possible model respecification and re-estimation. However, given the complex nature of these topics, their related discussion extends well beyond the limits of the present entry. Nonetheless, for a thorough explanation of these topics, together with their application to several different CFA models based on the EQS (Bentler, 2000), LISREL (Jöreskog & Sörbom, 1996), and AMOS (Arbuckle, 1999) statistical packages, respectively, readers are referred to Byrne (1994, 1998, 2001a). For a comparison of these three popular programs, see Byrne (2001b).

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RELATED ENTRIES

Factor Analysis: Exploratory, Validity: Construct, Theoretical Perspective: Psychometrics, Multidimensional Item Response Theory

FACTOR ANALYSIS: EXPLORATORY

INTRODUCTION

Exploratory Factor Analysis (EFA) has long been a central technique in psychological research, as a powerful tool for reducing the complexity in a set of data. Its key idea is that the variability in a large sample of observed variables is dependent upon a restricted number of non-observable 'latent' constructs. This entry addresses key issues in EFA, such as: aims of EFA, basic equations, factor extraction and rotation, number of factors in a factor solution, factor measurement and replicability, assumptions, future perspectives.

AIMS OF EXPLORATORY FACTOR ANALYSIS

Exploratory Factor Analysis (EFA) has long been a central technique that has been widely used, since the beginning of the 20th century, in different fields of psychological research such as the study of mental abilities, of personality traits, of values and of beliefs, and the development of psychological tests (see Cattell, 1978; Comrey & Lee, 1992; Harman, 1976; McDonald, 1985). Its key idea is that the variability in a large sample of observed variables is dependent upon the action of a much-restricted number of non-observable 'latent' constructs. The aims of EFA are twofold: to reduce the dimensionality of the original set of variables, and to identify major latent dimensions (the factors) that explain the correlations among the observed variables. The starting point of an EFA is a matrix (**R**) of correlation coefficients (usually Pearson coefficients). The end is a matrix (**A**) that contains the correlations among the factors and the observed variables (called '*factor loadings*'): this is a rectangular matrix containing as many rows as the observed variables, and as many columns as the latent factors.

BASIC EQUATIONS

The basic idea of EFA is that a standard score on a variable can be expressed as a weighted sum of the latent factors, so that the following specification equation holds:

$$z_{ik} = a_{i1}F_{1k} + a_{i2}F_{2k} + \cdots + a_{ip}F_{pk} + a_{is}S_{ik} + a_{ie}E_{ik}$$

where z_{ik} is the standard score for a person k on the variable i; a_{i1} to a_{ip}, a_{is} and a_{ie} are the loadings on, respectively, the common factors F, the specific factor S and the error factor E; F_{1k} to F_{pk}, S_{ik} and E_{ik} are the standard scores of person k on, respectively, the common factors F, the specific factor S and the error factor E. While the common factors represent the variance that each variable shares with the other variables, the specific and error factors represent sources of variance that are unique for each variable.

The equation above is a basis for 'decomposing' the **R** matrix into the product of two other matrices, the matrix of factor loadings (**A**) and its transpose (**A**′), so that $\mathbf{R} = \mathbf{AA}'$ (this is called the *fundamental equation* of Factor Analysis). The key idea here is that the original correlation matrix can be 'reproduced' from the factor solution. From this decomposition it is possible to derive the following equation, which relates the variance of a standardized variable z_i to the factor loadings:

$$\mathrm{Var}(z_i) = 1 = a_{i1}^2 + a_{i2}^2 + \cdots + a_{ip}^2 + a_{is}^2 + a_{ie}^2$$

In sum, the total variance of a standard variable can be divided into a part that each variable shares with the other variables and that is explained by the p common factors (this part is called *communality*, and is equal to the sum of squared loadings for the variable on the common

factors, $h_{ii}^2 = a_{i1}^2 + a_{i2}^2 + \cdots + a_{ip}^2$) and a part that is explained by the specific and the error factors (the combination of these two components is called *uniqueness*, $u_{ii}^2 = a_{is}^2 + a_{ie}^2$).

FACTOR EXTRACTION

EFA is mainly interested in estimating *common variance*. The unique variance is derived a posteriori, once the loadings on the common factors is estimated by means of several methods that have been developed to this aim. A set of methods, as Principal Axes Factor Analysis (PAF) and Principal Components Analysis (PCA), aims at maximizing the variance of the original variables explained by the latent factors. The most important difference between PAF and PCA regards the content of the principal diagonal of the **R** matrix that is analysed. Where in PCA the diagonal of **R** contains all ones (i.e. the total variance of each standardized variable), in PAF the diagonal of **R** contains an estimate of the communality (usually the square of the multiple correlation of each variable with all the other variables).

Other methods (like the MinRes and the Minimum Residuals) use a Least Squares (LS) approach to identify the factor loadings in matrix **A** so that the squared values of the matrix subtraction ($\mathbf{R} - \mathbf{AA}'$) are minimal (these values are called 'residuals', while the matrix $\mathbf{R}^*$ obtained from the matrix multiplication $\mathbf{AA}'$ is called 'reproduced' correlation matrix). Another method (the Maximum Likelihood method, ML) estimates population values for **A** in order to maximize the probability of observing the sample correlation matrix **R**.

Other methods that solve the equality $\mathbf{R} = \mathbf{AA}'$ have been developed and are available in the major statistical software packages. All these methods are usually referred to as methods of factor '*extraction*', and estimate factor loadings under the condition that factors must be *uncorrelated* among each other.

A major difference between PCA and all other factor extraction techniques is that PCA analyses all the variance of the observed variance, while the other methods analyse only common variance. Accordingly, while PCA reproduces the complete **R** matrix, the other methods reproduce the correlation matrix **R** with communalities in the principal diagonal.

The numerical process that leads to factor analysis solution implies a series of operations on the correlation matrix **R**. The products of these operations are always the 'eigenvalues' and the 'eigenvectors' of the **R** matrix. Both eigenvalues and eigenvectors are necessary to decompose the correlation matrix. The former, in particular, summarize the variance of the observed variables explained by each latent factor. For each factor, the sum, across the corresponding column, of squared loadings contained in matrix **A** is equal to the 'eigenvalue' associated to that factor: this quantity, divided by the number of observed variables, is equal to the proportion of variance of the observed variables explained by that factor.

FACTOR ROTATION

Once factors are extracted, they must be interpreted. The more a variable is correlated with a factor (i.e. the higher is its *loading* on that factor), the more important is the interpretation of this factor. However, the initial factor solution is not always adequate for factor interpretation. To facilitate factor interpretation a 'rotational' procedure is usually applied after the extraction. In this procedure a *simple structure* is pursued. The *simple structure* criterion has been developed by Thurstone and states that, for being maximally interpretable, a solution with p common factors must have the following features: (a) each row of the matrix **A** must have at least one value equal to zero; (b) each column of **A** must have at least p zeros; (c) for every pair of columns in **A**, there must be at least p observed variables with a zero value in one column, and a non-zero value in the other; (d) if $p > 3$, then for every pair of columns in **A** the proportion of observed variables with zeros in both columns must be large; (e) for every pair of columns in **A**, the proportion of observed variables with non-zero values in both columns must be small. These five criteria can be used to guide the analyst in finding, among all possible transformations of

A, the one that maximizes a solution's interpretability.

Once factors are rotated the total variance they are explaining is distributed across the new rotated factors, whose loadings are usually different from those of the unrotated factors. The sums by column of squared loadings on the rotated factors are not more equal to the eigenvalues of **R**: indeed, when divided by the number of observed variables, they represent the proportion of variance explained by the rotated factors. However, the rotation process does not influence variable communalities that remain the same in both rotated and unrotated solutions.

Factor rotation evidences an important issue in EFA: there are infinite ways to rotate the original unrotated factors, and there is an infinite set of values that can be found for **A**. Each one of this set reproduces equally well the original correlation matrix **R** (i.e. if **B** is the new rotated factor matrix derived from a rotation of the factors in **A**, then $\mathbf{R} = \mathbf{BB}'$). Then, all rotations fit the data equally well than the initial non-rotated solution. This problem is usually referred to as 'factor indeterminacy'.

In rotation factors may be left uncorrelated (like in orthogonal rotations such as Varimax or Tandem Criteria) or may be allowed to correlate (like in oblique rotation such as Promax and Oblimin). When an oblique rotation is performed, because factors are correlated, there are two different matrices that summarize the relation among observed variables and latent factors: the pattern matrix (**P**) containing the regression weights of the variables on the factors, and the structure matrix (**S**) containing the correlations among variables and factors. While the pattern matrix contains the coefficients summarizing the direct effect of the factors on the variables, the structure matrix contains the coefficients summarizing the total effect (i.e. direct plus indirect) of the factors on the variables. The structure matrix is obtainable from the pattern by post-multiplying the latter by the factor correlation matrix Φ (i.e. $\mathbf{S} = \mathbf{P}\Phi$). In oblique factor rotation the proportion of variance explained by the rotated factors is obtained by first multiplying the Pattern and Structure matrices element by element, then by summing across columns the resulting products, and finally by dividing the resulting sums by the number of observed variables.

IDENTIFYING, MEASURING AND GENERALIZING FACTORS

Several methods have been proposed to identify the number of factors to be extracted, although none of them offers a definitive solution. The 'mineigen' criterion extracts all factors whose corresponding eigenvalue is greater than 1. This method tends to overestimate the number of factors when the variables are many, and to underestimate it when the variables are few. In the 'scree test' method the eigenvalues are plotted, where a straight line is drawn through the latter smaller values: the larger values that are separated from the smaller do not fall on the line and correspond to the factors to retain. This method can be used for obtaining a first idea of the number of factors but is subject to strong idiosyncratic interpretation. When the LS and ML methods of extraction are used it is possible to use a test of fit (based on the chi-square distribution) that examines whether the difference among the observed (**R**) and the reproduced ($\mathbf{R}^* = \mathbf{AA}'$) correlation matrices is statistically significant. Then, one can extract new factors until this difference becomes non-significant. This test, however, is strongly dependent on sample size. New promising methods for determining the number of factors have been proposed, based on the generalizability of a factor solution. Only those factors that can be replicated across samples should be considered.

Once a factor solution has been defined and interpreted, the researcher may want to 'measure' the latent factors for each subject. Several methods have been proposed for estimating subjects' scores on the latent factors; the more frequently used are based on a regression approach.

Several indices, moreover, have been proposed for comparing factor solutions across different samples. In this regard, indices of factor invariance or factor congruence (such as the Tucker coefficient) assess the 'resemblance' of separate factor solutions derived from the same variables on different samples. These

indices, however, are mainly of practical utility, and must be used with caution since they cannot be tested for statistical significance.

ASSUMPTIONS UNDERLYING EFA

There are several assumptions underlying the EFA model. Variables must be at least at the interval level and must follow the multivariate normal distribution (this is particularly crucial in ML extraction), relations among the variables must be linear, the number of subjects must be much higher than the number of variables, the sampling scheme must be the simple random sampling. For a correct application of EFA, correlations in **R** must be different from 0. This can be tested using the Bartlett test of sphericity (that must be statistically significant) and the Kaiser–Meyer–Olkin test of sampling adequacy (that must give values higher at least than 0.6): otherwise factor analysis is not recommended.

If EFA assumptions cannot be met, conclusions drawn from the results of an EFA may be taken with caution. This represents an important limitation for the technique. Generally, EFA results are influenced by the set of variables used: accordingly, variables must be used that has been carefully chosen to measure the domains of interest. In particular, at least 3 variables (i.e. 'markers') for each hypothesized factor must be provided, and a similar number of variables per factor is highly recommended. Another limitation of EFA derives from the indeterminacy problem: the factor solution is not identifiable, and the statistical significance of the factor loadings cannot be tested.

Assumptions violation may no longer be important if one utilizes appropriate methods that were developed for analysing dichotomous, ordinal and non-normal variables, as well as methods for non-linear factor analysis. Also identification and hypothesis testing are no longer a problem if one conducts EFA within the context of Confirmatory Factor Analysis using Jöreskog's restricted EFA approach (Jöreskog & Sörbom, 1979).

FUTURE PERSPECTIVES AND CONCLUSIONS

EFA has been mainly used to explore the dimensionality of a set of variables by finding the smallest number of interpretable factors needed to explain the correlations among them. Its exploratory essence lies in the fact that it places no structure on the relationships between the observed variables and the factors, but only specifies the number of factors. Recently, new methods for Confirmatory Factor Analysis were proposed and used to overcome many of the limitations of EFA. Accordingly, there is the tendency to consider EFA as an 'old style' method of data analysis and to prefer more 'advanced' techniques such as CFA. However, EFA may still be considered as a useful instrument, especially in test building, and in research on personality and intelligence, not only to identify the number of factors but also to: (a) determine the quality of a measurement instrument; (b) identify variables that are poor factor indicators; (c) identify factors that are poorly measured. For these reasons EFA may be considered as an essential preliminary step to CFA if not a valid alternative at all, especially in the first steps of a research and when the number of observed variables to analyse is high.

The vitality of EFA is furthermore well testified by recent developments that highlighted the possibility of using this technique: (a) in multilevel-data structures (*multilevel EFA*, see Hox, 2000); (b) in multivariate time series (*dynamic factor analysis*, see Hershberger, 1998); (c) in the analysis of non-linear relations and multidimensional item response models (see McDonald, 1999); (d) in the analysis of dichotomous and ordinal data (see Muthén & Muthén, 1998). All these expand the potentiality of EFA and prefigure interesting future developments.

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RELATED ENTRIES

Factor Analysis: Confirmatory, Validity: Construct, Theoretical Perspective: Psychometrics

FAMILY

INTRODUCTION

Research of the past three decades has repeatedly implicated the family in the aetiology, course, treatment, and prevention of most psychopathological disorders. Equally important, there is increasing recognition that family influences play a key role in a range of major social problems, which although not achieving psychiatric status, are critical to the physical and psychological welfare of millions. Further, studies of normative family transitions such as marriage, childbirth, ageing, and death are of increasing interest in both the development and prevention of psychopathology. Regardless of disciplinary identification, theoretical orientation, or substantive focus, all family researchers must ultimately select, revise, or develop measurement procedures that operationalize the family constructs they wish to investigate.

In pursuing this goal, the investigator soon encounters a tremendous number of instrument choices spanning a range of constructs and applications, what L'Abate (1994) has called an 'embarrassment of riches'. To address this plethora of choices, the present entry will present a general schema for classifying available family assessment procedures including examples and references to particular instruments that represent different techniques as well as brief discussion of related methodological issues.

CLASSIFYING FAMILY ASSESSMENT PROCEDURES

In considering the breadth of family assessment procedures, three organizing dimensions are particularly helpful: (a) the method of data collection used (report or observational procedures); (b) the unit that is the focus of assessment (i.e. the number of family members); and (c) the major constructs that an instrument attempts to measure. These dimensions guide assessment decisions, implementation, and eventual interpretation.

Method of Data Collection

Methods of data collection include (a) self-reports of family members and (b) direct observation of families during actual interactions. The key feature of the self-report approach is that the participant is asked for his/her perceptions of family events. There are many advantages to report methods, including the strong face validity, convenience, and modest cost for administration and scoring. Also, given the possibility of a large sample base, normative data may be available to which individual protocols can be related. Further, there is greater access to 'private' family data which cannot be reasonably obtained by other procedures (e.g. the nature of sexual interactions, or

members' unexpressed dissatisfaction). Most importantly, self-report procedures capture members' cognitions and attributions about relationships and events, data that are increasingly viewed as essential to the goals of understanding and predicting family processes and outcomes. Notwithstanding these benefits, self-report procedures are, in the end, an individual's own perception of self and other, perceptions that can be inaccurate, biased, and at times seriously distorted. Furthermore, the researcher must reconcile the inevitable inconsistencies that are found in reports from different family members. Finally, most self-report data provide little in the way of the fine-grained details of moment to moment, day-to-day interactions between family members, data that are of great importance to researchers interested in the analysis of actual family processes which are only available through observation.

In contrast, observational procedures inform us most directly about actual interchanges among family members. Under the best of circumstances, such procedures provide highly detailed information regarding streams of behaviour that characterize the family 'in operation'. Specific coding systems can be applied to these interactions allowing for precise measurement of aspects of family processes and patterns of interaction. These results provide a critical foundation for an empirically based theory of family interaction with consequent links to the disorders of children and adults. Even so, direct observation strategies involving the use of complex coding procedures are costly and labour intensive, and require a significant commitment of time and resources in order to collect, collate, and analyse complex interaction data. Furthermore, there are methodological issues associated with these measures including subject reactivity to being observed and the meaningfulness of highly specific behavioural codes as indices of the larger dimensions and constructs of relevance to family experience.

In considering the unique features and methodological limitations of self-report and observational procedures, neither method appears *generally* more valuable, useful, or defensible. Rather, the two strategies are complementary and therefore necessary for full elucidation of the relationship between family interaction and psychopathology.

Within each data collection approach are important subgroups. Self-report procedures include objective tests such as the Family Environment Scale (FES) and the Family Assessment Measure (FAM-III) that tap various aspects of family functioning. Examples of structured interviews are the McMaster Structured Interview of Family Functioning (McSIFF), the Camberwell Family Interview Schedule (CFIS) and the UCLA Parent Interview for assessing expressed emotion; and the Family Ritual Interview developed by Wolin and his colleagues to investigate the preservation of rituals in families of alcoholics. Other instruments are behaviourally focused, such as the marital and parental versions of the Areas of Change Questionnaire (ACQ), Child Report of Parent Behaviour Inventory (CRPBI), or the Quality of Relationships Inventory (QRI). (For references, see Jacob & Tennenbaum, 1988 and Grotevant & Carlson, 1989.)

Instruments using observational procedures can be further subdivided into laboratory and naturalistic settings. Laboratory procedures frequently use structured tasks or games to produce measures of family attributes or performance. For example, the Revealed Differences Technique (Strodtbeck, 1951) determines family power characteristics by considering the relative predominance of one member's individual choices over others in joint rankings of family activities and functions. Another laboratory procedure involves the assessment of actual interactions among family members using personally relevant and/or previously conflictual topics (e.g. Jacob, Seilhamer & Rushe, 1989). These discussions are recorded (using video or audio tape) and then assessed by various means: detailed, multicomponent coding systems that preserve the ordering of behaviour over time; ratings of the total interaction along general/global dimensions of interest; and the recording of members' psychophysiological or physical responses during the ongoing interactions (Weiss & Summers, 1983).

In contrast, naturalistic observations involve the observation and assessment of family interaction in the home setting. Methods for collecting data in natural contexts include audiotaping and videotaping that is similarly subjected to coding. Researchers have used video taping in the home at random or specified times

of the day, and have used daily diaries updated at preset times or beepers to signal family members at unplanned times to record details of current daily events. All the above methods yield naturalistic observational data of day-to-day family experiences which characterize family attributes.

Unit of Assessment

This second dimension specifies the unit of assessment and involves a focus on individuals, relationships between two or more members (dyads, triads, etc.), the whole family, or the interface between the family and extrafamilial environment.

Individual assessments represent the most basic level of family characterization, and have included traditional tests of personality or psychopathology. These instruments provide important data regarding the psychiatric and psychosocial status of the individual members. For example, the measurement of Communication Deviance is based upon analysis of each parent's individual Rorschach responses (see Jacob & Tennenbaum, 1988).

A second level of family assessment focuses on dyadic descriptions; that is, on marital, parent–child, and child–sibling relationships. In contrast with the assessment of individuals, relationship assessments provide information about dyadic status and functioning. By far, the most extensive group of dyadic assessment measures has concerned marital relationships (Spanier & Thompson, 1982), whereas procedures for assessing parent–child and child–sibling relationships have been more limited (Jacob et al., 2000).

Further, the family can be assessed as a whole; that is, across all family members to characterize the family in general or as a totality. For example, assessments can be obtained via self-report procedures concerning an individual's perceptions/descriptions of his/her family; alternatively, laboratory procedures may be used to observe the family's performance on a structured task which can then be coded and analysed to identify patterns among family members. In addition, projective methods are available that address the family as a unit such as conjoint family drawings and a consensus version of the Thematic Apperception Test (Jacob & Tennenbaum, 1988).

Finally, several assessment procedures provide information about extrafamilial variables and their impact on family functioning. Measures of social support and social networks (Anderson, 1982), for example, are based on the recognition that the family system can vary in its permeability. Instrument development in this area has focused largely on family adaptation and utilization of extrafamilial resources associated with specific stressors, such as chronic illness, divorce, or death (see Buehler, 1990; Conoley & Werth, 1995). Examples of instruments that evaluate community and extended family supports are the Feetham Family Functioning Survey (FFFS) and the Family Inventory of Resources for Management (FIRM).

The critical issue for each level of assessment is correspondence across different members' reports, an issue with a long history in family studies (Jacob & Windle, 1999). Although early work on this topic indicated low to moderate correlations between different informants, recent work has provided a clearer and more encouraging view. Cook and Goldstein (1993), for example, examined the correspondence among three members' reports (mother, father, child) on the same dyadic relationships (mother to child negativity, and father to child negativity). Using a latent variable approach, the investigators were able to determine the degree to which each member's reports represented a 'unique perspective' versus a 'common perspective' shared by that of other family members, and demonstrated significant 'common' experience across family members.

Constructs Assessed

The third dimension specifies the variables of interest. How one conceptualizes and examines the relationship between family influences and childhood or adult disorders will vary in relation to one's theoretical model. Given the past four decades of theoretical and empirical effort, a wide range of family constructs have been presented as relevant to understanding the family–psychopathology complex. Thus, family assessment instruments often include a variety of subscales purporting to assess various concepts of a particular theoretical model. However, seldom has a convincing case been made for the statistical independence of the component scales (especially in self-report methods). Specifically, significant correlation between component

scales demonstrates redundance and suggests that different scales may be measuring the same underlying factor. It appears that relationships may be differentiated along but a few orthogonal dimensions, a conclusion which has received considerable support from a range of theory and research in the domain of interpersonal processes (see Jacob & Tennenbaum, 1988). As well, recent work by the authors (Jacob & Windle, 1999; Gondoli & Jacob, 1993) indicate that score variance is best captured by three general factors (affect, control, and activity) rather than by the many dimensions that these instruments purport to measure. Four sets of constructs have received consistent support in the literature: affect, control, communication, and family systems properties.

Affect

The primacy of the affective bond as a determinant of relationship satisfaction and individual outcome has been emphasized across a broad range of disciplines and types of interpersonal relationships. From early studies of infant attachment and group process to investigations of marital dissatisfaction and patterns of childhood socialization, the importance of a supportive and nurturing affective relationship has been repeatedly underscored. Clearly, the affective relationship characterizing the parent–child and marital dyads has received most emphasis by theorists and clinicians.

Control

As with the affective dimension, interpersonal influence/control has been of major importance in conceptualizations of a wide range of relationships (see Jacob & Tennenbaum, 1988). In adult relationships, the most common descriptors have been power, influence, and dominance. In parent–child relationships, the literature has focused on strategies, techniques, and styles of parenting behaviour with an emphasis on those processes by which parents attempt to control and shape the behaviour of their offspring during early childhood and adolescence. Similar to assessments of affect, the measurement of influence and control strategies at a general family level or with regard to parent–child or marital dyads has received most attention, whereas child–sibling relationships have received minimal attention.

Communication

In the family literature relevant to psychopathology, several models of communication have been of interest. First, certain types of communication distortions are related to the development and perpetuation of cognitive disorders in children. This line of research began with family theories of schizophrenia which emphasized the role of communication distortion in development of a child's cognitive disturbances. Key concepts included the notions of double bind, transactional thought disorder, and, more recently, communication deviance.

Second, investigators soon broadened the meaning of double bind communications, and integrated it into a rapidly developing literature on non-verbal communication which focused on family communication with disturbed but non-psychotic samples (see review by Jacob & Lessin, 1982). In exploring the relationship between verbal and non-verbal communication channels, particular interest has focused on the conditions under which channel inconsistency occurs (i.e. non-redundant information emerges) and the consequent impact of such inconsistent messages on receivers.

A third communication focus has involved studies of family problem solving in dysfunctional family units and the development of treatment programmes aimed at enhancing those 'communication skills' thought to be most relevant to the effective and satisfactory resolution of conflict (Brown et al., 1997).

Systems Properties

Attention is here directed toward general properties and principles of family systems that characterize relationships within the family as well as with extrafamilial systems. Included in this domain of processes would be such characteristics as system flexibility and adaptability, and the family's ability to change patterns of control and affect in response to changing needs of members and in response to situational stresses imposed on the family (Jacob & Tennenbaum, 1988). Related processes such as boundary permeability, subsystem relationships,

and alliance structures have also been emphasized in the application of systems perspectives to the diagnosis and treatment of family dysfunction. Vuchinich, Emery, and Cassidy (1988) based an observational study of third-party interventions in dyadic interactions on the contention that additional family members often become involved in what begins as a dyadic conflict. In their observations of videotaped dinners in the home, they found specific effects for child gender (girls are more likely to intervene than boys), parents' behaviour (they are usually on opposing sides), and role ascriptions (fathers use authority, mothers use mediation, children use distraction). Other theorists have highlighted the family's use of time and space as well as amount of interaction that occurs within different family subsystems as relevant to understanding the nature of functional versus dysfunctional family systems (Steinglass, 1979).

FUTURE PERSPECTIVES AND CONCLUSIONS

As can be gleaned from the foregoing overview, the family assessment domain is characterized by a great diversity of instruments that span a range of data collection methods, assessment foci, target populations, and constructs. And although our evaluation of the field is generally positive and optimistic, it is tempered by the recognition that much work remains to be done to address and expand upon current limitations. Most importantly, future assessment efforts can be profitably directed toward clarification of five major research areas: instrument dimensionality, correspondence across different family members, correspondence across different family subsystems, correspondence across different methods, and undeveloped assessment targets and concepts. As an aid to understanding the potential relevance of work in each of these theoretical areas, Table 1 suggests several key questions that should be answerable through future research efforts.

In addition, recent societal changes suggest a number of newly emerging topics for future study including issues related to dual career families, divorce, single parenting, stepparent families, lesbian and gay families, cultural differences of minority populations, homeless families, the impact of chronic illness upon family functioning, and family stresses related to the care of the

Table 1. Future research directions

Research topic	Questions to address
Instrument dimensionality	(a) How many dimensions best characterize report-based and observation-based measures of family functioning? (b) Is instrument dimensionality similar across different family subsystems?
Correspondence across different family members	(a) To what degree do different family members describe family functioning in a similar fashion? (b) Does correspondence across different family members vary as a function of family subsystem assessed?
Correspondence across different family subsystems	(a) To what degree is there similarity in the description of different family subsystems? (b) Under what conditions are cross-system similarities maximized?
Correspondence across different methods	(a) Is there convergent and discriminate validity of key family constructs assessed by different methods? (b) Does correspondence across methods vary in relation to construct assessed and subsystem assessed?
Undeveloped assessment targets and concepts	(a) How can key family systems concepts be operationalized and measured? (b) What methods appear best suited for describing such complex processes? (c) Can such constructs be differentiated from the general family dimensions of affect, engagement, and control?

elderly. The reader is referred to recent reviews that include further discussion and abstracts of existing instruments for special needs populations (see Buehler, 1990; Conoley & Werth, 1995). Further, there are many available handbooks and reviews that catalogue existing measures (often according to constructs of interest or levels of family subsystems). The reader is referred to the following publications for detailed presentations of the development and psychometric properties of specific instruments, further appreciation of the diversity and breadth of family assessment methods, and in depth discussion of the complex methodological issues in family assessment research: Jacob and Windle, 1999; Jacob, 1987; Bray, 1995; Grotevant and Carlson, 1989; and Jacob and Tennenbaum (1988).

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Theodore Jacob and Jon Randolph Haber

RELATED ENTRIES

Applied Fields: Clinical, Caregiver Burden, Child Custody, Couple Assessment in Clinical Settings, Social Networks, Social Resources

FIELD SURVEY: PROTOCOLS DEVELOPMENT

INTRODUCTION

Survey research is the methodological field within the social sciences concerned with the systematic collection and analysis of information from a subset of individuals or groups of persons chosen randomly from a population. Technically speaking it involves the following steps: (1) question wording, (2) structuring of the questionnaire, (3) sampling, (4) interviewing, (5) coding, (6) reporting.

TYPES OF SURVEYS

There are three main types of surveys, depending on how information is collected: face-to-face, mail, and telephone surveys. Each of these collection methods presents advantages and disadvantages (Groves, 1979; Backstrom & Hursh, 1986). The face-to-face method is the most efficient method for interviewing people from difficult-to-reach groups. Another advantage is that the researcher has more control over respondents. This allows for longer interviews and increases the probability that the interview will be completed. Face-to-face interviews also allow for the use of visual aids. Their biggest disadvantage is their cost and the fact in large cities it is often difficult to get access to where people live. Telephone surveys can avoid this problem; moreover, they are much cheaper: with current computer programs, a single person can randomly select respondents, interview them, and code the answers directly into the computer (Saris, 1991). The drawback of this method is that interviewers have less control over respondents than in face-to-face interviews. This sets limits on the duration of interviews. The cheapest survey method is the mail survey. It is particularly suited for topics that are not very complex. Its main drawbacks are the very low response rate, which can introduce bias in the results, and the absolute lack of control over the person who fills out the questionnaire.

COMPARISON WITH OTHER DATA-GATHERING METHODS

Compared to ethnographic and experimental methods, survey research presents advantages in terms of external validity (ability to extrapolate survey results to the target population) and disadvantages in terms of internal validity (ability to draw causal conclusions from observed associations) (Cook & Campbell, 1972; Kish, 1987). Indeed, the correct implementation of probability sampling methods allows estimation with a given margin of error confidence, of intervals of varying precision for common statistics, like the mean or percentages, for a particular population. This sort of inferential precision is not possible with experimental and ethnographic methods. On the other hand, the general lack of randomization in the assignment of treatments differentiates survey research from experimental research, but not from ethnographic research, and complicates the process of attaching causal meaning to measured associations. The use of statistical controls in survey data analysis mitigates this problem but, since the number of potential statistical controls is infinite, this makes the statistical conclusions of survey research highly sensitive to the theoretical soundness that guides the selection of control variables and which thus determines the inclusion of particular questions in a questionnaire.

Another threat to the internal validity of survey research is that surveys are generally cross-sectional, which raises the problem of determining the causal order characterizing a particular association. Panel surveys and retrospective questions in cross-sectional surveys reduce this problem, but only at the cost of complex and not always easy to estimate statistical models in the case of Panel studies and lower reliability

of the answers when one relies on retrospective information.

The comments above refer to the pros and cons of survey research as a method. There are, however, better and worse surveys, and this depends on the quality of the questions (Foddy, 1993; Schuman & Presser, 1980; Payne, 1951), how well the questionnaire is structured (Backstrom & Hursh, 1986), the quality of the sampling (Kalton, 1983; Kish, 1965), how well the interviews are conducted (Cannell et al., 1977; Converse & Schuman, 1974; Guenzel et al., 1983), and how accurate the coding of the interviews is.

QUESTION BUILDING

In order to ensure the quality of the questions, researchers must have a very clear idea about the information that they intend to collect. Moreover, the questions need to be short and devoid of grammatical complexity; they should also include simple and unambiguous words to ensure that they are understood the same way by respondents with very different social backgrounds. Loaded words or expressions must be avoided too.

When researchers design questionnaires they must weigh the advantages and disadvantages of closed- and open-ended questions. The prevalence of closed-ended questions is one of the main distinguishing features of survey methods when compared with more ethnographic techniques, such as the semi-structured interview. One main reason why closed-ended questions are preferred in survey research is that they are easy to code and therefore more appropriate for a method, one of whose main characteristics is the collection of information from large numbers of people that is then analysed statistically. Nevertheless, a few open-ended questions in survey research can make the interview more interesting to respondents, for they allow them to express themselves with their own words. Moreover, they provide qualitative information that may spice-up the final report. Finally, they can be used when the researcher is not sure about what answers to expect to a particular question. This goal is generally better served, however, by using open-ended questions at the pretest stage that are then transformed into closed-ended questions in the final version of the questionnaire.

Closed-ended questions involve two elements: the question proper and the answer-set. The structure and wording of the answer-set is as important for the quality of a survey as the question itself. Number of choices, order of answer options, balance among the different choices, and realism in the answer options are contextual factors that may influence the information one collects. For instance, in face-to-face interviews a long list of choices may result in higher percentages of respondents choosing the last options presented to them, whereas it may have the opposite effect in a mail survey, where the choices are read by the respondents. Neutral options (e.g. Neither...Or, DK, or Undecided) create special problems, since their inclusion in the middle of a list leads to higher percentages choosing the option than when included at the end of a list.

QUESTIONNAIRE STRUCTURE

There is no standard structure for a survey questionnaire. Manuals, however, often recommend the following sequence of sections: (1) Introduction, (2) Warm-up, (3) Topic 1, (4) Topic 2, ... (n) Topic n, ($n + 1$) Socio-demographic. Researchers must take into account that question order matters. Previous questions may involuntarily condition the answers to later questions, because of people's tendency to appear consistent or because of narrowing the type of factors respondents consider when answering general questions. These problems arise in General...Specific or Specific...General sequences of questions respectively.

Sampling

Survey research, compared to other research methods, is particularly strong with respect to external validity. This is because it relies on random selection methods. There are two main types of sampling: probabilistic – where the selection probabilities are or can be known – and non-probabilistic – where the selection probabilities cannot be ascertained. Only the former allow for the use of statistical procedures to infer population parameters from the sample results. Different factors influence the degree of precision of the population estimates obtained from a survey. The sample size is the most important

factor, to such an extent that 1200 interviews, regardless of the size of the target population, can already provide a high degree of precision. Beyond this, different sampling designs can also affect precision. Stratified sampling, for instance, which consists in sampling within categories of theoretically relevant variables such that the proportion of interviews in each category matches the population distribution, leads to more precise estimates. Cluster sampling, on the other hand, which consists in sampling within a number of clusters (e.g. counties, provinces, electoral districts), randomly selected from the total number of clusters of a particular type in the population, tends to diminish the level of precision of the estimates. Many surveys involve multiple stages and include both stratified and cluster methods.

Interviewing

The interview stage of a survey is as important as the other stages. Like in an experiment, the reliability of the results is largely a measure of how well the environment conditions have been controlled for. All respondents to a survey should be exposed to the same type of stimuli from the interviewers, in order for the researcher to be able to rule out non-random interviewer effects from the explanation of the statistical results. This goal can be approached through detailed and clear instructions in the questionnaire and in the survey codebook about, for instance, the flow of the interview (e.g. skip patterns), the meaning of particular words or phrases, probing questions, and reactions to queries by the respondents. Also, interviewers should receive specialized training. Familiarity with the questionnaire, strict adherence to the text of the questionnaire, slow interviewing pace, indifference to the respondent's occasional interruption during the reading of a question, opaqueness about the interviewer's own feelings with respect to the questions being asked and the respondent's answers, the ability to reassure respondents about the value of their answers, are some of the skills that interviewers learn during their training.

Coding

The final stage in a survey, before the statistical analysis can proceed, is the coding phase or transfer of information from the written questionnaires to a computer database. To minimize errors coders must be trained and, most importantly, computer programs need to be developed that detect the input of erroneous codes, the transgression of particular skip patterns during the interview, or inconsistencies between answers to different questions.

FUTURE PERSPECTIVES AND CONCLUSIONS

Survey research is now a mature discipline and one may therefore expect few revolutionary developments. In the future, research may still offer new insights on the effects of question wording and order and about the effects of the structure of a questionnaire. In the field of sampling, researchers and institutions are experimenting with better designs for measuring both cross-sectional and time-dependent processes (e.g. rolling samples) and for sampling from small but difficult to reach populations. Just as computer-assisted telephone interviewing have radically transformed the comparative costs and benefits of this mode of survey data collection, the development of the internet poses a challenge to survey researchers; it opens the door to a new type of collecting survey information, which will surely present advantages and disadvantages with respect to face-to-face, telephone, and mail surveys.

In sum, survey research is an established methodology in the social sciences whose main comparative virtue is that of allowing us to generalize from small samples to large populations. Surveys can vary in quality, however, dependent on the data-collection method, the quality of the questionnaire, the sampling method used, the qualifications and training of the interviewers, and the way the collected information is coded.

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RELATED ENTRIES

SOCIO-DEMOGRAPHIC CONDITIONS, SELF-REPORTS (GENERAL), AMBULATORY ASSESSMENT

FLUID AND CRYSTALLIZED INTELLIGENCE

INTRODUCTION

Original Theory

The concept of fluid (g_f) and crystallized (g_c) intelligence was originally developed by Cattell and Horn (for example, Cattell, 1987, 1998; Horn, 1988). Horn (1988: 660) gives the following description of g_f: 'The g_f abilities are indicative of skills of perceiving relationships among stimulus patterns, drawing inferences from relationships and comprehending implications. The factor is a fallible indicator of reasoning of several kinds, abstracting, and problem solving, when these qualities are acquired outside the acculturational process ...' Horn (1988: 658) also provides a description of g_c: 'The measured factor is a fallible indicator of the extent to which an individual has incorporated, through systematic influences of acculturation, the knowledge and sophistication that can be referred to as the intelligence of a culture.'

Ability Structure

g_f and g_c are usually conceived as second-order or second-stratum factors in hierarchical factor analysis (*cf.* Cattell, 1987). 'Historical' $g_{f(h)}$ forms the third-stratum factor at the top of the hierarchy, while primaries corresponding to Thurstone's primary mental abilities are located at the bottom of the hierarchy. g_f and g_c are further embedded in a broader theoretical framework comprising second-order factors for visualization, fluency, and cognitive speed, and so-called *provincial factors* located between the primary and secondary level, which cannot be directly demonstrated through factor analysis (Cattell, 1987, 1998).

Dynamic Aspects

It is assumed that there is initially (perhaps two or three years after maturational shaping from birth) a single relation-perceiving ability. This ability is not tied to any specific habits or sensory, motor, or memory area, and is therefore termed 'fluid' intelligence, g_f (Cattell, 1987). Complex abilities representing g_c (reading, arithmetic, and abstract reasoning) are subsequently acquired through learning and thus through the investment of g_f. g_f has been found to increase in early life, reaching a peak at around 18–20 years, and

then to slowly decrease. In contrast, g_c has been found to increase up to the age of 60 years.

FURTHER DEVELOPMENTS

Several models of intelligence integrate aspects of g_f and g_c. Gustafsson (1984) proposed a model including g_f and g_c as second-order factors, where g_f was identical to general intelligence. Ackerman (1996) presented an integrative theory of adult intellectual development, focusing on intelligence-as-process representing g_f-type abilities, and intelligence-as-knowledge representing g_c-type abilities. Baltes et al. (1998) integrated g_f and g_c in the developmental concept of the mechanics (close to g_f) and pragmatics (close to g_c) of intelligence. In Woodcock (1998), g_f represents high complexity information processing, whereas g_c is a component of declarative and procedural knowledge. Important evidence for g_f and g_c was presented in Carroll's (1993) monumental review and analysis in the domain of human abilities. The model comprises g_f and g_c, but the structure presented by Carroll differs from that presented in Cattell (1987, 1998) in that visual and auditory perception occur as second-order factors like g_f and g_c and not as provincial factors. Apart from the integrative models of intelligence listed above, a great deal of research has related g_f and g_c to very different theoretical approaches. g_f has been related to cognitive correlates, for example, by Kyllonen and Christal (1990), who found a strong relationship between reasoning measures, which they also consider to be measures of g_f, and working memory. Correlations between processing speed and g_f have been interpreted within the mental speed framework (for example, Rabbitt, 1996).

Stelzl et al. (1995) investigated the effects of schooling on g_f and g_c. They found substantial schooling effects on both g_c and g_f. The schooling effect observed on g_f is in conflict with the assumption that the development of g_f is primarily based on biological processes of neural growth and maturation, and that it is not influenced by formal education.

CRITERION VALIDITIES

Criterion validities with job performance as criterion are mostly reported for general intelligence, but not for g_f and g_c. It is therefore difficult to evaluate the extent to which the substantial predictive validities of general intelligence for job performance reported in Schmidt and Hunter (1998) can be attributed to g_f and g_c. However, job-related knowledge has some incremental validity when used with a measure of general intelligence as a predictor for job performance (Schmidt & Hunter, 1998). This may indicate that g_c is also important for the prediction of job performance. Further criterion validities for g_f and g_c are available for general and school achievement. Mitchell and Lawson (1988) reported that g_f was a powerful predictor of performance in a biological achievement test. Cattell (1987) reported substantial correlations between measures of g_f and g_c and school performance (for example, spelling, word meanings, arithmetic).

TESTS FOR g_f AND g_c

In the following, the most important tests of g_f and g_c are briefly presented (see Table 1). The Culture Fair Intelligence Test (CFT; Cattell, 1957) was primarily conceived for the measurement of g_f. In the CFT tests, the measurement of g_f is based on figural material (matrices, topologies). Because Raven's (1983) Advanced and Standard Progressive Matrices are based exclusively on matrices, they are often used for the measurement of g_f.

In the fourth edition of the Stanford–Binet Intelligence Scale, Thorndike et al. (1985) proposed measuring g_c by scales for verbal and numeric reasoning, and measuring g_f by a scale for abstract/visual reasoning. According to Kaufman and Kaufman (1997) the scales of the Kaufman Adolescent and Adult Intelligence Test (Kaufman & Kaufman, 1993) could also be used for the measurement of g_f and g_c, despite the fact that the test initially had another theoretical background.

The Wechsler Adult Intelligence Scale – Revised (Wechsler, 1981) has also been used to measure g_f and g_c. It has been assumed that the verbal part of the WAIS-R measures g_c and that the non-verbal part measures g_f (Grégoire, 1993).

Amthauer et al. (2001) and Beauducel et al. (2001) suggest that g_f cannot simply be reduced to figural abilities and that g_c cannot simply be

Table 1. Tests for the measurement of g_f and g_c

Authors	Test	Measures	
Cattell, 1957	The IPAT Culture Fair Intelligence Scales 1, 2, and 3. Champaign, Illinois: Institute for Personality and Ability Testing.	g_f	
Raven, 1983	The Standard Progressive Matrices, 1938–83. New York: Psychological Corporation.	g_f	
Thorndike, Hagen & Sattler, 1985	Technical Manual: Stanford–Binet Intelligence Scale. Chicago: Riverside.	g_f	g_c
Kaufman & Kaufman, 1993	The Kaufman Adolescent and Adult/ Intelligence Test (KAIT) Manual. Circle Pines, MN: American Guidance Service.	g_f	g_c
Wechsler, 1981	Wechsler Adult Intelligence Scale – Revised. San Antonio, TX: Psychological Corporation.	g_f	g_c
Amthauer et al., 2001	Test for intelligence structure, 2000 R. Göttingen: Hogrefe.	g_f	g_c
Woodcock & Johnson, 1989	Woodcock–Johnson Psycho-Educational Battery-Revised. Chicago: Riverside.	g_f	g_c
Flanagan & McGrew, 1997	A cross-battery approach to assessing and interpreting cognitive abilities	g_f	g_c

reduced to verbal abilities. Even though figural abilities may be less influenced by acculturation than verbal abilities, it should not be assumed that figural abilities are pure measures of g_f. Beauducel et al. (2001) show that the contamination of g_f with figural abilities and of g_c with verbal abilities can be reduced by means of a faceted conceptualization of g_f and g_c, comprising a facet for the differentiation between g_f and g_c and another facet for the types of content (verbal, numerical, figural).

Flanagan and McGrew (1997) suggest that there is a problem of construct underrepresentation in the measurement of g_f and g_c, which means that g_f and g_c cannot generally be measured accurately with convenient single tests. Therefore, they recommend an improvement of the measurement of g_f and g_c by means of their 'cross-battery approach'. The cross-battery approach integrates a number of different tests, including the Woodcock–Johnson Psycho-Educational Battery – Revised and the Kaufman Adolescent and Adult Intelligence Test (see Table 1).

FUTURE PERSPECTIVES

Since g_f and g_c have been related to the domain of social intelligence (Lee et al., 2000) it could be expected that the g_f–g_c differentiation will be further extended beyond the domain of academic intelligence. Cattell (1987) already reports a loading of a test of mechanical knowledge on g_c which could indicate some relation to the domain of practical intelligence (see also Heidrich & Denney, 1994). Thus, the g_f–g_c differentiation could serve as a heuristic for future research within the broad field beyond academic intelligence.

CONCLUSIONS

The multitude of theoretical approaches relating to g_f and g_c demonstrates the importance of these concepts. However, with regard to the measurement of g_f and g_c, this multitude has produced considerable variations. Since there was already some degree of variability in the measurement of g_f and g_c, there has been a temptation to use only a single type of task for the measurement of g_f, and another single task for the measurement of g_c. Such construct underrepresentation may be avoided by the development of broad test batteries for the measurement of g_f and g_c, as in Amthauer et al. (2001), or by the combination of different test batteries, as in Flanagan and McGrew (1997). Of course, new theoretical developments (for example, Ackerman, 1996; Woodcock, 1998) will probably lead to further improvements in the measurement of g_f and g_c in the future.

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RELATED ENTRIES

Intelligence Assessment (General), Cognitive Ability: Multiple Cognitive Abilities, Cognitive Ability: *g* Factor, Theoretical Perspective: Psychometrics

FORMATS FOR ASSESSMENT

INTRODUCTION

Psychological and educational assessments today come in many forms: they vary on the basis of the item type or types that are included, the physical means by which items are presented to test-takers and responses are supplied, and the manner in which items and test forms are assembled. In this way, the format of an assessment is the end result of numerous psychometric and practical considerations about the nature of the ability being evaluated and the appropriate and the most feasible ways to gather such information. By separating formats for assessment into several component parts, the layers of decisions that must be made in the process of test creation emerge and the full range of possibilities for test creation and use likewise become more readily apparent. The three component parts that constitute the format of an assessment are (1) methods of delivery and response collection, (2) test algorithm, and (3) item type. The remainder of this entry will focus on each component in turn and how they relate to each other and test purpose in defining the format of an assessment.

METHODS OF DELIVERY AND RESPONSE COLLECTION

The choice of delivery and response modes for assessment is central in the process of test development, as this refers to the physical means or medium by which items are presented to test-takers and how test-takers in turn provide answers. There are four methods by which a test can be presented and responded to/recorded: using pencil and paper, oral, by physically carrying out a behaviour or series of behaviours, or via electronic media such as computers or other audio/video devices. Of course, two or more delivery modes could be used in a single assessment; for example, a classroom teacher might read item stems aloud while students write answers on their papers.

Many educational assessments administered to students on a large scale are implemented as paper-and-pencil instruments for both item delivery and response collection. This builds flexibility into the test administration because many test-takers can be evaluated at once, they can work at their own pace, and answer sheets can be gathered for scoring at the convenience of the administrator. On the negative side, the paper-and-pencil format may not be the most flexible mode of delivery and response collection for all constructs.

Indeed, certain constructs of interest to psychologists and educators are better suited to assessment by oral or physical/behavioural means, especially with regard to test-takers' responses. These modes of assessment allow for the administrator to evaluate a test-taker in a more one-on-one setting, which the examinee may be more comfortable with and this may lead to more valid assessment. Completing an assessment by a series of behaviours could include the use of role-playing exercises, while an oral assessment might be along the lines of a psychological interview or thesis defence. By these two methods test-takers can demonstrate competency in areas that paper-and-pencil tests cannot readily assess, but in both methods practical considerations such as economic and time costs as well as psychometric complexity of scoring are factors that must be taken to account.

The fourth assessment format involves the use of electronic media to present items to examinees and/or to record their responses. Computers are one important route for test delivery and response collection (this is made promising by the escalating power of desktop computers as well as their increasing graphical and audio capabilities), but other forms of video and audio data transmission represent means by which assessment can take place as well.

These four methods of assessment provide test developers with a number of options for creating test instruments. In evaluating the different delivery and response collection methods for use in an assessment, however, particularly in terms of the nature of the response, it is important to recognize that each of these methods is more appropriate in some situations than others, dependent on the nature of the construct and how it can best be measured given concerns for validity and reliability and real-world constraints such as time and cost.

TEST ALGORITHM

The format of an assessment also refers to how the test form is assembled and the way in which items are sequenced for presentation to test-takers. Thissen and Mislevy (2000) describe test algorithms as a matter of three questions: how to start (what is the first item?), how to continue (after a response, what is the next item?), and how to stop (when is the test over?). The three basic test algorithms are linear, multi-stage, and fully adaptive, and a number of variations of each exist. These test algorithms are described and their strengths and weaknesses are highlighted in Table 1.

In a linear test algorithm, the ordering or inclusion of items may change across forms of the test but not within a form. A test-taker starts with item one, proceeds to the next sequentially numbered items, and then goes on through to the last presented item (Thissen & Mislevy, 2000). Each test-taker who receives the same form of the test sees the same items in the same order. Different forms of the same test can also be created such that items are scrambled across forms or so that different items appear on different forms. These different 'versions' of the same test can be equated to each other statistically to ensure that all examinees receive comparably difficult tests, and when this is the case the forms are referred to as parallel. Nearly all paper-and-pencil tests are presented as a single linear form or with multiple linear forms that are parallel.

A second family of test algorithms is known as multi-stage testing (MST). The basic principle behind MST is sequential or adaptive testing, where the responses a test-taker provides to a given set of items determine the next set of items to be presented (Thissen & Mislevy, 2000). Each set of items is referred to as a stage. An examinee is presented a set of items, and the examinee's ability is estimated based on his or her responses to that stage. The examinee then progresses to the second stage of testing and is presented with a new set of items dependent on the estimated ability level. The difficulty level of any one stage is conditional on the test-taker's

Table 1. Continuum of test algorithms

	Variations	Comments	References
Linear	Single form Multiple parallel forms Linear-on-the-fly	Examinees can review items Inefficient for individuals	Thissen & Mislevy (2000)
Multi-stage	Two-stage	Stages tailored to examinee ability	Luecht & Nungester (2000)
	Flexilevel		Thissen & Mislevy (2000)
	Stratified-adaptive	2 to *n* stages	
	Fixed-branching	Can be paper and pencil or computerized, depending on level of complexity	
	Variable-branching		
	Testlet-based adaptive	Potential for shorter test	
	Computer-adaptive sequential testing		
Fully adaptive		As many branching decisions as items on the test Items tailored to examinee ability Potential for shorter test	van der Linden & Pashley (2000)

performance on the previous stage, and stages are chained in this manner, from a minimum of two up to as many stages as the test user deems necessary given the test purpose. Different MST algorithms basically vary by the number of stages, the number of items per stage, and how examinees pass through stages (Patsula, 1999).

The third basic test algorithm is the fully adaptive test, where the examinee's response to one item determines the item that will follow it. In a sense, a fully adaptive test can be viewed as the limiting case of a MST where only one item appears at each stage and the number of items administered is identical to the number of stages in the test. Fully adaptive tests administered by computers are particularly useful in cases where a high degree of measurement precision is required, as these tests can be programmed to cease only when a pre-specified standard error of measurement is reached. Fully adaptive tests can also shorten the length of a test because only those items are administered that are judged as suitable for estimating ability. Items that are judged as too easy or too hard in relation to the candidate's ability level need not be administered as they provide very little information in the ability estimation process.

The emergence of these different test algorithms and their variations has provided test developers with a measure of freedom in the test creation process; the standard no longer is a single form or multiple parallel forms. By the same token, many of these algorithms are largely confined to the realm of computer-based tests, as in most cases only computers can process test-takers' responses fast enough to take advantage of the adaptive-type algorithms.

ITEM TYPE

In developing an assessment, the third essential element of format is item type, and in this regard test developers have a substantial number of options to select from. Without getting into specifics of content or constructs, these item types at a basic level vary from one another in one other important way – they vary in terms of the nature of the response that test-takers are expected to provide.

Responses to test items can take many different forms, such as the selection of one of several alternatives on a multiple-choice item, the development of an extended essay, or the acting out of driving skills in a road test. Clearly, these responses range along one significant dimension, in that with some item types (termed *selected-response* or *closed-product*) test-takers choose one of several pre-defined answer choices, while on others (*constructed-response* or *open-product*) answers are uniquely synthesized and expressed by each individual taking the test (Osterlind, 1998). As noted by Osterlind and Merz (1994), differentiating between item types based on the nature of response using a rigid classification system is not as useful as thinking about items in terms of whether more or fewer answers can be judged as acceptable. In this way, each different item type imaginable can be described as located somewhere on a continuum of more to less restrictive responses.

Some examples of item types that are familiar include the standard multiple-choice format (and its variations such as matching, k-type, true–false, and multiple true–false), fill-in/grid-in, and essays. Among the constructed-response item types are performance tasks, which are assessments that aim to align as closely as possible with the ability of interest to maintain a high degree of realism with an emphasis on doing (Hambleton, 1996). Some performance task formats are laboratory experiments, interviews, discussions, performances, exhibitions, oral reports and presentations, and portfolios. Additionally, recent advances in desktop computing have facilitated the emergence of a number of novel test item types that are primarily being researched and used in computer-based testing (reviewed in Zenisky & Sireci, in press), such as items where examinees are prompted to generate examples or hypotheses, edit onscreen passages, manipulate graphics or items onscreen using the computer mouse, interact with the computer in simulation activities, sort or order items according to various attributes, or type in numerical expressions. Research into emerging item types (e.g. Bennett, Morley & Quardt, 2000; Bennett et al., 1999; Bennett & Rock, 1995; Bennett & Sebrechts, 1997; Martinez & Bennett, 1992) is in response to test users who are increasingly interested in assessing new constructs as well as familiar constructs in new ways.

These latter item types in particular introduce another important component of item types: the incorporation of multimedia. While a number

of item types are largely text- or language-based, many other assessments incorporate still graphics and images into the stem as a matter of routine. Furthermore, one emerging area of interest for assessment concerns the use of other media in item stems as assessment developers continue to explore and integrate audio, video, and computerized-interactive options (Parshall, Davey & Pashley, 2000). The extent to which different media are featured in item stems is not always directly related to item type, as whether an item type is selected-response, constructed-response, or performance assessment does not mean it will have more or less media complexity in the stem. For example, a short video in the prompt could be followed by a series of multiple-choice questions or an essay or a graphical modelling-type item.

In considering various item formats for use in psychological assessments, accepted standards of validity and reliability must be met, but it is also important to keep in mind additional practical constraints such as the amount of reasonable or available testing time, the time to score and scoring costs, and the development costs. Some of the free-response formats (such as oral presentations, portfolios, demonstrations, and essays) require substantial time commitments in terms of the amount of time that it will take examinees to complete and the time required to evaluate the finished product or performance. Test developers must try to balance many factors such as time to develop a test, the cost of development and scoring, the time required by candidates to complete the test, while at the same time retaining sufficiently high levels of reliability and validity to justify the use of the test.

FUTURE PERSPECTIVES AND CONCLUSIONS

Given the various delivery and response collection methods, a variety of test algorithms, and many item types, test developers have an assortment of choices to make in crafting a coherent final product known as the test instrument. The format of an assessment is the end product of many decisions about what a test needs to look like in order to accomplish a specific purpose. How test-takers will be presented test items and what item types can be used to evaluate a construct are issues that test developers must consider from numerous angles in order to ensure quality measurement.

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RELATED ENTRIES

Applied Fields: Education, Achievement Testing, Criterion-Referenced Testing: Methods and Procedures, Norm-Referenced Testing: Methods and Procedures, Performance

GENERALIZABILITY THEORY

Everyone who works in any field of science is well acquainted with the notion that whatever measure we take of whatever phenomenon, that measure is inherently affected by random error. Indeed, reliability issues are recognized as of capital importance in any scientific endeavour, as well as in psychology. Over the years, the classical test theory of measurement has been the solid ground for almost all of psychological testing. The aim of this entry is to describe generalizability theory (Brennan, 2001; Cronbach, Gleser, Nanda & Rajaratnam, 1972), which represents a more precise and complete model of the composition of an observed measure, and to show some of its advantages relative to classical test theory.

According to classical test theory, an observed score is composed of the sum of two components: the unknown true score and the random error. The central point of classical test theory is that error is randomly and independently distributed, and is uncorrelated with true score, as well as with true scores and errors on subsequent measurements.

The classical test theory only takes a unitary error term into account, even though errors actually come from multiple sources. This means that reliability assessment must rest on multiple procedures and indicators (for example, test–retest, split-half, Cronbach's alpha), each one accounting for a different error source. Thus, a high test–retest reliability means that we can trust that measure independently of the occasion when it is measured, but it tells us nothing about whether we can trust that measure independently of the system (human being or instrument) which actually makes the measurement. Consequently, multiple reliabilities exist within classical test theory, for instance across occasions, across raters, across items, and so forth. This represents a major limit of the classical approach to reliability, as it cannot account for multiple error sources. Far more importantly, classical theory of reliability cannot account for the interaction among different sources of error. For instance, neither Cronbach's alpha nor test–retest reliabilities are useful when consistency across items changes across occasions.

Generalizability theory represents a more general approach to the assessment of the reliability of a score. It defines a score as a sample from the universe of all the admissible observations, characterized by one or more conditions of measurement. Here, the true score is defined as the universe score, that is the average of all the observations in the universe of admissible observations, and errors are defined by the conditions of measurement. Items, raters, occasions, tests, and so forth, are examples of the conditions of measurement, and each one accounts for part of the variability of the observed scores. Generalizability theory is designed to estimate the multiple components of the obtained score variability, and to use them to explore the effects of different sources of

measurement error. Consequently, it allows the investigation of several sources of variation simultaneously, and the estimation of the error in generalizing an observed result to the universe defined by each of them. Generalizability theory was developed in the context of dependability of behavioural measurements. Nevertheless, the model is rather general and may as well apply to other reliability issues.

Generalizability theory is founded upon the statistical model of the analysis of variance (ANOVA). In ANOVA, the total variance is partitioned according to the independent variables in the design. Similarly, generalizability theory uses the ANOVA model to estimate the variance components associated with the sources of variation that affect the score under investigation. In other words, the sources of variation define a model of the score, and specify which error source (by itself or combined with others) affects the measure and how much it does. In generalizability theory, sources of variation other than the object of measurement are defined as *facets*, while groupings within a facet are defined as *conditions* (factors and levels represent their analogues in factorial ANOVA). Facets may be considered as either random or fixed, likewise factors in ANOVA. Conditions within a random facet are considered as randomly sampled from the universe of conditions that define that facet. Specifying a facet as random allows the researcher to generalize to all the conditions within that facet, including those not explicitly included in the design. For instance, items of a test may be regarded as conditions within a random facet, since researchers are not usually interested to those particular items, but consider them as a sample drawn from the population of items that measure the same theoretical construct. Specifying a facet as fixed, instead, implies that all the conditions within that facet have been included in the model, or that the researcher is willing to generalize only to the conditions included in the design. Individuals enter as a source of variation in all the generalizability theory models, usually as the object of measurement. This means that the variance associated with the individuals represents actual differences among persons, whereas the variance associated with the facets reflects error.

The main focus of generalizability theory is upon the components of variance associated with the object of measurement, with the facets and their interactions, and with the residual. It should be noted that the components of variance are the variances of the hypothesized components of the score under investigation, and they are not the same as the mean squares in ANOVA. The component of variance associated with a facet reflects how much that facet contributes to the error in the score. In more analytical terms, the variance of a score is decomposed into its components. For a simple two-facets crossed design, for instance, Persons × Raters × Occasions, we have:

$$\sigma^2(X_{pro}) = \sigma^2_p + \sigma^2_r + \sigma^2_o + \sigma^2_t + \sigma^2_{pr} + \sigma^2_{po} + \sigma^2_{ro} + \sigma^2_{pro,e}$$

where X_{pro} represents the observed rating of a person (p) by a rater (r) on an occasion (o). In this example, the observed score is composed of the sum of the components of variance due to the object of measurement (individuals, σ^2_p), to the conditions of measurements (raters and occasions, σ^2_r and σ^2_o), to the interactions between facets and between facets and individuals (σ^2_{ro}, σ^2_{po}, σ^2_{pr}), and finally to the residual ($\sigma^2_{pro,e}$). It should be noted that in these models the residual is confounded with the higher order interaction. As it can be seen, the main advantage of generalizability theory is that it allows the estimation of the components of variance for multiple facets and their interactions. In other words, it becomes possible not only to estimate how much a facet contributes to the error in the score by itself, but also if the contribution of that facet increases or decreases when it is associated with other facets (Shavelson, Webb & Rowley, 1989; Shavelson & Webb, 1991). Furthermore, the comparison of the size of each component suggests the relative ranking of error sources. For instance, if the component of variance associated with a given facet was small compared to others, then that facet contributes to a small extent to the variability of the observed score, thus it is not a major source of error.

Of course, the interpretation of the estimated components of variance depends on the goal of the study. When generalizability theory is applied to psychological testing, individuals are usually the object of interest. Variation among individuals represents real differences and is referred to

as the estimated universe score variance. Instead, variations associated with the facets and their interactions represent the errors that affect the score. However, in other situations the object of measurement may change. For instance, experimental manipulation may be the object of interest in psychophysiological studies. In these cases, individual differences would be usually considered as measurement error. Cardinet, Tourneur and Allal (1976) proposed a principle of symmetry in order to enable generalizability theory to address the situation in which the object of measurement changes. The principle simply states that any facet in the design may be regarded as the object of measurement. Variance components may be computed regardless of the measurement design, since their meaning is defined only after a decision is made about the object of measurement.

One of the most important issues regarding generalizability theory concerns how to estimate the components of variance. Fisher (1925) proposed the 'analysis of variance' method of estimation, also called 'Expected Mean Squares' (EMS) method. Here, the sums of squares are equated to their expected values, obtaining a set of linear equations. In the simple case of a single facet $p \times i$ design we have:

$$\left\{ \begin{array}{l} E(MS_p) = \sigma^2_{pi,e} + n_i\sigma^2_p \\ E(MS_i) = \sigma^2_{pi,e} + n_p\sigma^2_i \\ E(MS_{pi,e}) = \sigma^2_{pi,e} \end{array} \right\}$$

where n_p and n_i are the number of levels in p and i, respectively. These equations have to be solved to obtain estimates of each component of variance. Replacing the expected mean squares with the corresponding observed mean squares and replacing each σ^2 with the estimate σ^{*2} we have:

$$\left\{ \begin{array}{l} MS_p = \sigma^{*2}_{pi,e} + n_i\sigma^{*2}_p \\ MS_i = \sigma^{*2}_{pi,e} + n_p\sigma^{*2}_i \\ MS_{pi,e} = \sigma^{*2}_{pi,e} \end{array} \right\}$$

These equations can be easily solved using simple algebra.

The EMS method is very simple and gives unbiased estimates. Nevertheless it may give negative estimates of components of variance. This is quite disturbing, of course, since a component of variance is by definition a non-negative quantity. Negative estimates may be due to an erroneous measurement model or to sampling error. In the former case, usually when the negative estimates are large, a different definition of the measurement model is needed. For instance, other facets should be included into the model. In the latter case, usually when the sample size or the number of conditions within one or more facets are smaller than needed, the relative magnitude of the negative estimates is normally close to zero. Cronbach, Gleser, Nanda and Rajaratnam (1972) proposed to solve this problem by setting the negative estimates to zero, and using this value to compute the other variance component estimates. A different approach was proposed by Brennan (2001), who suggested setting the negative estimates to zero, but to use the original negative values to compute the other variance components. As Shavelson and Webb (1991) pointed out, the first approach gets rid of an impossible result at the cost of producing biased estimates of the variance components. The second approach uses the negative variance component estimates, but returns unbiased estimates. Both are commonly used as well as unsatisfying approaches. An alternative that avoids the problem of the negative estimates is to use estimation methods that make them impossible, such as maximum likelihood, restricted maximum likelihood and Bayesian estimation.

A feature of the ML method is that in estimating variance components it does not take into account the degrees of freedom that are involved in estimating fixed effects. This characteristic is overcome by restricted (or residual) maximum likelihood estimation (REML). Generally speaking, in REML the estimation of variance components is based on residuals computed after fitting the fixed effects part of the model by ordinary least squares. REML estimates of variance components are closer to the true parameters than EMS estimates. However, with balanced data sets and normal distributions, REML and EMS methods perform similarly. Interested readers may refer to Searle, Casella and McCulloch (1992) for a discussion on estimating variance components.

The estimated components of variance are further used within generalizability theory in

order to compute generalizability coefficients. They are analogous to the reliability coefficients in classical test theory. Generalizability theory distinguishes between decisions based on the relative standing of an individual and decisions based on the absolute value of a score. This is a rather important point because the error term that enters into the generalizability coefficients changes according to the nature of the decision the research is willing to make. Error term in relative decisions (σ^2_{rel}) arises from all the non-zero variance components associated with the rank ordering of individuals. Hence, variance components associated with the interaction of persons with each facet (or combination of facets) define the error term. For instance, in a person (p) by rater (r) by occasion (o) design the error term would be:

$$\sigma^2_{rel} = \frac{\sigma^2_{pr}}{n_r} + \frac{\sigma^2_{po}}{n_o} + \frac{\sigma^2_{pro,e}}{n_r n_o}$$

where n_r and n_o are the numbers of raters and occasions.

Instead, error term in absolute decisions (σ^2_{abs}) arises from all the components associated with the score, except the component associated with the object of measurement. That is:

$$\sigma^2_{abs} = \frac{\sigma^2_r}{n_r} + \frac{\sigma^2_o}{n_o} + \frac{\sigma^2_{ro}}{n_r n_o} + \frac{\sigma^2_{pr}}{n_r} + \frac{\sigma^2_{po}}{n_o} + \frac{\sigma^2_{pro,e}}{n_r n_o}$$

In generalizability theory, the generalizability coefficient E^2_p is the ratio of the universe score variance to the expected observed score variance; that is:

$$E\rho^2_{rel} = \frac{\sigma^2_p}{\left(\sigma^2_p + \sigma^2_{rel}\right)}$$

A reliability coefficient can be also defined for absolute decisions. Brennan and Kane (1977) called this coefficient an index of dependability and used the symbol ϕ (phi):

$$\phi = \frac{\sigma^2_p}{\left(\sigma^2_p + \sigma^2_{abs}\right)}$$

On the basis of this sketch of generalizability theory given above, it is clear that it provides a more complete picture of the sources of variability that affect an observed score. The exact meaning of the results of a generalizability study depends of course on the nature of the problem the study addresses. For example, consider a simplified study in which some ability is measured on a number of persons by two tests forms, each one composed of a number of items. This would be a $p \times t \times i$ crossed design. In a generalizability study on these hypothetical data, variance components associated with Persons, Tests, Items, Persons by Tests, Persons by Items, Items by Tests, and Persons by Tests by Items, the last interaction, confounded with Residual, would be estimated.

Depending on the relative amounts of the variance components associated with those sources, different conclusions would be drawn. If the component of variance associated with Persons was large and those associated with the other sources were small, then one could infer that the measure is highly reliable independently of the form of the test and the items. In this case, both generalizability coefficient and dependability index would be large, because both relative and absolute errors would be small. However, if the components of variance associated with both Persons and Test were large, then one should infer that the absolute scores of individuals depend on the particular form of the test that was administered. The generalizability coefficient would be still high, because the relative ranking of individuals would remain unaffected by the test form, but the dependability index would be low, because the absolute scores would not be independent of the test form.

In this case, classical test theory would only have provided a high reliability coefficient, if measured with parallel forms. On the other hand, if the components of variance associated with Persons and Persons by Test interaction were large, relative to the others, then one should conclude that also the relative ranking of individuals depends on the particular test form, and both generalizability coefficient and dependability index would be small.

More interesting to a researcher would be the pattern of results concerning the combined effect of Test and Items facets. Indeed, if the component of variance associated with the Test by Items interaction was large compared to the other

sources of variability, then one should infer that individual score depends on both the form of the test and on the particular items which have been administered. In this case, individuals may behave consistently on each form and on each item, when separately considered, but still individual scores would be affected by a relevant source of error, which would go undetected with classical test theory.

Generalizability theory also distinguishes between generalizability studies (such as those described above) and decision studies. Generalizability studies provide an estimate of the variance components associated with the sources of measurement error. Decision studies are used to select the number of conditions of each facet that minimizes error for a specific purpose, much like the Spearman–Brown formula in the classical test theory.

Generalizability theory is perhaps the most complete measurement model currently available to researchers. As such, it is applicable to any scientific field in which a multifaceted perspective on measurement errors is important. Both SPSS and Statistica statistical packages include modules that estimate the components of variance in a variety of designs, whereas the GENOVA software program (Crick & Brennan, 1982) performs univariate generalizability analyses for balanced designs. Recently, other modules (urGENOVA and mGENOVA) have been added to deal with unbalanced designs and multivariate analyses.

FUTURE PERSPECTIVES AND CONCLUSIONS

Until recently, generalizability theory has been mostly applied in educational psychology, and mostly to address issues regarding the reliability of different proficiency tools. It has been also applied to other fields of investigation, such as psychophysiological (e.g. Strube, 2000), observational and longitudinal studies, albeit rather sparsely. Nevertheless, in recent years the interest toward this model has grown up to a large extent. In the near future, it is likely that the perspective the generalizability theory acknowledges will spread more consistently to other scientific fields, and develop as a standard method in psychometrics. Also, the model underlying the generalizability theory was proved useful to address reliability issues in experimental as well as in observational studies (e.g. Di Nocera, Ferlazzo & Borghi, 2001), and in the near future it will likely contribute to make the reliability of results from psychological experiments more carefully addressed by investigators.

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RELATED ENTRIES

Classical and Modern Item Analysis, Reliability, Validity (General)

GIFTEDNESS

INTRODUCTION

The assessment of giftedness has it roots in the study of individual differences which has focused on the constructs of intelligence, creativity, and motivation. Although broad definitions of giftedness have emerged, the most extensive body of research on assessment concentrates on intelligence. Unfortunately, the construct of intelligence is enigmatic and models of intelligence range from unidimensional to multidimensional. Of course, the identification of giftedness should not be based solely on an intelligence test, but also on the basis of the social and cultural context. To assess the construct of giftedness, valid and reliable measures of domain specific knowledge, speed, and metacognition are necessary. Alternative assessment procedures, such as Sternberg's Triarchic model or dynamic assessment, should also be considered.

DEFINITION OF GIFTEDNESS

There is no agreed upon definition of giftedness or talent that dominates the field. Sternberg and Davidson (1986) edited a collection of 17 conceptualizations of giftedness. The range in conceptualizations was diverse, but the majority concentrated on the psychological aspects of giftedness. The psychological aspects emphasized constructs of intelligence, creativity, and motivation. Renzulli (1978) suggested that giftedness is an interaction of three clusters of traits: above-average general or specific abilities, task commitment, and creativity.

Feldhusen and Jarwan's (1993) review of definitions of giftedness and talent fell into six categories: psychometric definitions, trait definitions, definitions focused on social needs, education-oriented definitions, special talent definitions, and multi-dimensional definitions. These categories were not mutually exclusive.

Often, giftedness and talent are used interchangeably. However, the two concepts can be differentiated (Gagne, Belanger & Motard, 1993). Giftedness is above average competence in a human ability, whereas talent is above average performance in a particular field. Giftedness refers to human aptitudes such as intelligence or creative abilities, whereas talent is demonstrated in a human activity such as mathematics, literature, or music.

PSYCHOLOGICAL CHARACTERISTICS

Theoretically, the study of giftedness is related to the psychology of individual differences. Constructs of intelligence and creativity, and to some extent motivation, have provided the psychological foundations for the assessment of giftedness. The empirical rigour of most of this research, however, is poor. However, by far the greatest body of empirical research on the assessment of giftedness is related to intelligence. Unfortunately, intelligence is an enigmatic concept. For example, is intelligence the same as verbal ability, analytic thinking, academic aptitude, strategy thinking, or just the ability to problem solve? Further, models of intelligence range from unidimensional, such as Spearman's *g*, to a three dimensional or multidimensional model according to Sternberg's (1985) Triarchic theory, or Guilford's 120 components.

In one of the classic longitudinal studies in the field, Terman (1925) investigated the various characteristics of individuals with high IQ (those with IQ scores at 140 and above). Using a 1916 edition of the Stanford–Binet, Terman and colleagues identified over 1500 children whose IQs of 140 or over placed them in the top 1% in the United States. He found that gifted individuals were of average socioeconomic status and physical characteristics, but scored above average on a variety of psychological characteristics.

Sternberg and Davidson's (1986) review outlined a number of cognitive abilities of which gifted individuals are exceptional: they have high

general intelligence and specific ability in an area of expertise, and they can easily conceive of high order relations. Many of these characteristics are in an area we call metacognition.

Metacognition, or thinking about one's own thinking, is an important component of giftedness. Alexander, Carr, and Schwanenflugel (1995) reviewed the literature on giftedness and metacognition in the areas of factual knowledge about thinking strategies, the use of strategies, and cognitive monitoring. They found that gifted students showed better performance than other students in only some aspects (factual knowledge about metacognition and transfer of strategies). Swanson (1992) compared intellectually gifted children to high, average, and low average IQ children on problem solving tasks and a metacognitive questionnaire. Gifted children performed better on problem solving tasks and scored higher for information on a questionnaire related to attributions and strategy use.

Davidson (1986) compared gifted students on mathematical and verbal insight problems. Comparing information and combining novel encoding were considered measures of insight. The gifted scored better than the non-gifted sample on insight problems and they also employed more selective encoding.

In terms of cognitive differences, Rogers' (1986) comprehensive review concluded that gifted children and adults generally differ in degree and not kind of cognition.

SOCIAL/EMOTIONAL

Janos and Robinson (1985) concluded that the intellectually gifted, at least of moderate notice or ability, are often precocious or advanced in their social adjustments. Contrary to outdated stereotypes, gifted students are typically socially and emotionally well adjusted. Extremely gifted individuals have more social and emotional adjustment problems than those who are moderately gifted. There is some conflict in the literature on whether gifted children vary in self-esteem (see Olszewski-Kubilius et al., 1988, for a review). Some studies using global measures of self-esteem show that the gifted score higher on these measures whereas other studies suggest there are no differences between the groups. Olszewski-Kubilius et al. reviewed some studies showing that gifted younger students generally score higher on measures of locus of control than comparison students. Benbow, Arjmand, and Walberg (1991) investigated educational achievement in a sample of mathematically precocious youth. They found that motivation, as measured by the quantity of academic activities participated in, was an important predictor of educational achievement and aspiration at age 23, followed by the variables related to quality of instruction and home environment.

CULTURAL/SOCIAL CONTEXT

Many psychologists who have studied intelligence believe that it is in the 'eye of the beholder' and therefore intelligence is largely or wholly culturally defined. Different cultural views have concrete effects on children's performance in the schools. For example, Okagaki and Sternberg (1993) assessed parents' and teachers' conceptions of intelligence among a variety of ethnic groups in San Jose, California. Included among others were Cambodians, Laotians, Mexicans (first generation), Mexican-Americans (second generation), and Anglos. They found that different groups placed different emphases on cognitive versus social competence aspects of intelligence. Teachers, however, emphasized cognitive over social aspects of intelligence.

Giftedness includes cultural values and therefore the opportunities to use those gifts. For example, chess prodigies appear in cultures where chess is appreciated and available to the child. Thus individuals from diverse ethnic backgrounds may display certain gifts and talent in areas particularly valued by members of the culture, but not necessarily members of the other cultural groups.

ASSESSMENT TECHNIQUES

Intelligence Testing

Klausmeier, Mishra, and Maker (1987) surveyed psychologists to determine how giftedness was identified. The majority relied on intelligence tests, primarily the Wechsler scales, followed by the Stanford–Binet, and the Kaufman Abilities Scale for Children (K-ABC). Very few used tests

Table 1. Summary of some important standardized instruments to assess intellectual giftedness

I Traditional measures
A The Wechsler Tests (e.g. WISC-III)
B Stanford–Binet Intelligence Scale
C Kaufman Assessment Battery for Children
II Alternative measures
A Sternberg Triarchic Abilities Test
B Swanson–Cognitive Processing Test

Table 2. System of categories with the gifted and talented populations

Label	SD	IQ equivalent	% of general population	Ratio
Basic	+ 1	112–115	15–20%	1 in 5 or 6
Moderate	+ 2	125–130	2–4%	1 in 35
High	+ 3	140–145	0.1–0.3%	1 in 600
Extreme	+ 4	155–160	0.002%	1 in 50,000

of creativity or achievement. The Wechsler series yield two primary factors: a verbal and a performance factor. The verbal and performance factored together yield what is known as a Full-Scale score, determined by professionals to reflect *g* (general intelligence). Table 1 provides a summary of some standardized traditional intelligence and alternative measures (to be discussed) to measure intellectual giftedness.

How far from the average a person's abilities should be before the labels of gifted or talented are applied is unclear. Some psychologists use Full-Scale IQ score at or above 120 as a cutoff score for identifying giftedness. This practice is questionable, however, because it obscures performance on individual subtests.

Subgroups of giftedness have been proposed. Gagne et al. (1993) have provided a continuum of differentiation that varies from a 'base of giftedness' to extremely gifted. As shown in Table 2, the cutoff scores on IQ tests vary from 1 standard deviation to 4 standard deviations with the prevalence in the population varying from 1 in 5 to 1 in 50,000. Conventional approaches rely on 1 standard deviation as a cutoff score from giftedness.

Criticisms

Some argue that intelligence tests are discriminatory, while others argue that they are valid predictors of school performance. Several authors argue that the identification of giftedness should not be based solely on intelligence tests, but takes into consideration expertise in a particular area. Thus, for example, if one is attempting to identify gifted writers, common sense would suggest having writing samples evaluated by an authority in that particular area. Others assume that intelligence should be defined the way the individuals are viewed in different cultures, ethnic or social backgrounds.

Alternatives

Additional arguments against traditional intelligence testing are: (a) traditional intelligence tests are more concerned with the product rather than the processes of learning, and (b) traditional testing does not address responsiveness of an individual to instruction. These criticisms have led to alternative techniques for measuring learning potential, discussed below.

Triarchic Model

One emerging model to assess giftedness is based on Sternberg's (1985) Triarchic theory. The model consists of three parts. The first relates to the internal world of the individual and specific mental mechanisms that lead to a more intelligent or less intelligent mediator. It focuses on three types of mental processes in planning what things to do, in learning how to do things, and actually doing them (referred to as meta-components, performance components, and knowledge acquisition components). The second part of the model focuses on tasks or situations that involve novelty or optimizing mental processes. Particular emphasis is given to insight and selective coding. The third part focuses on the external world of the individual and specifies three kinds of acts: environmental adaptation, environmental selection, and environmental shaping. The latter part of the theory emphasizes the role of environmental context in determining what constitutes intelligent behaviour in a given situation. Sternberg indicates that different individuals may be more or less intelligent through different patterns of abilities. However, he views mental representations and processes underlying intelligence as constant across individuals (the internal role), but the intelligent use of these processes in everyday life is not constant

and may vary from person to person and culture to culture. External world, or context, varies both within and between cultures. The interaction of the internal with the external world is mediated by experience.

No existing test measures all of the different abilities in the Triarchic Model. Within this model, however, two instruments have emerged: the *Sternberg Triarchic Abilities Test* (STAT) based on a strict theory and the *Cognitive Abilities Survey* based on a rather loose notion of a theory. The STAT has been tested in upper elementary and high school populations. Subtests focus on analytical, creative, and practical abilities in verbal, quantitative, figural, and essay domains. The Cognitive Abilities Survey has nine subtests focusing on arithmetic, proverbs, practical maths, and other examples of real world problems.

Dynamic Assessment

Underachievement is one of many complicating factors in assessing the psychological characteristics of gifted individuals. Within this context, several authors suggest that traditional intelligence underestimates general ability (e.g. see Grigorenko & Sternberg, 1998, for a review). An alternative or supplement to traditional assessment is to measure an individual's performance when given examiner assistance. Procedures that modify performance, via examiner assistance, to understand learning potential, are called dynamic assessment. The examiner attempts to move the student from failure to success by modifying the format, providing more trials, providing information on successful strategies, or offering increasingly more direct cues, hints, or prompts. Thus, 'potential' for learning new information (or accessing previously presented information) is measured in terms of the distance, difference between, and/or change from unassisted performance to a performance level with assistance. In this context, giftedness may be defined as those individuals whose performance supersedes others (e.g. as predetermined by cut-off score at 1 standard deviation above the mean) under dynamic testing conditions. This would require a standardized dynamic processing test, such as the S-Cognitive Processing Test (Swanson, 1995). Unlike traditional testing procedures, score changes due to examiner intervention are not viewed as threatening task validity. Limitations are that a number of dynamic assessment procedures provide minimal psychometric information.

Expert/Novice Strategies

Ericson and Lehmann (1996) provide a model with application to the assessment of giftedness. They review research showing large individual differences and varied performance associated with experts within a particular field. Experts are those with exceptional performance that reflects acquired abilities to store specific types of information in long-term memory. For example, those precocious in mathematics may also be precocious in their ability to remember numbers or those with expertise in a literary domain (e.g. writing) are accompanied by high vocabulary or quick retrieval of lexical information.

In one of the few subgrouping studies on expertise and giftedness, Swanson, O'Connor, and Carter (1991) compared High and Average IQ 4th and 5th grade children on measures of problem solving, strategy knowledge, creativity, academic achievement, and attributions. Subgroups were determined through a hierarchical cluster analysis for strategies for problem solving. One subgroup was designated as a prototype of gifted intelligence based on their sophisticated heuristic and strategy use. However, this gifted prototype excelled only on measures of attribution and mathematical achievement.

Speed

Another alternative assessment is reaction time or speed of information processing. Speed of memory retrieval is considered by some as an adequate measure of intelligence (Jensen, 1993). Such approaches place no emphasis on previous learning or acquired knowledge, yet these particular processes are strongly related to IQ measures.

Nomination

Numerous other techniques have been used to identify gifted people. Some are related to nominating techniques by parents, teachers, and peers on such questions as who has the most leadership ability, who has the most original

ideas, and so on. Teacher nomination is not necessarily the most reliable one, because sometimes a gifted child might have misbehaviour in the class.

FUTURE PERSPECTIVES AND CONCLUSIONS

Several definitions, whether they are psychologically based or educationally driven, have moved away from equating giftedness with intelligence as defined by general IQ tests. Unfortunately, these alternative approaches are less reliable and more open to judgement. Emerging approaches broaden assessment to suggest that expert performance be observed as well as responsiveness to dynamic testing conditions. One of the most comprehensive empirically based alternative models to assess giftedness is outlined by Sternberg (e.g. Sternberg, Ferrari, Clinkenbeard & Grigorenko, 1996). The model focuses on the internal role of the individual, the individual experience, and the external world of the individual.

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H. Lee Swanson

RELATED ENTRIES

APPLIED FIELDS: EDUCATION, CREATIVITY

GOAL ATTAINMENT SCALING (GAS)

INTRODUCTION

This entry will provide a brief summary of background, major psychometric issues, implementation aids, and current developments of Goal Attainment Scaling (GAS).

BACKGROUND

Goal Attainment Scaling (Kiresuk & Sherman, 1968) is an individualized treatment outcome measure that was developed and first applied in the mental health department of the Hennepin County Medical Center, a major metropolitan teaching hospital in Minneapolis, Minnesota. Although initially used to measure inpatient, outpatient, and day treatment patient outcomes, the method was also applied to programme evaluation of administrative divisions. Since its inception, GAS has been applied to a wide range of human service interventions in addition to mental health. The initial research was funded by the National Institutes of Mental Health for the purpose of demonstrating the method, comparing mental health treatments, and developing related knowledge and technology to bring about improved evaluation and thereby reform of publicly funded mental health.

Unlike many goal setting methods commonly found in industry and service delivery (which specified only the intended goal or target), GAS provided for the assessment of a range of expected outcomes and a resulting quantitative summary score.

Early publications (Sherman et al., 1974) dealt with the psychometric properties of the Goal Attainment Score. Later, in the mid-1970s, Smith and Cardillo of the Ioannis A. Lougaris Veterans Administration Medical Center in Reno, Nevada, provided standardization of the method and clarified its psychometric status. GAS is best understood as a measure of change rather than immediate status as is the case with standardized measures (Kiresuk, Smith & Cardillo, 1994).

Widespread utilization of the method led to the accumulation of several hundred articles, brief reviews and chapters in evaluation textbooks, translations, many dissertations, and several hundred miscellaneous documents. Our current database contains 142 dissertations, and the total number of publications is about one thousand. It is important to note, however, that GAS has taken many forms and goal setting is referred to in several contexts. The relationship of many of these publications to the standards of application recommended in the Goal Attainment textbook has not been determined. The best source of information regarding GAS at this time is the 1994 textbook where one can find the history of the method, the details of its implementation and quality control, detailed discussion of reliability and validity, and scoring aids. The findings reported in this entry are all treated at length in that volume.

The essential idiographic concept of GAS is that individuals receiving any form of intervention should be judged according to their unique capacities, aspirations, and their abilities to achieve these aspirations. Standardized measures, i.e. personality scales, mental health scales, achievement scores, level of functioning scales, etc., compare an individual relative to the performance of particular populations. However, these measures do not deal with how an individual SHOULD or COULD perform relative to these standards. GAS is not appropriate if one requires a needs assessment, the absolute level of either adjustment or functioning of clients or students at the beginning or end of a treatment programme. The method is appropriate if one wants to know about the degree of change brought about by a programme or treatment, in which case the efficiency of GAS can exceed that of standardized measures with similar content.

Another factor driving the invention of GAS is the selection of relevant content for clients having a wide range of socio-economic, educational, age, racial, and cultural population characteristics. What may be perceived as a

therapeutic achievement by the therapist and as a crucial change by the patient may never be taken into account in the organization's prescribed assessment of progress when that assessment relies entirely on standardized symptom scales.

THE BASIC PROCEDURE

The minimum requirements for GAS are (a) the specification of five plausible and scorable levels of outcome, (b) definitions of the levels consistent with the definitions originally proposed by Kiresuk and Sherman (1968), and (c) prespecification of the criteria for scoring at each level. Prespecification requires that the criteria for scoring at each of the five levels of a scale must be stated at the time the scale is constructed and not at the time of follow-up.

There are no restrictions on the types of goals that can be set (e.g. behavioural, affective, cognitive, standard scale scores, invented content) provided that a sufficiently skilled follow-up interviewer will be able to observe, elicit, document, or infer the client's level of attainment at the time of the follow-up interview. Tables 1 and 2 provide examples of Follow-up Guides for an adult medical patient and a child behavioural disorder.

Follow-Up Requirements

In all formal research or programme evaluation the follow-up interview and goal scoring should be conducted by a person who has not been directly involved in the client's treatment and has no personal investment in the outcome score. However, many therapists use the method as part of the treatment process rather than for treatment comparisons, and score the Follow-up Guide themselves. A treatment facilitation effect has been demonstrated in several studies.

Content Areas

The 1994 GAS textbook provides a wide range of examples of patient and organizational Follow-up Guides including: special education & learning disabilities, social services, diabetes, geriatric medicine, medical education, neurological handicaps, rehabilitation, marriage and family counselling, rape counselling, child abuse, crisis intervention, corrections, chemical abuse, Native American diabetic education, problem pregnancy.

For patient populations (such as geriatric patients) that have common characteristics, the process of goal specification is aided by providing content that had been found to be relevant and quality controlled for these special populations.

Table 1. Goal attainment follow-up guide

Level of attainment	*Scale 1* Control of hypertension	*Scale 2* Control of congestive heart failure	*Scale 3* Control of diabetes
− 2 Much less than expected	Cerebrovascular accident	Congestive heart failure	Diabetic acidosis in last 2 weeks
− 1 Somewhat less than expected	Diastolic pressure 105 or higher	Three or more severe symptoms: Dyspnea on exertion, shortness of breath, angina 4 or more per day, nocturnal dyspnea	Blood glucose level maintained at more than 158
0 Expected level of outcome	Diastolic pressure within 100–104	Dyspnea on exertion, shortness of breath, angina 2–3 times per day	Blood glucose maintained between 120–158 in last 2 weeks of treatment with medication
+ 1 Somewhat more than expected	Diastolic pressure within 95–99	Dyspnea on exertion, shortness of breath only when exercising, angina once a day	Blood glucose within normal limits in last 2 weeks with medication
+2 Much more than expected	Diastolic pressure 94 or less	Dyspnea on exertion, shortness of breath only when exercising, no angina	Within normal limits by diet alone (no medication)
Comments			

Table 2. Goal attainment follow-up guide

Level of attainment	*Scale 1* Eating behaviour	*Scale 2* Tantrums	*Scale 3* Dressing skills
− 2 Much less than expected	Eats alone with close supervision	5 or more tantrums per day in last 3 days	Parents dress child completely
− 1 Somewhat less than expected	Eats alone with no supervision	3 or 4 tantrums per day in last 3 days	Parents do most of dressing (pull pants up, shirt down, etc.)
0 Expected level of outcome	Eats at table with other children with special supervision	1 or 2 tantrums per day in last 3 days	Child puts clothes on with exception of shoes and socks; does no buttoning, tying, or zipping
+ 1 Somewhat more than expected	Eats at table with other children with little or no supervision	No more than 2 tantrums total in last 3 days	Also puts on shoes and socks with no tying, zipping, or buttoning
+ 2 Much more than expected	Eats with family with no supervision	No tantrums in last 3 or more days	Child ties, buttons, zips, and snaps all clothes
Comments			

In addition, these scales can take on the properties of standardized scales as well (Smith et al., 1998).

Calculating the Score

In the original publication (1968), a comprehensive formula was presented which would convert the outcome levels indicated in the Follow-up Guide into a Goal Attainment Score, with a mean of 50 and standard deviation of 10. Since that time, this formula has been greatly simplified because weighting of the scales is no longer recommended and a reasonably accurate estimate of the average intercorrelation of the scale scores has been determined. A simple alternative is to sum the scale scores, note the number of scales that are summed, and use tables to find the *T*-score corresponding to a given sum for a given number of scales. The textbook provides tables for follow-up guides having one to eight scales. Examples appear in Table 3.

PSYCHOMETRIC PROPERTIES

Scale Characteristics

A properly constructed Goal Attainment scale is at least ordinal in character: that is, a higher attainment level on a scale always represents a better or more successful outcome than a lower level of attainment. Generally, it has been found that Follow-up Guide constructors produce Goal Attainment Scores that have symmetrical or approximately normal distribution with a mean of about 50.00 and a standard deviation of about 10.00.

Reliability

In the Minneapolis study (involving multiple goal setters and follow-up occurring at different times) the intraclass reliability coefficient was 0.57.

In two studies at the Reno VAH (involving therapist-set goals and multiple follow-ups conducted at the same time) an intraclass average of 0.97 was obtained.

The corresponding intraclass values for the Psychiatric Status Rating Scale and for the Brief Psychiatric Rating Scale were 0.82 and 0.90 respectively.

In the Reno study, Product-Moment Correlations for GAS ratings averaged 0.97, for the Psychiatric Status Rating Scale 0.86, and for the Brief Psychiatric Rating Scale 0.94.

Validity

Concurrent validity studies indicate that the correlation between the GAS score and rated degree of improvement on several different measures typically falls between $r = 0.40$ and $r = 0.50$. The agreement among change measures

Table 3. Conversions key for follow-up guides having four scored scales

Sum of scale scores	Average scale score	*T*-score
Conversion key for follow-up guides having four scored scales		
−8	−2.00	20.98
−7	−1.75	24.61
−6	−1.50	29.24
−5	−1.25	31.86
−4	−1.00	35.49
−3	−0.75	39.12
−2	−0.50	42.75
−1	−0.25	46.37
0	0	50.00
+1	+0.25	53.63
+2	+0.50	57.25
+3	+0.75	60.88
+4	+1.00	64.51
+5	+1.25	68.14
+6	+1.50	71.76
+7	+1.75	75.39
+8	+2.00	79.02
Conversion key for follow-up guides having five scored scales		
−10	−2.00	19.85
−9	−1.80	22.86
−8	−1.60	25.88
−7	−1.40	28.89
−6	−1.20	31.91
−5	−1.00	34.92
−4	−0.80	37.94
−3	−0.60	40.95
−2	−0.40	43.97
−1	−0.20	46.98
0	0	50.00
+1	+0.20	53.02
+2	+0.40	56.03
+3	+0.60	59.05
+4	+0.80	62.02
+5	+1.00	65.08
+6	+1.20	68.09
+7	+1.40	71.11
+8	+1.60	74.12
+9	+1.80	77.14
+10	+2.00	80.15

is largely effected by content similarities. For instance, when the mental health treatment goals were not represented at all in the Brief Psychiatric Rating Scale, then there was no significant relationship between the GAS score and Brief Psychiatric Rating Scale scores. However, as content of the two measurements became more similar (i.e. as goals were more adequately represented by the scales of the Brief Psychiatric Rating Scale) the correlation between the GAS score and the posttreatment Brief Psychiatric Rating Scale score increased to 0.644. The same trend occurred for the correlation between the GAS score and true change on the Brief Psychiatric Rating Scale, increasing to 0.923. By including all the items in standard scales regardless of their relevance to particular clients, one is only adding error to the estimates of treatment related improvement.

There are a number of studies reported in the 1994 textbook which indicate the ability of the Goal Attainment Score to detect treatment differences.

FUTURE PERSPECTIVES AND CONCLUSIONS

The current and probable future of GAS lies in its application (along with other measures) in many areas of service delivery and in many countries. Early efforts have demonstrated that individualized outcome measures *can* be developed and used. There appears to be the nucleus of like-minded service providers and evaluators that have an affinity for understanding their interventions and their clients through the process of individualized goal setting, finding the method self-evident and facilitative of the treatment process (Gordon et al., 2000; Malec, 1999; Zaza et al., 1999). The Internet will greatly influence communication among GAS users. Current and future exchange of information regarding references and experiences with GAS can be facilitated by e-mail (thomas@kiresuk.-com) and via the World Wide Web at http://www.kiresuk.com

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RELATED ENTRIES

Applied Fields: Clinical, Applied Fields: Health, Evaluation: Programme Evaluation (General), Outcome Assessment/Treatment Assessment

HEALTH

INTRODUCTION

Most lay people say that their health is more important than anything else. Though people value health, few question what it means. When asked, people define health in many ways depending on sociodemographic factors, on behaviour or personal factors, and on their culture. For example, common descriptions of health may include references to not being ill, absence of disease, behavioural functioning, role functioning, physical fitness, energy and vitality, emotional well-being, and social relationships. Even answers to the salutation 'how are you?' can be considered a general index of health or well-being (Feinstein, 1987).

Experts also define health in many ways and there is no right or wrong definition of health. However, few would disagree with the notion that health is a important dimension of quality of life. Healthcare professionals strive to help people achieve longer and better lives through interventions aimed to save lives, ameliorate suffering, improve functioning, and protect from disease. Ware (1987) indicated that the goal of healthcare is to maximize the health component of quality of life, which could be operationalized as returning patients to normal lives. Although health status and quality of life are used interchangeably (Bowling, 2001), quality of life in reference to health should be termed health-related quality of life. That is, health-related quality of life (HrQL) is the quality of life as it is affected by health. It represents the impact of a person's health on his/her ability to lead a normal or fulfilling life. Chronic disease affects and is affected by broader aspects of people's lives and it is impossible to separate disease from an individual's personal and social context. No illness exists in a vacuum. Using health assessments instruments or HrQL measures ensure that treatment and evaluations focus on the patient rather than the disease. These instruments complement the traditional focus on disease outcomes (objective, clinical, or biological measures of disease) by assessing variables such as the need for healthcare, the quality of service, and the effectiveness or cost utility of treatments and interventions. Outcomes are defined as the change in health status that results from health interventions, or the deliberate decision not to intervene. An HrQL outcome has come to mean the extent to which a change in a patient's functioning and well-being meets that patient's needs or expectations.

Definitions of Health

Most definitions of health cluster around one of two views: health as the absence of illness and infirmity (freedom from disease, dysfunction, and disability), or health as a positive well-being (a state of equilibrium, adaptation, harmony, and wholeness). The World Health Organization (WHO) emphasizes the importance of defining health in terms of positive states and defines

health as a 'state of complete physical, mental and social well-being and not merely the absence of disease or infirmity' (WHO, 1948). Two additional themes that emerge from the many definitions of health are (1) that premature mortality is undesirable, and (2) that quality of life is important. Thus, healthcare practices are concerned not only with the avoidance of death but also with the prevention and riddance of conditions that reduce quality of life.

Health is frequently conceptualized as a multidimensional construct that includes at least six dimensions (Bruess & Richardson, 1992): *Physical health* (efficient bodily functioning, resistance to disease, and physical fitness), *Mental health* (the ability to cope, grow in awareness and consciousness, and grow emotionally and develop to our fullest potential), *Emotional health* (the ability to control emotions and express them comfortably and appropriately), *Social health* (good relations with others, a supportive culture, and successful adaptation to the environment), *Occupational health* (feelings of comfort and accomplishment related to one's daily tasks), and *Spiritual health* (the ability to discover and articulate a personal purpose in life, learn how to experience love, peace, and fulfilment, and how to help oneself and others achieve full potential). Thus, any comprehensive health assessment should include measures of physical, mental, social, and role functioning along with global indicators of general health and quality of life perceptions (Ware, 1995).

A Concept of Health as a Personal Resource

Health can be conceptualized as a dynamic and empowering resource that improves quality of life and lengthens quantity of life. The attainment of health is not 'the' goal itself, but a tool or state that allows an individual to develop physical, psychological, social, and spiritual resources to function in his or her environment. Health is the ability to have and reach goals, meet personal needs, perform daily activities, fulfil role obligations, and cope with everyday problems. We also favour the view that health is not an *all-or-none* state. As a multifaceted resource, an individual may have both poor physical health and good psychological health. Moreover, poor and good health may co-occur within the same dimension of health. For example, at the psychological level, a person may lack confidence but report being otherwise happy. If health and ill-health are not binary opposites, health and ill-health may, and most likely do, co-exist in all people. Health occurs in the presence of ill-health rather than in its absence (Buetow & Kerse, 2001).

Although a personal resource, health is also a socio-ecological product, whose effective promotion and successful attainment depends on the participation all those within the social milieu. The Ottawa Charter for Health Promotion stated that 'health is created and lived by people within the settings of their everyday life; where they learn, work, plan and love. Health is created by caring for oneself and others, by being able to take decisions and have control over one's life circumstances, and by ensuring that the society one lives in creates conditions that allow the attainment of health by all its members' (WHO, 1986). Thus, pro-health investments and responsibilities should be extended beyond the narrow spectrum of healthcare organisms and professionals. Growing out of this recognition that daily-living environments impact the health and well-being of their members are the well-known Healthy Cities movement and the more recent initiative 'health promoting universities' (Tsouros et al., 1998; Reig et al., 2001). These settings-based programmes aspire to: (1) provide with healthy working and living environments, (2) integrate health-promoting initiatives into the daily activities of those living within specific settings, and (3) reach out and incorporate these initiatives into the larger community.

HEALTH ASSESSMENT

One of the important developments in the healthcare field has been the recognition of the centrality of the patient's point of view in monitoring the quality of healthcare outcomes (Ware, 1992). Thus, health assessment, or the use of standardized procedures that quantify an individual's health, should in most cases include measurements of the person's subjective feelings of health, behavioural functioning, and well-being (HrQL). Subjective health assessments often complement objective measurements and contribute to develop a more complete picture of the

person's health status, effects of a disease, and the effectiveness of healthcare interventions.

Perhaps the most important step in the health assessment process is the selection of appropriate measurement instruments, which should be guided by clearly conceptualized and operationalized definitions of health. Health assessment strategies may vary along a continuum from completely quantitative (e.g. cost-effectiveness) to qualitative methodologies (e.g. unstructured interviews), with many variations in between. It should be noted that theoretical and technical advances in test construction, design, international adaptation, and methods for self-administered questionnaires have contributed to important improvements within the health assessment field and that subjective, self-report inventories are not necessarily less valid or useful than instruments that measure more easily quantifiable data. General heath surveys have many valuable applications, including (a) monitoring the health of the general population, (b) evaluating healthcare policies, (c) evaluating clinical trials of alternative treatments, (d) designing systems for monitoring and improving healthcare outcomes, and (e) guiding treatment in clinical practice.

Most health assessment instruments can be grouped into three categories: Generic, Disease-specific, Domain-specific measures (Bowling, 1997; Bowling, 2001). Generic measures are useful when the purpose of the assessment is to cover basic relevant variables to make outcome comparisons between different diseases and conditions, or across different populations or reference groups, or to obtain norms about the health status of the general, 'healthy' population. However, when the investigator or practitioner is interested in a particular component or domain of health, domain-specific instruments are called for. A domain-specific measure is used when the area covered is of particular relevance to the study and its hypotheses, and where generic and disease-specific instruments neglect that area. Finally, disease-specific measures are used when disease-related outcomes for a specific illness or disease are the focus of study. The advantage of disease-specific measures is that they contain items highly relevant to specific medical conditions and are more likely to detect medical or quality of life changes within specific patient populations. Table 1 presents some of the best known health-assessment instruments classified under each of the three categories described above.

Table 1. Some examples of health status assessment instruments and health related quality of life measures

Generic measures
The Nottingham Health Profile
The Dartmund COOP Function Charts/ The COOP-WONCA Charts
SF-36
Disease-specific/Condition-specific/ Diagnostic-specific measures
Guyatt's Chronic Heart Failure Questionnaire (CHQ)
The EORTC Quality of Life Questionnaire
SmithKline Beecham Quality of Life Scale (SBQOL)
Stanford Arthritis Center Health Assessment Questionnaire (HAQ)
St George's Respiratory Questionnaire
Disease-specific measures of quality of life: Stroke
Kidney Disease Quality of Life Questionnaire (KDQoLQ)
Domain-specific measures
Goldberg's Health Assessment Questionnaire
The Mini-Mental State Examination
The McGill Pain Questionnaire
The Index of Independence in Activities of Daily Living
The Life Satisfaction Index
The Social Adjustment Scale
Rotter's Internal-External Locus of Control Scale

Note: For a more detailed description of these and other instruments see Bowling, 1997, 2001; McDowell & Newell, 1996; Salek, 1998; Stewart & Ware, 1992; Streiner & Norman, 1989.

The universal and psychometrically perfect instrument does not exist. It would be deceiving to imagine that one set of questions could suit all health conditions, all individuals, and all applications. Increasingly, authors are calling for efforts to foster a science of health assessment that integrates the fields of psychometrics, clinimetrics, and econometrics. This vision sees health assessment as a clinical and policy-making guiding tool whose function would be to give practical solutions such as the selection of specific clinical interventions or the allocation of public funding to different healthcare initiatives. Ultimately, such an effort would improve the welfare of patients, and would pressure healthcare professionals to include HrQL outcome assessments in the routine of their clinical interventions.

Table 2. COOP chart system. Nine scales, each of which is used to measure different dimensions of a person's behavioural functioning and well-being

Concept	Definitional strategy
Physical fitness	Shows a person's physical endurance
Feelings	Shows a person's emotional health
Daily activities	Shows the difficulty a person may have accomplishing daily tasks at home or work
Social activities	Shows the extent to which physical or emotional health interferes with a person's social activities
Pain	Shows the level of pain a person may be experiencing
Overall health	Shows the level of a person's overall health/well-being
Health change	Shows if change in a person's health has occurred
Social support	Shows the number of people an individual can turn to for help
Quality of life	Shows how a person does and feels about his/her life in general

Most health status instruments measure deviations away from a state of health, with health conceptualized as the absence of illness and disease. Whereas this narrow conceptualization of health can be appropriate when measuring health status in severely ill populations, general population surveys should include multidimensional, HrQL assessments that sample the individual's functioning across various domains of human activity (Bowling, 2001). The COOP Charts are a good example of the multidimensional approach to HrQL assessment (see Table 2).

Advances in Health Assessment or Health-Related Quality of Life

HrQL as an outcome measure redirects attention towards the impact of the health conditions and healthcare interventions on the patient's behavioural functioning and lifestyle. HrQL has become an industry in itself (Bowling, 2001). These measures should assess the complete range of normal activities that could potentially be affected by the medical condition and treatment under study. Findings obtained through applied investigations reveal the following conclusions:

- HrQL instruments provide important information to investigators and healthcare professionals, as well as to the patients and their significant others. Important benefits include aid in the identification and prioritization of problem areas, improvements in the communication and relationship between all interested parties (i.e. patients, their families and healthcare personnel), facilitation of the client's participation in clinical decisions, and better detection of treatment-induced changes in the patient.
- Many HrQL instruments have good psychometric properties and their designs and formats make them amenable to both research and clinical settings.
- HrQL measures have contributed to the realization that there is not a direct correspondence between objective functioning and an individual's HrQL, nor between perceptions of patients, health professionals, or even others with similar disabilities. Health assessments as seen by the patients themselves, their healthcare providers, and those close to the patients are often uncorrelated.
- Patients may rate their health or quality of life highly despite having obvious medical problems. For example, patients may show significant improvement in HrQL scores that do not correlate with accompanying changes in objective measures of disease or physical functioning.
- Patients' priorities may change during the course of their disease or even near the end of their life.
- Patients may change their internal standards, values, or health and quality of life conceptualization as they respond and adapt to their situation. These have come to be known as the 'response shift'.
- Patients tend to rate their own health and quality of life as being better than the patients' own relatives and friends.
- Healthcare professionals may find it difficult to accept patients' positive ratings of health and quality of life.

- Healthcare professionals and informal caregivers can provide valid and useful information on concrete, observable aspects of health and quality of life, for patients who, as a result of age, cognitive impairment, communication deficits, severe distress, or because the measures are too burdensome, are unable to complete the HrQL measures themselves.

Testing the validity and usefulness of new and existing HrQL instruments continues to be an important endeavour within the health assessment field. Investigators are interested in checking whether all relevant concepts are represented in the measure or set of measures under investigation (content validity). Also important is to test whether the measure of interest correlates with a 'gold standard' measure of that concept (criterion validity), or with related variables in theoretically congruent ways (construct validity). Researchers are also interested in learning the meaning of specific scores and score-change values (interpretability of scale scores), and whether a particular measure adds substantial information above and beyond other measures and sources of information (incremental validity). Finally, researchers also examine systematic response biases and evaluate whether the psychometric properties generalize across populations (generalization validity).

FUTURE PERSPECTIVES

Fortunately, we have today many standardized health assessment instruments of sound psychometric properties, with simple well-organized formats that make them user friendly and attractive to the average person. However, more research might be needed to further refine their formats and designs to make them more valid to underserved and special populations such as psychiatric patients and individuals with perceptual or attentional deficits. Of special attention is the area of investigation invested in promoting the development and validation of instruments across culturally and ethnically diverse populations.

Individualized measurement is an area of particular relevance that will need further development. These instruments ask the same questions to all patients but allow them to specify their own responses. Current examples include the *Patient Generated Index*, the *Schedule for the Evaluation of the Individualised Quality of Life*, and the *Disease Repercussion Profile*. Developing new measures and refining existing ones to simplify weighing systems, facilitate data analysis, or combine short individualized measures with key-disease and treatment-outcome measures are advances to seek in the future.

Utilization of new technologies is already a highly adopted and accepted practice by researchers and clinicians. Today's potent computers facilitate the storage of huge data sets, and accelerate the process of data analysis and results presentation. The administration of questionnaires through the Internet has great potential for improving health assessment strategies because electronic administrations may facilitate data collection tasks, improve the accuracy and efficiency of data scoring and data analysis, and provide the scientific and lay communities with rapid access to the results and their implications. Thus, future areas of inquiry will include the validation of the Internet approach to data collection.

Of increasing interest is the area of clinical utility. In particular, it will be important to determine whether instruments are appropriate, valid, and useful in the clinical setting and, if not, whether new instruments should be developed. Clinical interpretations, the practical meaning of results obtained with HrQL instruments, continue to be ambiguous. Future research should answer the questions: what constitutes an important change in health or HrQL score? To whom is the change important?

Training in the use of health assessments is something that is generally lacking in undergraduate and postgraduate education. Proxies or informal caregivers would also benefit from specific education and training in the function and use of HrQL instruments. Here we are talking not only about ensuring that training and education occur and reach those involved in the direct care of patients, but also about the process of creating and testing effective instruction methods. A related area is that of public dissemination of scientific knowledge. Informing the public at large of the findings associated with treatment-outcome evaluations may foster social involvement with the potential for increasing

accountability and the quality of care among healthcare professionals.

Last but not least, further development and refining of theoretical models of health should be at the forefront of the health assessment field. Outcome results need to be accompanied by an understanding of how they came about and how they may generalize or be specific to certain circumstances. Thus, theoretically driven research with clearly formulated, falsifiable hypotheses should continue to be the guiding principle.

CONCLUSIONS

Health is a personal resource that allows us to live a normal life and health problems represent a threat to our ability to carry out our daily-living activities. Currently, there are many health assessment instruments with good psychometric properties that are being used successfully within research and clinical settings. The great majority of these instruments belong to the area of study known as health-related quality of life (HrQL). HrQL measures are designed to assess people's own perspectives of the impact health and healthcare interventions have in their lives, and thus enable them to part take in research clinical decisions. Although comprehensive, reliable, and valid measures are available, further development of health assessment methodologies is needed. We must strive for a better understanding of how to interpret and use this information for clinical use and to develop better models for integrating health assessment data into a general model of health outcome.

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RELATED ENTRIES

APPLIED FIELDS: HEALTH, QUALITY OF LIFE, INTERVIEW IN BEHAVIOURAL AND HEALTH SETTINGS

HISTORY OF PSYCHOLOGICAL ASSESSMENT

INTRODUCTION

Assessment was introduced in psychology as part of the scientific methodology applied to the study of mental and behavioural processes. Evaluation, both in quantitative and qualitative terms, was needed in order to fulfil the scientific aspiration to determine, measure and evaluate all phenomena involved in that research, and turning into a measurable form those elements not yet quantified (Pearson).

The ways to carry out assessment very soon diverged, as dimensions and elements to be considered by psychologists increased very rapidly and related to different aspects of their object of study. Research concentrated at an early moment on individuals, but soon after social and group aspects gained salience. At the turn of the century, psychologists became progressively engaged in practical affairs. They needed to know not only who the person was and how his/her mind was working, but also what capacities and abilities could be employed as a means to reach personal aims. Individual assessment had to be completed with group and collective measures (Anastasi and Urbina, 1997).

The development of assessment techniques clearly parallels the history of psychological science (Carpintero, 1996). Types of evaluation have been adapted to the idiosyncratic kind of phenomena to be studied (normal vs. abnormal, individual vs. group dimensions, abilities vs. performance...). Only some crucial points will be included in what follows.

ASSESSMENT IN PRE-WUNDTIAN TIMES

Popular non-scientific techniques for assessing individuals have been employed since ancient times. Astrology, chiromancy and some similar procedures have spread out all over the world, as the need for knowing who the other is represents a basic and pungent one. But they will not be considered here.

A first scientific view on the subject may be related to early Greek medicine, and its Hippocratic school of thought. Reworked by Galen (2nd century A.D.), the doctrine that body constitution, conceived as the result of a combination of humours – yellow bile, black bile, blood and phlegm – caused the psychological qualities of the person lasted for a millennium or more. People could then be categorized into a fourfold system of temperaments (melancholic, choleric, phlegmatic and sanguine), predisposing them to experience different types of emotional reactions and to exhibit different personality styles (Fernández-Ballesteros, 1980).

In the Renaissance, the Spanish physician Juan Huarte (*c.*1530–1589) built a complete theory of vocational guidance based on Galenic ideas of temperament and body constitution, and on a rough 'professiography' of his own. He first claimed in his *The Trial of Wits* (1575) for an adjustment of the person's qualities to the requirements of each profession – theology, medicine, law, army and politics. He is usually credited as the 'Father' of the psychology of individual differences.

The doctrine of humours, variously reinterpreted, was still alive in the 20th century. I. Pavlov (1849–1936) redefined these temperaments in terms of dynamic properties of the nervous system as conceived by his own doctrine (nervous speed, strength and excitation–inhibition balance).

Some other approaches were developed in modern times, which were also based on natural science. Phrenology, created by the Austrian physician F.J. Gall (1758–1828), admitted that mental faculties were directly related to the relative volume of brain centres, whose size could be estimated through skull examination. Phrenologists (G. Combe, J.G. Spurzheim, M. Cubí and others) made personality diagnoses of normal and abnormal people. Influential among lay people and strongly criticized by philosophers

and scientists, they in fact paved the way for the building of a scientific psychology.

The momentous importance of individual differences clearly appeared after the discovery of the so-called 'personal equation' characterizing the operation of individuals when registering events. The German astronomer F.W. Bessel (1784–1846), and the Dutch physiologist F.C. Donders (1818–1889), elaborated the 'reaction-time' concept that in the long run became the basis for mental chronometry, an essential methodology for the study of mental activity.

The theory of evolution (1859), by C. Darwin (1809–1882), marked a turning point in the issue. It stressed the variability of somatic and mental characteristics in individuals, which would enable best-endowed individuals to cope with environmental challenges, while less capable ones would not survive. Such 'natural selection' was a means of the evolution. Based on evolutionary grounds, a functional assessment of potentialities and abilities of organisms to face different types of situations was considered to provide with useful predictive knowledge of future behaviour in certain settings. So the basis of mental assessment had been laid.

PSYCHOLOGICAL ASSESSMENT IN MODERN TIMES

While scientific psychology is generally viewed as born under German W. Wundt's efforts in 1879, Englishman Francis Galton (1822–1911), a versatile genius, is usually conceived as the founder of psychological assessment. Influenced by Darwinism, he became interested in the study of differences among individuals, and worked out useful methods and designs (such as the study of twins), and statistical concepts and measures. He also established in London (1884) a laboratory for testing individuals, and devised some instruments (e.g. the Galton Whistle or the rating scale) for that purpose.

Differences among mental patients became the main focus of interest for some nineteenth century psychiatrists. German Emil Kraepelin (1856–1926) and Italian Giulio Cesare Ferrari (1868–1932) devised various mental proofs to test on dimensions like sensory discrimination, reaction time or mental association in order to arrive at a diagnosis. But it was in the US where the technical concept of 'mental test' was introduced with its modern significance. This was done (1890) by J. McKeen Cattell (1860–1944), a former student of Wundt and Galton who tested sensory and motor abilities among college students. Soon after, J. Jastrow (1863–1944) administered a test battery to general people at the Chicago International Fair (1893). The testing movement had yet begun (McReynolds, 1968).

During the same time, educational authorities facing school problems asked psychologists for help. In Germany, H. Ebbinghaus (1850–1909) devised some tests for assessing school children on learning and retention (1897). But it was Frenchman A. Binet (1857–1911) who with his collaborator V. Henri made an epoch-making contribution, the metric scale for intelligence (1905), a worldwide test for assessing intellectual abilities, allowing the determination of the relative position of a child (his 'mental age') among a certain population. Evaluation and comparisons between individuals became then possible. German W. Stern (1871–1938), whose pioneer book (*Ueber Psychologie der individuellen Differenzen*, 1900) set the field for the followers, coined the idea of the Intelligence Quotient (IQ), conceived as the ratio of mental age to chronological age (times 100).

The Binet scale soon received a lot of attention by practitioners from all over the world (R.M. Yerkes [1876–1956], F. Kulhmann [1876–1941], O. Decroly [1871–1932], H. Goddard [1866–1957], W. Stern, among others). Some independent measures implemented by other people (like the Maze test of G.S. Porteus [1915] or the Kohs' Block-design test [1923]) were largely overshadowed by the success of the Binet–Simon scale.

Tests paved the way for an in-depth study of mental abilities and their structure. In the United Kingdom, C.E. Spearman (1863–1945), another student of Galton, working on correlation scores from different tests, set the basis for 'factor analysis', and considered that intelligence test scores resulted from two main components ('two-factor' theory): a general ability (*g* factor) for knowledge and various specific abilities related to each tested dimension. Abilities in every individual appeared then, forming a structure whose order had to be discovered.

Quantitative studies on intelligence benefited from large testing programmes carried out in various countries. The US Army carried out a noteworthy programme during World War I

(1917–18) in which over one and a half million people were tested with two parallel proofs – the Army Alpha for literate and the Army Beta for illiterate people [A. Otis and R.M. Yerkes]. It proved to be very effective in placing in the right place thousands of young soldiers entering the army, a result that strongly backed the usefulness of psychological methods in applied questions.

More and more, intelligence was seen as a general ability based on hereditary grounds, stable through ages, and easy to be measured with scales that were improved day after day. American L.M. Terman (1877–1956) assumed its distribution to be normal in a population. Also, the stability of mental measures along the lifetime was soon established. In the US, D. Wechsler (1896–1981) added a scale for adult testing, and considered adolescent scores as good estimates for adult ones. Such results stimulated further developments in other fields and new testing instruments were created for practical purposes. Musical talent was appreciated by the Seashore's proof; child development was evaluated through a battery of scales devised by A. Gesell (1880–1961) in the US, and by Ch. Bühler (1893–1974) in Austria; some other specific aptitudes, such as the mechanical ones, were evaluated through some tests created by McQuarry (1925) and many others. In the field of personality, US psychologist Robert S. Woodworth (1869–1962) created a 'Personal data sheet' (1918), the first personality inventory, to provide psychologists with an instrument to screen out neurotic tendencies and emotional aspects of personality among soldiers. Moral honesty, self-control and personal character were studied by two US psychologists, H. Hartshorne and H. May (1925), that created a large test battery with situations where deceit was more or less feasible, and defined moral traits through covariation of results.

The study of personality was enriched with new qualitative, non-quantitative, approaches. First, Swiss psychiatrist Hermann Rorschach (1884–1922) created an inkblot projective test, that proved very useful to detect psychopathological tendencies among patients in the clinic. Individuals were supposed to 'project' out the conflicts and forces acting in their minds through their responses to inkblots. While psychometric approaches offered some insights on mental structure, projective tests threw new light on mental dynamics.

Applied psychology has been one of the fields that largely stimulated the creation of new assessment techniques. These were required in order to formulate adequate predictions of the performance of individuals in real settings. A widely accepted principle was 'the right man in the right place'. Test situations had to be evaluated according to the predictive (valid) knowledge obtained through them. The need for efficacy oriented the work of many research groups all over the world.

The German psychologist H. Muensterberg (1863–1916), a former student of Wundt, became the leader of the field in the US until World War I, then as a German-born person was ostracized there and he soon died. He devised tests for attention, memory, speed response and accuracy. Under his influence, applied psychology rapidly developed in Germany and in other European countries. H. Tramm, W. Moede, K. Piorkowsky, in Germany; A. Gemelli in Italy; E. Mira in Spain; J.M. Lahy and H. Piéron in France; E. Claparède in Switzerland, C.S. Myers in Great Britain; O. Christiaens in Belgium, founded testing centres and devised instruments with which mental diagnosis and evaluation in different settings became possible, so that practical decisions could be taken.

The spreading of tests, procedures and instruments in different countries raised technical problems of communication among groups. Questions on vocabulary, test adaptation and score equivalence demanded cooperative work, and mainly through the efforts of Swiss E. Claparède (1873–1941) an international society (*Societé internationale de psychotechnique*, then turned into the now existing IAAP) was established in 1920 to enhance practical research under common standards.

Some basic problems also appeared. For instance, psychotechnologists had to differentiate between innate and learned abilities, to compare the effectiveness of one-session against continuous assessing procedures, or to differentiate selection from vocational guidance techniques, among other questions.

In what concerns the innate-learned opposition, intelligence tests became strongly questioned. Was it an inborn quality, or could it be learned from experience? In the US,

H.H. Goddard (1866–1957), a Binet follower, tried to compare the achievements and life records of both legitimated and illegitimated lines flowing from one common ancestor – the former characterized by the respect to law and middle class morality, the other full of immoral or criminal individualities. He concluded from here (1912) the hereditary nature of mental traits. Not only intellectual but also moral qualities were supposed to be based on an inherited nature. As a consequence, US federal law regulating immigration excluded from it all the 'persons of constitutional psychopathic inferiority'.

Different races and cultures were also compared on the basis of their performance on intelligence tests. Data from the Army Alpha and Beta tests were studied and reanalysed. Significant differences on IQ among people from various ethnical origins were supposed to be found (Brigham, 1923). Among other pungent results, intellectual weakness of Negro Americans seemed to be firmly established on those grounds. Democracy was criticized by some groups on the grounds of offering political equality to unequally mentally endowed people. Racist arguments seemed to flow from psychological data. In Europe, data obtained by H. English and others suggested strong correlation between economic level and IQ, so pointing to non-inborn factors in intelligence scores. The discussion was deeply affected by political prejudices and attitudes. Voices then rose against IQ on political grounds. In the US, the journalist W. Lippmann (1899–1974) strongly criticized (1922) the testing procedures for taking scores as true 'things' instead of rough estimates of variable qualities in subjects. In other countries, reaction took place later. In Russia, then under the Soviet regime, a ban for all testing activities was imposed by the Communist Party's Central Committee, considering them as reactionary and anti-egalitarian techniques (1936).

Opposition to mental measurement also grew from theoretical grounds. Behaviourism, that largely dominated US psychology (between the 1920s and 1960s), banned all mentalistic concepts from its system, especially from its clinical topics. Psychology should only deal with behavioural facts and laws, and each individual should be tested in definite settings, in order to establish those precise S-R associations causing his/her behaviour. Adaptive or maladaptive habits substituted old personality traits, and were evaluated in order to permit their change under application of 'behaviour modification' procedures. New instruments based on observational procedures were developed, employing sampling recording of target behaviours; they substituted the traditional tests and questionnaires.

Notwithstanding, some classical tests continued to be successfully developed. During World War II, a new Army General Classification Test (AGCT, 1947) was administered to millions of US soldiers, and proved to be a useful instrument, largely employed in social studies of intelligence. At the other hand, in clinical grounds mental concepts were kept alive. C.G. Jung's associative test (1905) to explore the conflicts of mind through word associations represents a pioneer effort. Projective proofs were developed after the Rorschach model: H. Murray (1893–1988) created the TAT (Thematic Apperception Test, 1935) to explore needs and drives through the analysis of short stories; diagnoses based on the peculiarities of motor responses were offered by A. Luria (1902–1977); knowledge through drawings (L. Bender, F. Goodenough, K. Machover); and E. Mira-Lopez (1896–1964) with his PMK test, and so on. Comparison of 'answer profiles' with those coming from criterion groups of psychiatric patients were employed in MMPI (Hathaway & McKinley, 1943); comparison of performances with those of criterion groups is at the core of Luria's neurological test. All these explorations reflected psychologists' efforts to create qualitative ways of assessing psychological traits. (A basic source of information on testing devices is O.K. Buros' *Mental Measurement Yearbook*, that appears on a periodical rate since 1938). A related theoretical discussion rose between pros and cons of both 'clinical' and 'statistical' approaches to knowledge. L.J. Cronbach also pointed to a 'harder' and more basic opposition between 'experimental' and 'correlational' methodologies in psychology.

CONTEMPORARY PROBLEMS

The decline of behaviourism and the rise of the new cognitive model since the 1960s brought

with them a renewed attention on mental processes as causing open behaviour (Silva, 1993). The 'computer metaphor of mind' largely inspired the new view, and great attention was paid to the ways and manners of mental information processing (IP) by individuals. Under its influence, the assessment process turned to be viewed mostly as a process of problem-solving and decision-making, in which measurements and analysis are employed as means for answering questions related to the characteristics of a certain target involved in a psychological intervention. As a result, it may be said that 'any type of psychological task involves assessment at some stage' (Fernández-Ballesteros, 1999).

The field has grown enormously in recent times. Now it includes not only the study of individuals and groups, but also of environmental characteristics and traits, and of the efficacy of intervention programmes. Both quantitative and qualitative standardized procedures are offering a detailed knowledge that permits not only objective classifications but also some well-controlled practical interventions (Matarazzo, 1992).

Present day psychological assessment is multifaceted and covers old and new topics. Among them are included the evaluation of a variety of dimensions – intelligence and aptitudes, personality, emotionality, motivation, attitudes and values etc. – that may well serve for theoretical or practical purposes in different areas (health, education, clinical practice, organizational work etc.) and perspectives.

The growing variety of theoretical constructs, and the technical advances in detection and measurement procedures, impulsed great developments in the field. For instance, the recent 'Big Five' factor model of personality (McCrae & Costa, 1990), that integrates many previous findings, has brought new vitality to that area. At the other hand, some mathematical developments paved the way for current 'Item response theory', which stresses the significance of responses to single items in order to evaluate a certain trait in an individual. Under its influence, some tailor-made proofs have been developed, in which an arborescent group of items are administered in an idiosyncratic way to individuals, according to their own traits and problems.

As it has been noted, contemporary societies are more and more interested in questions related to ageing, multiethnic characteristics, quality of life and its global distribution and inequalities, and other topics that demand the creation of new instruments for standardized measurement-enabling comparisons.

Recent progress in neurological and neuropsychological techniques (brain imaging, gene interventions and therapies etc.) is improving the knowledge of brain-behaviour dimensions and interactions. At the same time, computer assisted testing has largely developed, enabling researchers to operate with larger and faster volumes of information to be employed in assessment process. New instruments have been elaborated for these machines, that shorten the time for evaluation, permit comparisons with enormous amounts of data, and combine clinical and statistical approaches to the study of the individual (e.g. Krug, 1993).

The field, as a whole, is growing in parallel with that of scientific psychology in general, and both are facing the challenges of present-day societies.

FUTURE PERSPECTIVES AND CONCLUSIONS

As phenomena to be studied are changing, according both to variations of the theoretical points of view and to the emergence of new social needs, the field of assessment is in continuous evolution.

Some basic questions are at present demanding sound solutions.

(a) Assessment procedures are poorly regulated. Norms regulating adaptation and construction of instruments, scientific requirements to be fulfilled by technicians, and ethical standards protecting subjects under study are in need of a general consensus that will guide evaluation carried out in developed societies.

(b) Instruments employed into a wide range of cultures are scarce, and cross-cultural comparisons are a difficult task to be carried out, in many sorts of psychological dimensions. Wide acceptance of some models in western countries – as the mentioned Five Factors Model in personality – is a goal to be reached in other dimensions, in order to implement broad

theoretical constructs well measured through widely spread out devices. Meta-analysis techniques have spread out in literature, trying to introduce normalization among the immense variety of empirical studies.

(c) An in-depth knowledge of the person–situation interactions cannot rely only on tests and psychometric devices, but need also to integrate holistic and qualitative information to mere quantitative measures. Theoretical models offering coherent integration of those dimensions are to be built as a means for enlarging our body of knowledge.

(d) Psychological models of man will include more and more gene-based knowledge of the biological basis of organisms. Evaluation of individuals will rely more and more both on genetic engineering and on a socio-historical approach to group mentalities.

Given the basic connections mediating psychological theory and evaluative processes, a continuous interaction between both lines of thought may be predicted for the coming future.

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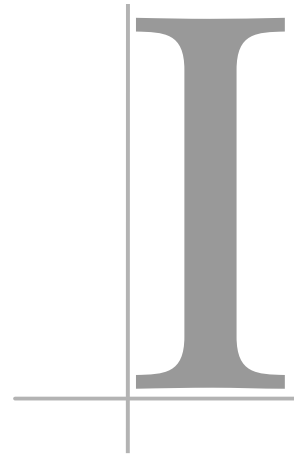
Heliodoro Carpintero



IDENTITY DISORDERS

INTRODUCTION

This entry describes Erikson's concept of identity and important elaborations made by later researchers. It also overviews currently used measures of identity derived from Erikson's work. Various identity disorders linked with arrested development of the self are also addressed, along with current instruments used for assessment purposes. New directions for research on the relationship between identity development and psychopathology are suggested in conclusion.

IDENTITY DEFINED

Erikson (1963) defined identity as a sense of self-sameness and continuity, which enables one to express biological capacities and psychological needs and interests within a social context. Identity formation is the process of finding meaningful vocational directions, outlets for the expression of ideological values, and satisfying forms of sexual expression in a wider social milieu.

Issues of identity, according to Erikson (1963), generally come to the fore during adolescence, though they may continue to be revised and modified throughout adult life. Erikson has described an eight-stage sequence of psychosocial tasks requiring resolution for optimal personality development over the lifespan; he sees the task of finding some resolution to 'Identity vs. Role Confusion' as central to adolescence. To Erikson, identity is something an individual possesses to a greater or lesser degree; one can assess an individual's identity as lying on a continuum somewhere between the poles of identity achievement and role confusion.

Elaborations on Identity

James Marcia (1966; Marcia et al., 1993) has operationalized and empirically elaborated Erikson's construct of identity by identifying different styles by which adolescents engage in forming their identities. The *identity achieved* and *foreclosed* individuals have both formed reasonably firm identity-defining commitments. However, the identity achieved has made such commitments on his or her own terms following a time of active exploration and experimentation, while the foreclosed individual has made commitments based on identifications with significant others, without significant exploration of alternative possibilities. *Moratorium* and *diffuse* individuals have not made identity-defining commitments; however, moratoriums are very much in the process of actively exploring possibilities, while diffusions are not. Identity-diffuse individuals may or may not have previously engaged in identity exploration, but are unable to form, or uninterested in forming, identity-defining commitments. These four identity statuses have consistently been associated with different clusters of personality variables,

antecedent family conditions, and developmental patterns of movement over time.

IDENTITY STATUS ASSESSMENT

The Identity Status Interview (Marcia et al., 1993) assigns an overall ego identity status to an individual based on the ways in which he or she has explored (or not) and made commitments (or not) to identity-defining vocational, ideological, and sexual roles and values. The most commonly used paper-and-pencil measure of ego identity status is the Extended Objective Measure of Ego Identity Status – II (Adams, Bennion & Huh, 1989). This instrument assigns an identity status within each of eight identity domains, and provides ways of deriving an overall identity status assessment. Both measures have consistently shown good indices of reliability and validity.

Whether identity in general or each identity status in particular represents a unitary construct is an issue for further research. Preliminary research on the identity diffusion status with patient samples has suggested that identity diffusion can be divided into at least four facets: 'role absorption', 'painful incoherence', 'inconsistency', and 'lack of commitment' (Wilkinson-Ryan & Westen, 2000). The diffusion identity status may thus reflect any one of a variety of underlying identity disorders.

IDENTITY DISORDERS

A developmental prerequisite for optimal identity formation is the development of a stable sense of self. By and large, early disturbances in the development of a child's sense of self arise from a history of parental empathic failures and the child's consequent inability to create inner representations of these attachment figures. Failures by the child to establish basic trust and secure attachment to a caretaker as well as parental failure to optimally frustrate the child's grandiose sense of self are likely to create developmental deficits (Erikson, 1963). The lack of a secure base may lead the individual to avoid the exploration and experimentation necessary for future identity achievement, and may result in identity diffusion (Kroger, 2000). In some cases then, a state of identity diffusion could indicate a fragmented self, feelings of emptiness, gender dysphoria, and a susceptibility to external influences. These circumstances may also create a vulnerability to dysfunctional impulse regulation typical of, for example, bulimic symptoms, suicide attempts and substance abuse. Other manifestations of identity diffusion might be the antisocial, paranoid and schizoid personality disorders and, in particular, the borderline personality disorder (Akhtar & Samuel, 1996). The latter will be reviewed in more detail below.

Gender Identity Disorder

Gender identity development normally takes place during the first 2–3 years of childhood. As children progress developmentally into adolescence, they attain a sense of certainty about their gender and their gender roles. Developing a sense of gender identity is usually an unconscious process, while more conscious considerations are involved in developing gender role behaviours. Normally, the adolescent operates within a rather wide range of culturally acceptable gender role behaviours.

In childhood and adolescence, some transitory cross-gender behaviours may occur as experimentations in the search for a sense of identity. However, a small number of individuals will develop a Gender Identity Disorder (GID), a more fundamental disturbance in gender identity preference. Here, cross-gender behaviours may be more stereotypical, and indicate an emotional identification with the opposite sex and a corresponding marked discomfort with one's own sex, primary and secondary sex characteristics, as well as gender role. One way of understanding individuals with GID is that they are identity diffuse, and that there is considerable anxiety and insecurity about the self (Akhtar & Samuel, 1996). Such feelings may develop from attachment difficulties, parental intolerance of cross-sex behaviours, as well as the same sex parent's inability to function as a role model (Zucker & Bradley, 1995).

Several projective and behavioural assessment methods have been developed with large samples to identify those children with GID (see Zucker & Bradley, 1995 for an overview). These measures have generally shown good discriminant validity and reliability. For adolescents and adults, however, psychometrically sound assessment methods for GID are lacking.

Dissociative Identity Disorder

Individuals with a Dissociative Identity Disorder (DIS) typically feel confused about the stability of their identity. They may feel as though they are playing roles, rather than experiencing themselves as consistent persons. In some cases, two or more distinct identities or personality states alternate, determining the individual's behaviour. DIS is also characterized by a marked dissociative amnesia, sometimes for basic personal information. DIS may be a psychological defence against painful or traumatic experiences (see Steinberg, 2000 for a review). The amnesia as well as alexithymia, denial, and an array of symptoms such as anxiety, depression, psychosis, and substance abuse complicate assessment of DIS. Recent empirical evidence indicates blurred boundaries between DIS, conversion, and somatization (e.g. Spitzer et al., 1999; Saxe et al., 1994). This blurring may challenge the current definition of DIS as a separate diagnosis, and revitalize the psychodynamic conceptions of hysteria. A sharp rise in the prevalence of DIS, particularly in the United States, may indicate previous professional neglect of the disorder. However, it may also serve as an example of how increased public attention and professional interest in a particular syndrome may give rise to such syndromes as culturally specific means to express general psychological distress or discomfort.

Indeed, the choice of self-report versus interview based assessment methods may also account for some of the variation in the prevalence figures. Among self-report measures, the Dissociative Experience Scale (DES) is a psychometrically sound screening tool (Dubester & Braun, 1995), though it captures a rather wide range of dissociative symptoms. However, recent research (Waller & Putnam, 1996) has identified a subset of 8 items from the DES that may identify DIS more precisely. Among interview measures, the DSM-IV based structured interview (Steinberg, 2000) has shown good reliability and discriminant validity (see Steinberg, 2000 for a review).

Personality Disorders

One aspect of understanding the aetiology of personality disorders is as a consequence of developmentally early deficits in the formation of the self, in affect regulation, as well as an imbalance between separation and individuation processes. Thus, the individual may not be able to integrate positive and negative representations of the self and of others. In adolescence and early adulthood, an identity disturbance manifested as a sense of self-incoherence and lack of commitment are prominent clinical features of the borderline personality disorder (Wilkinson-Ryan & Westen, 2000). In this disorder, the subjective experience of impaired identity may be more salient than in the other forms of personality disorders because the extremely poor integration creates a sense of inner emptiness and a hypersensitivity to external circumstances.

FUTURE PERSPECTIVES

Recent theoretical and empirical work has begun to differentiate forms of identity diffusion that may enable a more refined understanding of selected identity disorders (Marcia, 1989; Wilkinson-Ryan & Westen, 2000). For example, Marcia (1989) contrasts the pathological form of identity diffusion, characteristic of the borderline personality disorder (self-fragmentation), from the culturally adaptive, carefree, developmental, and disturbed (as per Erikson's schizoid loner) forms of identity diffusion. A fruitful line of future research may lie in identifying possible intrapsychic differences across these various diffusion groups in order to best determine possible intervention or treatment options. Another line of research investigates possible intrapsychic predictors of developmental arrest among both foreclosed and diffuse individuals (see Kroger, 2000 for a review). Future research on the more pathological forms of identity diffusion might begin to address the roles and functions of transitional objects that could facilitate further identity development during adolescent and adult life.

CONCLUSIONS

Erikson's (1963) theoretical writings on identity have been reviewed, and Marcia's elaborations of Erikson's fifth psychosocial task of adolescence, 'Identity vs. Role Confusion', have been

described. Marcia's four identity statuses have been presented, along with measures currently used to assess identity status. The diffusion identity status has been associated with distinct forms of developmental arrest. More pathological forms of identity difficulties have been reviewed, including gender identity disorders, dissociative identity disorders, and personality disorders. Promising directions for future research lie in understanding the relationship between psychosocial identity development and intrapsychic forms of developmental arrest.

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RELATED ENTRIES

Applied Fields: Clinical

IDIOGRAPHIC METHODS

INTRODUCTION

Idiographic methods of psychological assessment are techniques designed to capture the unique and potentially idiosyncratic qualities of the individual. The assessor seeks to identify the constellation of psychological attributes that best characterizes the particular individual who is the target of assessment.

The idea of idiographic assessment can be contrasted with that of nomothetic assessment. Nomothetic methods (from the Greek for 'law', *nomos,* referring here to the search for universal scientific laws) characterize individuals via a fixed set of psychological variables and assessment procedures; that is, variables and procedures that do not change from one person to the next. In nomothetic assessment, a primary goal is to

describe individuals in relation to the population at large; for example, people may be ranked on interindividual-difference dimensions. In contrast, idiographic methods (from the Greek *idios*, referring to personal, private, and distinct characteristics) employ psychological constructs and assessment procedures that may vary from one person to the next. The primary aim is to describe qualities of the individual and the within-person organization among these qualities. In idiographic assessment, describing the individual with fidelity is the paramount task, whereas characterizing the individual's standing with respect to the population at large is of secondary importance.

This entry discusses the rationale behind idiographic assessment and reviews specific idiographic techniques. The focus primarily is on assessment in personality and clinical psychology. Personality psychologists have devoted particular attention to idiographic methods, spurred by Allport's (1937) highlighting of the organized qualities of the unique individual. Clinical psychologists' need to understand individual clients in depth inherently motivates idiographic methods in this field; indeed, although this entry focuses on quantitative idiographic assessment techniques, one should note that clinical case studies also constitute idiographic methods.

RATIONALE FOR IDIOGRAPHIC ASSESSMENT

To the extent that qualities of human nature are universal, idiographic methods might seem unnecessary. In principle, assessing universal aspects of psychological variation might be sufficient to characterize individual persons. There are, however, three reasons for adopting idiographic methods.

One is simply that assessors may desire more detailed information than is provided by nomothetic techniques. Describing individuals within a universal system of individual differences is only a first step in capturing the features of individual persons, who possess unique qualities that may require more detailed, individual-focused assessment techniques to be fully revealed.

A second reason for adopting idiographic methods involves predictive utility. The assessor may wish to predict a particular behavioural outcome, yet may know that established nomothetic methods already have proven to have little predictive value in the domain under investigation. This might occur, for example, if individuals tend to display criterion behaviours only in highly specific contexts that vary idiosyncratically from one person to the next. In such cases, pragmatic considerations motivate the use of idiographic techniques.

A third reason is not merely pragmatic, but conceptual. Theoretical considerations may suggest that standard nomothetic assessments do not adequately represent the psychological qualities in which the assessor is interested. Nomothetic assessments typically describe people according to individual-difference dimensions, where those dimensions commonly are statistical factors identified in analyses of the population at large. The factors, then, are statistical properties of populations, not of individuals. On purely statistical grounds, one cannot assume that group-level statistical parameters necessarily will capture the qualities of each individual in the group. Person-centred rather than population-based methods thus may be required to capture psychological qualities at the level of the individual.

IDIOGRAPHIC METHODS AND GENERAL LAWS

It is sometimes thought that idiographic methods conflict with the search for general psychological laws. Idiographic methods are sensitive to individual idiosyncracy, whereas scientific practices pursue generalizable principles. Idiographic methods might appear antithetical to nomothetic science. Such a conclusion, however, is unwarranted on various grounds.

Idiographic methods can complement the pursuit of generalizable knowledge. The careful analysis of multiple individual cases provides particularly strong support for generalizable conclusions if a particular finding proves replicable at the level of the individual case. Further, understanding of some phenomena might require idiographic techniques. For example, personality psychologists seek to understand the coherent within-person organization among distinct personality systems (Cervone & Shoda, 1999). This task inherently requires idiographic,

person-centred assessments in addition to nomothetic, variable-centred techniques.

Idiographic and nomothetic procedures can be combined to yield generalizable conclusions. One might assess individuals idiographically, but aggregate findings across individuals help to identify general patterns. For example, idiographic assessments of cross-situational consistency in psychological response reveal patterns of consistency that often are idiosyncratic; people display personality consistency across relatively unique sets of social contexts. In the aggregate, however, consistency is lawfully related to individuals' beliefs about the self and social contexts (Cervone, 1997).

Another path from idiographic assessment to generalizable conclusions is to assess multiple variables at the level of the individual and then to employ statistical techniques that identify subgroups of individuals who are relatively homogeneous with respect to these variables, and thus constitute a qualitatively distinct class of persons. Research on temperament provides an example. Kagan and colleagues (Woodward, Lenzenweger, Kagan, Snidman & Arcus, 2000) obtain multiple measures of behavioural reactivity in infants and analyse them via statistical techniques designed to identify classes, or taxa, that may not be evident in simple frequency distributions. Results suggest that approximately 10% of infants possess a highly reactive biological temperament that differs qualitatively from the population at large.

IDIOGRAPHIC ASSESSMENT TECHNIQUES

The utility of idiographic methods can be illustrated by considering a series of psychological phenomena for which they have proven to be illuminating.

Behavioural Tendencies

Personality psychologists often wish to assess overt behavioural tendencies; that is, surface-level tendencies to display one versus another type of behaviour. A primary tool for assessing behavioural tendencies idiographically is 'P-technique' factor analyses, in which one studies a given individual over a large number of occasions to determine the primary dimensions along which the individual's actions vary. This contrasts with traditional R-factor analysis, where numerous individuals are assessed once and interindividual-difference dimensions are obtained. Importantly, idiographic within-person dimensions identified via P-factor methods may fail to correspond with nomothetic interindividual-difference factors. P-factor analyses of global dispositional tendencies assessed over multiple occasions have been found to correspond to a canonical five-factor model of interindividual-differences in only a small minority of cases (Borkenau & Ostendorf, 1998). P-technique factor analyses make the broader point that idiographic methods can be conducted with the same statistical rigour that typifies nomothetic assessment.

In addition to studying global dispositional tendencies, another idiographic method is to plot individuals' behavioural tendencies as a function of social contexts. Investigators construct dispositional profiles that represent the contingent relations between situational contexts and action tendencies. People's tendencies are found to vary in idiosyncrasy, yet the variations are temporally stable and thus constitute an enduring 'behavioural signature' of the individual (Mischel & Shoda, 1995).

Affective Tendencies

Idiographic methods also have been employed constructively in the study of affective tendencies, where they can help to resolve questions about the structure of affective experience. One key question is whether the tendencies to experience positive and negative affect are independent dimensions or bi-polar opposites. Nomothetic techniques have been used in efforts to obtain a general answer to this question. Idiographic analyses, however, have shed new light on the issue.

In this work, individuals rate their emotional experiences daily for more than two months (Feldman, 1995). P-factor findings indicate that people vary in the degree to which their tendencies to experience positive and negative affect covary; there is, then, no generalizable answer to the question of independence versus bipolarity. The covariation of positive and negative affectivity varies considerably across persons, with idiographic positive/negative affectivity

correlations ranging from −0.72 to 0.21 (Feldman, 1995).

Idiographic methods also indicate that people differ not only in their average affective experience, but in the way their moods vary over time. Time-series analyses of daily reports of affective experience reveal that individuals differ in the frequency with which their mood shifts (Larsen, 1987).

Developmental Change

Idiographic methods have been used to study developmental change. Investigators recognize that group-level analyses may fail to represent developmental patterns experienced by individuals. A group may, on average, display stability with respect to a psychological characteristic, yet many individuals may change significantly.

An important intraindividual technique in the study of development is individual growth modelling, a statistical method that yields estimate magnitudes of both group-level and within-person change. The method has been applied fruitfully to the study of stability and change in self-reported extraversion in a large population of US men (Mroczek & Spiro, 2000). At the group level, results indicated that levels of extraversion were stable over time. At the individual level, however, there was evidence for change. Findings revealed statistically significant person-to-person variability in intraindividual change; in other words, many individual persons changed significantly in their levels of extraversion, despite the fact that the group, in the aggregate, was stable. Analyses of self-reported neuroticism similarly indicated significant individual differences in patterns of change over time (Mroczek & Spiro, 2000). These idiographic findings are important to personality theory. Based on nomothetic data, some theorists have contended that personality is stable across adulthood; these idiographic analyses, however, violate this contention, and thus compel investigators to develop personality theories that can embrace both stability and dynamic change in personality across the life course (Caprara & Cervone, 2000).

Knowledge and Belief Systems

Idiographic methods also have informed the study of knowledge and belief systems in personality functioning (Cervone, Shadel & Jencius, 2001). Investigators generally recognize that nomothetic systems are inadequate to capture the potential idiosyncrasy of people's beliefs, the way those beliefs are organized, and the contexts in which those beliefs come into play. They thus assess belief systems idiographically.

Kelly's (1955) Role Construct Repertory test (REP test) is a classic technique here. In some respects, the REP test is nomothetic. The assessor's goal is always to identify the ideas, or constructs, people use to understand their world, and the testing procedure always asks test takers to indicate how a set of target persons is similar or different from one another. The content of test items, however, varies idiographically. Test takers provide a personalized list of individuals of importance to them. This unique list then comprises the target persons employed in the test. The method thus uncovers the constructs individuals use to interpret the unique people and circumstances of their daily life.

An advance in representing the content of individuals' belief systems is HICLAS, a hierarchical classification procedure that can be used to identify idiographic groupings or 'families' of self-with-other representations. In the typical procedure (see, e.g., Ogilvie et al., 1998), participants first generate sets of 'targets' (usually significant others) that are important in their life and a set of 'features' (personal characteristics) that characterize themselves. They then indicate which features characterize their behaviour toward each target. The HICLAS algorithm provides an idiographic representation of target–feature clusters; that is, groupings of personal characteristics displayed in particular interpersonal settings.

Multidimensional statistical techniques such as cluster analysis or multidimensional scaling also have been employed to represent the pattern of interconnections in individuals' belief systems. Research reveals that representations obtained using different sources of data, such as spontaneous descriptions versus more structured techniques, converge (Hart et al., 1995), supporting the reliability of multidimensional idiographic methods.

Clinical Assessment

In clinical psychology, idiographic methods are important not only to the question of assessing individuals with fidelity, as noted above. They also

bear on the issue of relating research to clinical practice. Ideally, clinical practice would employ treatments that are empirically validated. In trying to apply empirically supported interventions to individual clients, however, practising clinicians face a problem. The empirical evidence generally consists of outcome studies demonstrating statistically significant group-level effects, with interventions being beneficial compared to control treatments. Such effects commonly are based on large, heterogeneous samples of persons, with the same intervention applied to all persons and treatment effects summarized as average responses to the intervention. The empirical data, in other words, are nomothetic. The problem is determining whether these nomothetic effects can inform the treatment of individual clients, many of whom may differ from the research sample in ways important to their recovery. Although some judge that this problem is intractable, others suggest that improved research designs might better inform treatment of the individual case (Erwin, 1999).

Investigators have begun to seek such improvements via novel idiographic methods. For example, the Articulated Thoughts in Simulated Situations paradigm (ATSS; Davidson et al., 1997) exposes individuals in the laboratory to a relevant situation (i.e. a social criticism situation in order to elicit social anxiety) and instructs them to speak aloud their thoughts and feelings at periodic intervals during exposure to the simulated situation. These responses are then coded for content and structure by trained raters who are unaware of the circumstances of the data collection which could potentially bias their codes. The ATSS procedure has two main implications for idiographic assessment (Davidson et al., 1997). First, open-ended responses are collected from individuals; no predetermined set of questions is asked which might bias subject responses and no assumptions are made about the content or structure of the individual's cognitions. Second, the data can be reliably coded so as to reveal not only idiosyncratic cognitive content that is prompted by particular contextual stimuli, but also differences in the underlying structure and organization of those cognitions.

Research with addictive behaviours, such as nicotine dependence, also has employed idiographic methods to uncover individual differences in the structure and content of clinically relevant cognition, including cognitive factors that regulate the execution of coping strategies that contribute to clinical success (Shadel, Niaura & Abrams, 2000). In this work, clinical assessments combine open-ended measures of multiple aspects of self-concept with individualized assessments of the social contexts in which these concepts come into play. Although treatments have yet to capitalize fully on these idiographic methods, these techniques promise to yield findings that might truly inform treatment of the individual case.

FUTURE PERSPECTIVES AND CONCLUSIONS

Idiographic methods have come of age and would appear to have a bright future. Advances in the area reflect an interplay of supply and demand. Increasingly, theories require assessment techniques that provide portraits of the structure and organization of psychological variables at the level of the individual (Cervone et al., 2001). The methods of assessment and statistical analysis reviewed here have begun to meet those needs.

Work in this area could productively progress along a number of paths. Future research should aim to enhance the psychometric reliability and validity of idiographic methods. Empirical work should further test theoretical assumptions about individual personality functioning and development that traditionally have been based on nomothetic methods. Finally, idiographic assessments might better capitalize on a broad range of data sources, including those yielded by narrative and ethnographic techniques.

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Daniel Cervone and William G. Shadel

RELATED ENTRIES

PERSONALITY ASSESSMENT (GENERAL), QUALITATIVE METHODS, SUBJECTIVE METHODS

INSTRUCTIONAL STRATEGIES

INTRODUCTION

Teaching, or instruction, has been defined as 'anything that is done to facilitate purposeful learning' (Reigeluth, 2000: 20). The assessment of teaching, then, needs to be referred to the process it aims to stimulate, i.e. learning, and the actions which may be taken to foster it. A variety

of theories of learning have been proposed among which cognitive constructivist theories have been prevalent for some decades now. Important differences can be found among them, which come along significant differences in instructional theories. However, for brevity purposes we shall focus here on their common points. The main assumptions of constructivist theories hold that knowledge cannot be passed on from one mind to the other but needs instead integrating new information with existing knowledge and has to be constructed through experience. It could then be concluded that teaching consists of organizing experiences which facilitate and demand knowledge construction. Different theories emphasize either the cognitive processes of skill and knowledge acquisition, the social processes which support the growth of individual knowledge or the specific features of the learning tasks or environments which help learning to occur. In fact, a combination of these elements is present in most current theories of learning and should be taken into account in instructional theory.

Next, we shall review some approaches which suggest relevant variables in teaching around which assessment might take place, then discuss some general rules of assessment and finally mention some assessment methods.

Constructivist theories highlight different paths that teachers may use to stimulate students' learning. If we consider the richness of these theories together with the dramatic sociocultural and technological changes affecting teaching and learning in modern societies, the resulting picture is quite complex. As a result, good teaching may adopt different forms depending on context, learner characteristics and content knowledge.

To enhance significant cognitive activity different strategies have been suggested such as structuring and signalling materials in a way which fosters students' structuring, elaboration and organization of information (Mayer, 2000). Performance and error analyses have also been proposed as a means to help overcome misunderstandings, and giving appropriate and timely feedback also stands out as a crucial activity to promote understanding. Worked examples have been shown to be helpful to understanding and, finally, alternative assessment, including self-assessment, seems to be a powerful method to foster higher thinking abilities.

It is generally accepted that social exchanges stimulate learning and conceptual change and strengthen motivation and emotional support. Two kinds of social interactions are relevant: *teacher–learner interaction* and close observation along task performance will allow assessing students' prior knowledge, diagnose their state of knowledge and give appropriate feedback. *Students' interaction with other students* in cooperative or collaborative tasks will also help them elaborate and refine their knowledge and keep their motivation high.

Finally, the design of tasks or environments which stimulate learning is another hallmark of good teaching (Jonassen & Land, 2000). The main assumption is that learning is promoted through problem solving so that features of tasks and environments created with this purpose need to be analysed in detail. The common features of good learning environments seem to be authenticity, complexity and variety. Scaffolding along tasks is needed and can be assisted by computerized systems such as expert tutors (Collins, Brown & Newman, 1989).

Gilbert and Gibbs (1998) discuss some models of teacher training which are interesting for the topic of assessment in that they point to important outcome measures. *Developmental models* describe a shift in the professional development of teachers from attention on *self* to *skills* and then to *students*. *Conceptual change models* describe different intentions in teaching, from transmitting information to students, having their students acquire the concepts of the discipline through different methods, helping students develop their own conception or aiming at students changing their conception. Models based on *reflection* emphasize the flexible use of a broad repertoire of teaching methods to adapt to the needs of the different contexts, students and goals they may be faced with. *Student learning models*, in congruence with recent attention on learning, rather than teaching, focus on the approach students take for learning and on learning outcomes. Finally, *behavioural models* assume good teaching can be identified by overt behaviours in the classroom.

GENERAL ASSESSMENT RULES

Some general rules should be followed in planning the assessment process. Considering the complex and varying behaviours which constitute good teaching, it is easy to realize that no assessment method, in isolation, will give us a comprehensive account. To get a reasonably complete picture it will be necessary to combine some of them and triangulate the perceptions of different sources of information. Sources of information as well as the methods selected should be appropriate to the context and the aims of assessment. These might be accountability or improving teaching; with this second goal, both measurement and feedback need to be non-judgemental and confidential, with a clear contract on by whom, what, how and when will the assessment be carried out and how will it be used. It may be argued that knowing these details in advance may allow teachers to prepare, thus making assessment less representative of real behaviour. This risk, however, needs to be upraised against the possibility that surprise might cause unrepresentatively poor performance. Assessment is frequently used as a crucial element of teachers' professional development and, with this end, it should be remembered that criticism is hard to take, while building on positive aspects may result in significant positive effects on performance.

Evaluation of teaching might focus on factors which foster learning or on the results achieved by learners. The target of assessment might then be *process* measures which describe how teaching is performed and experienced, or *result* measures, the first being richer to improve teaching. These two approaches are related to the two main goals of assessment and, in combination, provide a complete picture.

Next we shall discuss the main sources of information and some widely used assessment methods. Assessment may cover all the way from course proposal to peer observations and discussion of class and assessment practice to student feedback and outcome. Along this way, different sources of information will be relevant. A crucial decision in assessment planning will be the selection of sources and methods to gather information.

ASSESSMENT OF THE TEACHING PROCESS

Teacher Measures

Teachers are a valuable source of information about their own practice and intentions but their reflection should be supported in some structured way.

Self-monitoring, *diaries* or *interviews* structured after different models of teaching are used to explore relevant aspects of teaching and also may have an impact on the ability to reflect on their practice. Interviews may be carried out together with videotapes of teaching so that recall is anchored and communication facilitated. The best asset of these procedures is the quality of the information and the communication between teacher and assessor which is established, while the most outstanding difficulty has to do with the time needed for in-depth interviewing.

Schedules and inventories are also used, such as the *Approaches to Teaching Inventory* (Prosser & Trigwell, 1999), which reflects the intentions of teaching (teacher focused or information transmission vs. student focused and conceptual change) and strategy used.

The *Teaching Methods Inventory* (Gilbert & Gibbs, 1998) was created to describe the variety of methods teachers use and includes an open section where they can add to the existing list any additional practice they adopt. The rationale is that the variety of methods used to suit different situations and purposes will reflect the ability of teachers to flexibly adapt to different needs. The specificity of the information required makes it difficult to give a distorted picture of what is actually done.

Portfolio assessment has proven a robust method whereby teachers may collect evidence on their progress which can be used for self-development as well as for external purposes (Seldin, 1991).

Student Measures

Self-report: a number of schedules have been developed to gain information from students' experience in a structured way. They are commonly used in many universities to get feedback from students. In spite of some criticism that

students may be too sensible to some surface aspects of teacher behaviour, at least the better researched instruments have been shown to have good correlations with other measures of teaching quality and outcome, thus allowing a convenient and economical means to gather information. However, evidence of their shortcomings advise they should not be used in isolation. A comparison of the content of the best known questionnaires might be interesting. The *Students' Evaluations of Educational Quality* (Marsh, 1982) explores the amount of learning, instructor enthusiasm, organization of course, facilitation of group interaction, quality of personal relationship and width of contents. The instrument developed by Entwistle, Thompson and Tait (1992) covers presentation, level and structure, objectives, concern and friendliness, supporting learning, feedback, assessment, pace, workload and difficulty. The *Course Experience Questionnaire* (Ramsden, 1991) includes questions on good teaching, clear goals, workload, assessment and independence.

Peers and External Examiners

It is easy to see the value of having experts judge the adequacy of course planning, goals, content, sources and teaching methods from the standpoint of a given discipline or a degree. This is carried out by peers or professional staff, inspectors or superiors, usually via direct observations or structured rating scales both in natural and contrived situations. Teaching might be videotaped to facilitate discussion and feedback. A number of procedures have been developed to adapt to different contexts and goals of assessment (Brown, Jones & Rawnsley, 1993).

ASSESSMENT OF OUTCOME

Outcome is the most clear criteria of good teaching, although it is influenced by other variables. Two approaches might be followed, centred on the resulting learning or on learning processes adopted by students. Some confusion may arise around outcomes depending on how learning is defined; different approaches have privileged measurement of competences, results on traditional tests or integrated competent performance. Other indicators such as success rate or students enrolling in similar courses have also been used. Strategies or approaches to learning have been documented to be related to teachers' practices and to correlate with different outcomes (see entry on 'Learning Strategies').

FUTURE PERSPECTIVES

Following the current trend to consider teaching as instrumental for learning it is of paramount importance to arrive at a clear definition of learning outcomes. Sound methods to measure learning are needed to estimate effectiveness of teaching. The challenge is to reflect in this definition the main facets of learning and not only superficial features.

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RELATED ENTRIES

Applied Fields: Education, Theoretical Perspective: Cognitive, Learning Strategies

INTELLIGENCE ASSESSMENT (GENERAL)

INTRODUCTION

The assessment of intelligence via the conventional IQ test has tremendous potential for great use and great abuse. IQ tests can be used to categorize people into oblivion and misinterpreted to support a wide variety of racist and sexist ideologies. But they can also be used to examine and treat children once simply called 'stupid'. This entry will briefly touch on the history of intelligence assessment and then focus on the Wechsler Scales, the most-used tests of cognitive development, the Stanford–Binet IV, the descendant of the first major test of cognitive development, and then describe more recent tests of cognitive development, such as the Kaufman tests, the Woodcock–Johnson, the Differential Ability Scales, and the Cognitive Assessment System. Although theory played little or no role in the original Stanford–Binet and the Wechsler scales, the more recent tests have generally been theory-driven with Horn's model of intelligence (1989) and Luria's (1980) neuropsychological approach being the most influential. The uses for IQ tests in contemporary society are decidedly practical: *identification* (of mental retardation, learning disabilities, other cognitive disorders, giftedness), *placement* (gifted and other specialized programmes), and as a *cognitive adjunct* to a clinical evaluation whose main focus is on personality or neuropsychological evaluation. Yet, the introduction of theory into test development (e.g. Kaufman & Kaufman, 1983; Woodcock & Johnson, 1989) and test interpretation (Kaufman, 1994) has provided an important foundation for helping examiners optimize these practical applications of IQ tests.

HISTORY OF INTELLIGENCE ASSESSMENT

The assessment of intelligence was conceived in a theoretical void and born into a theoretical vacuum. During the last half of the nineteenth century, first Sir Francis Galton in England (1883) and then Alfred Binet in France (Binet & Henri, 1895) took turns in developing the leading intelligence tests of the day. Galton, who was interested in men of genius and in eugenics, developed his test from a vague, simplistic theory that people take in information through their senses, so the most intelligent people must have the best developed senses. His test included a series of sensory, motor, and reaction-time tasks, all of which produced reliable, consistent results (Galton, the half-cousin of Charles Darwin, was strictly a scientist, and accuracy was essential), but none of which proved to be valid as measures of the construct of intelligence (Kaufman, 2000). Alfred Binet, with the assistance of the Minister of Public Instruction in Paris (who was eager to separate mentally retarded from normal children in the classroom), published the first 'real' intelligence test in 1905. Like Galton's test, Binet's instrument had only a vague tie to theory (in this case, the notion that intelligence was a single, global ability that people possessed in different amounts). In a stance antithetical to Galton's, Binet declared that because intelligence

is complex, so, too, must be its measurement. He conceptualized intelligence as one's ability to demonstrate memory, judgement, reasoning, and social comprehension, and he and his colleagues developed tasks to measure these aspects of global intelligence. Binet's contributions included his focus on language abilities (rather than the non-verbal skills measured by Galton) and his introduction of the mental age concept, derived from his use of age levels, ranging from 3 to 13 years, in his revised 1908 scale (mental age was the highest age level at which the child had success; the Intelligence Quotient, or IQ, became the ratio of the child's mental age to chronological age, multiplied by 100). In 1916, Lewis Terman of Stanford University translated and adapted the Binet–Simon scales in the US to produce the Stanford–Binet (Terman, 1916).

Nearly coinciding with the Stanford–Binet's birth was a second great influence on the development of IQ tests in the US: America's entry into World War I in 1917. Practical concerns superseded theoretical issues. Large numbers of recruits needed to be tested quickly, leading to the development of a group IQ test, the Army Alpha. Immigrants who spoke English poorly or not at all had to be evaluated with non-verbal measures, spearheading the construction of the non-verbal group test, the Army Beta.

The next great contributor to IQ test development was David Wechsler. While awaiting induction into the US Army in 1917, Wechsler obtained a job with E.G. Boring that required him to score thousands of Army Alpha exams. After induction he was trained to administer individual tests of intelligence such as the new Stanford–Binet. These clinical experiences paved the way for his Wechsler series of scales. Wechsler borrowed liberally from the Stanford–Binet and Army Alpha to develop his Verbal Scale and from the Army Beta and Army Performance Scale Examination to develop his non-verbal Performance Scale. His creativity came not from his choice of tasks, all of which were already developed and validated, but from his insistence that *everyone* should be evaluated on *both* verbal and non-verbal scales, and that profiles of scores on a variety of mental tasks should be provided for each individual to supplement the global or aggregate measure of intelligence.

THE WECHSLER SCALES

While Wechsler (1974) defined intelligence as being a person's capacity to understand and cope with his or her environment, his tests were not predicated on this definition. Tasks developed were not designed from well-researched concepts exemplifying his definition. In fact virtually all of his tasks were adapted from other existing tests. Wechsler did not give credence to one task above another, but believed that this global entity called intelligence could be ferreted out by probing a person with as many different kinds of mental tasks as one can conjure up. Wechsler did not believe in a cognitive hierarchy for his tasks, and he did not believe that each task was equally effective. He felt that each task was necessary for the fuller appraisal of intelligence. All of his scales yields IQs with a mean of 100 and standard deviation (SD) of 15, as well as subtest scaled scores with mean = 10 and SD = 3.

Wechsler Primary and Preschool Intelligence Scale – Revised (WPPSI-R)

The WPPSI-R (Wechsler, 1989) is an intelligence test for children aged 3 years, 0 months through to 7 years, 3 months. The WPPSI-R emphasizes intelligence as a global capacity (and, therefore, provides a Full Scale IQ) but has Verbal and Performance scales as two methods of assessing this global capacity. The Verbal IQ measures children's ability to understand language and express themselves verbally, whereas the Performance IQ assesses cognitive functioning non-verbally via spatial reasoning and visual–motor coordination.

Wechsler Intelligence Scale for Children – Third Edition (WISC-III)

The WISC-III (Wechsler, 1991) is geared for children aged 6 years, 0 months through to 16 years, 11 months. In addition to yielding Verbal, Performance, and Full Scale IQs and scaled scores on 13 subtests, the WISC-III offers standard scores (Indexes with mean = 100 and SD = 15) on four separate factors: Verbal Comprehension (VC), Freedom from Distractibility (FD), Perceptual Organization (PO), and Processing Speed (PS). The first two factors are composed of Verbal subtests and the last two comprise Performance subtests. The VC and PO factors

provide the familiar distinction between verbal and non-verbal intelligence, respectively. The FD factor is extremely susceptible to the influences of distractibility and is dependent for success on attention, concentration, memory, sequencing ability, and numerical facility.

Wechsler Adult Intelligence Scale – Third Edition (WAIS-III)

The newest member of the Wechsler family of tests is the WAIS-III (Psychological Corporation, 1997; Wechsler, 1997), for adults of ages 16 to 89 years. Its lineage includes the original Wechsler–Bellevue Intelligence Scale, Form II, WAIS, and WAIS-R. The WAIS-III, the first Wechsler adult scale to be normed with a carefully stratified sample above the age of 74, was formatted to be similar to the WISC-III, i.e. it includes Verbal, Performance, and Full Scale IQs and Indexes on four factors: three factors with the same names as WISC-III factors – VC, PO, and PS – and the fourth factor is called Working Memory. The latter factor resembles the WISC-III Freedom from Distractibility factor, but includes a new subtest (Letter–Number Sequencing). This new task draws from cognitive research and theory on working memory (e.g. Woltz, 1988). Another theoretical advance in the WAIS-III concerns a new subtest, Matrix Reasoning (solving complex abstract analogies), which is a measure of the kind of fluid intelligence that Horn (1989) uses to exemplify his fluid construct.

THE STANFORD–BINET: FOURTH EDITION (BINET-IV)

Like its predecessors, the Binet IV (Thorndike, Hagen & Sattler, 1986) is based largely on the principle of a general ability factor, 'g', rather than on separate abilities, and the scale provides a continuous appraisal of cognitive development from ages two through to young adult. Unlike its previous versions, however, the Binet-IV has a decided theoretical basis for its structure, based on a three-level hierarchical model of the structure of cognitive abilities. Unfortunately, the theoretical basis of the Binet-IV was not supported very well by empirical, factor-analytic investigations. Despite the presentation of ample evidence of internal consistency and concurrent validity for its scores, the substantial problems with construct validity, data collection method, and other difficulties with the Binet-IV led one reviewer to recommend that the battery be laid to rest (Reynolds, 1987): 'To the S-B IV, *Requiescat in pace*' (p. 141).

WOODCOCK–JOHNSON PSYCHO-EDUCATIONAL BATTERY – THIRD EDITION: TESTS OF COGNITIVE ABILITY (WJ III)

The original Woodcock–Johnson Psycho-Educational Battery: Tests of Cognitive Ability (WJ; Woodcock & Johnson, 1977) made a major contribution to test development because of its inclusion of a diversity of novel tasks that represented the first major departure from subtests originally developed by Binet or by World War I psychologists. The WJ, however, was developed from an entirely practical perspective, with no apparent emphasis on theory. All that changed with the publication of the WJ-R (Woodcock & Johnson, 1989), an expanded and reformulated test battery that is rooted firmly in Horn's modified g_f–g_c psychometric theory of intelligence, as is its recent successor, the third edition of the WJ (WJ III; Woodcock, McGrew & Mather, 2000).

The WJ III, for ages 2 to 90+ years and composed of Cognitive and Achievement sections, is undoubtedly the most comprehensive test battery available for clinical assessment. The WJ III Cognitive battery (like the WJ-R) is based on Horn's (1989) expansion of the fluid/crystallized model of intelligence and measures seven separate abilities: Long-Term Retrieval, Short-Term Memory, Processing Speed, Auditory Processing, Visual Processing, Comprehension-Knowledge and Fluid Reasoning. An eighth ability, Quantitative Ability, is measured by several subtests on the Achievement portion of the WJ III.

KAUFMAN ASSESSMENT BATTERY FOR CHILDREN (K-ABC)

The K-ABC (Kaufman & Kaufman, 1983) is a battery of tests measuring intelligence and achievement of children of ages 2 through to 12 years. The K-ABC intelligence scales are based on

a theoretical framework of Sequential and Simultaneous information processing, which relates to *how* children solve problems rather than *what* type of problems they must solve (e.g. verbal or non-verbal). The Sequential and Simultaneous framework for the K-ABC stems from an updated version of a variety of theories (Lichtenberger, Broadbooks & Kaufman, 2000). The Sequential and Simultaneous theory was primarily developed from two lines of theory: the information processing approach of Luria (1980), derived from his neurophysiological observations, plus empirical research conducted on Luria's model (Das, Naglieri & Kirby, 1994); and the cerebral specialization work of Sperry and other researchers (e.g. Sperry, 1974).

KAUFMAN ADOLESCENT AND ADULT INTELLIGENCE TEST (KAIT)

The Kaufman Adolescent and Adult Intelligence Test (KAIT) (Kaufman & Kaufman, 1993) is an individually administered intelligence test for individuals between the ages of 11 and more than 85 years. It provides Fluid, Crystallized, and Composite IQs. It includes a Core Battery of six subtests (three Fluid and three Crystallized) and an Expanded Battery that also includes alternate Fluid and Crystallized subtests plus measures of delayed recall of information learned earlier in the evaluation during two of the Core subtests.

DIFFERENTIAL ABILITIES SCALES (DAS)

The DAS was developed by Elliott (1990) and is an individually administered battery of 17 cognitive and achievement tests for use with individuals aged 2 through to 17 years. The DAS Cognitive Battery has a preschool level and a school-age level. The school-age level includes reading, mathematics, and spelling achievement tests that are referred to as 'screeners'. The same sample of subjects was used to develop the norms for the Cognitive and Achievement Batteries; therefore, intra- and inter-comparisons of the two domains are possible. The DAS is not based on a specific theory of intelligence. Instead, the test's structure is based on tradition and statistical analysis. Elliott (1990) described his approach to the development of the DAS as 'eclectic' and credited the work of researchers such as Cattell, Horn, Das, Jensen, Thurstone, Vernon, and Spearman.

COGNITIVE ASSESSMENT SYSTEM (CAS)

The Das–Naglieri Cognitive Assessment System (CAS; Naglieri & Das, 1997), for ages 5 to 17 years, is based on, and developed according to, the Planning, Attention, Simultaneous, and Successive (PASS) theory of intelligence. The PASS theory is a multidimensional view of ability that is the result of the merging of contemporary theoretical and applied psychology (see summaries by Das, Naglieri & Kirby, 1994). According to this theory, human cognitive functioning includes four components: planning processes that provide cognitive control, utilization of processes and knowledge, intentionality and self-regulation to achieve a desired goal; attentional processes that provide focused, selective cognitive activity over time; and simultaneous and successive information processes that are the two forms of operating on information.

FUTURE PERSPECTIVES AND CONCLUSIONS

The unchanging nature of IQ tests has begun to thaw. For the first three-quarters of a century, from Binet's 1905 scale until to about 1980, there was the Binet and there was the Wechsler and that was about it. Then came a series of tests that included novel tasks and an attempt to link theory to IQ assessment. Today, clinicians have more choice than ever before and these choices include a pick of theory – namely Horn–Cattell g_f–g_c, expanded Horn g_f–g_c, and Luria PASS.

The critics of IQ tests abound, especially among popular and influential theorists such as Sternberg (e.g. Sternberg & Kaufman, 1998), and these critics must be heard. It is partly because of the critics that the developers of IQ tests have constantly striven to improve the existing measures and to attempt to bring more theory and research into the development of new tests and the revision of old ones. Tests that are powerful psychometric tools that have a solid research history, and that are clinically

and neuropsychologically relevant, are valuable if used *intelligently* by highly trained examiners. Clinicians who employ the intelligent testing philosophy as outlined in Kaufman (1994) can make a meaningful difference in a client's life when interpreting the results of a test profile in the context of clinical observations during the test session, background information about the client, research findings, and theoretical models. The array of instruments described in this entry, as well as others not included because of space constraints, can each serve quite well as the IQ test of choice for clinical evaluation. Perhaps when some of the highly respected theories of intelligence are translated into individual tests of intelligence it will be time to abandon existing instruments. But the test developers who attempt to translate the theories necessarily must be well versed in the clinical, neuropsychological, and psychometric aspects of assessment; otherwise, the perfect theory-based test will prove to be an imperfect clinical tool.

And what of the future? There has been considerable progress during the past two decades in providing options for clinicians apart from the Wechsler and Binet, and several of these options have impressive theoretical foundations. Yet progress has not been as rapid as most would wish. By their very nature, test publishers are conservative, investing their money in proven ventures rather than speculating on new ideas for measuring intelligence. Progress will likely continue to be controlled as the twenty-first century unfolds.

Eventually, new and improved high-tech instruments will be available that meet the rigours of psychometric quality and the demands of practical necessity. Hopefully those tests will not abandon theory but will embrace it, continuing the trend in the development of IQ tests that began in the early 1980s and has continued to the present. But none of the excellent instruments that are now available for clinical assessment of intelligence – Wechsler or otherwise – should be left for dead until there is something of value to replace them.

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RELATED ENTRIES

Cognitive Ability: *G* Factors, Development: Intelligence/Cognitive, Cognitive Ability: Multiple Cognitive Abilities, Fluid and Crystallized Intelligence

INTELLIGENCE ASSESSMENT THROUGH COHORT AND TIME

INTELLIGENCE: MODELS OF STRUCTURE AND THEORIES OF DEVELOPMENT

Intelligence measurement and theories of intelligence are represented in this encyclopedia by several entries. This corresponds to the importance and relevance that cognition, cognitive abilities, and intelligence have in the Western societies and consequently in psychological research since its beginning some 100 years ago. There exist hundreds of definitions of intelligence and cognitive abilities in philosophy and psychology, and in every day life. Most of them include a core of key concepts such as comprehension, judgement, reasonable thinking, but also successful adaptation to natural, cultural, societal circumstances and challenges in an efficient and practical manner, and finally productive and creative mental energy. As Schaie (1996) argued, in the scientific study of intelligence there is a hierarchy leading from information processing (speed, accuracy, mechanisms, strategies), through products measured in tests of intelligence to practical every day intelligence, and finally to wisdom.

This entry is devoted to the special aspect of development and change of intelligence through time (i.e. through ages), and through cohorts. Development and change are driven by environmental determinants (such as culture, generation, social and educational systems, family conditions and constellations etc.), by genetic determinants (including processes of maturation, growth, and ageing of the organism) and by interactions of influences from both. The entire human age span (or life time) should be included in studying these phenomena. A major task of this type of research is to identify the peaks in intellectual performance as well as to describe and to explain the rate and patterns of change and decline.

Schaie (1996) identified at least four theoretical positions which influenced paradigms of empirical research in intelligence and development of cognitive abilities and functions: unidimensional conceptions (such as those of Spearman, Binet and Simon – g-factor), the multidimensional concepts leading from Thorndike to Wechsler (multiple cognitive abilities), the multiple dimensions approach by Thurstone (primary mental abilities) leading to an expansion by Guilford and to the hierarchization by Cattell (fluid and crystallized intelligence), and finally the stage theoretical Piagetian approach (multiple cognitive abilities). There are some attempts to expand the Piagetian approach beyond childhood and adolescence to adulthood, middle age, and old age. However, the majority of research concerning change,

growth, decline and development of intelligence across the lifespan is based on the psychometric assessment of intelligence (i.e. Spearman, Thurstone, Cattell tradition and paradigm).

The Cattellian theory of fluid (g_f) and crystallized (g_c) intelligence (including the theory of investment from fluid intelligence into crystallized over the lifespan) was important to the lifespan oriented research, since the g_f- and g_c-components (but various others within this Cattellian system as well) differed in their time/age/cohort trajectories in terms of gains and losses and in types of more or less accelerated decline. Closely related to the Cattellian view Baltes and his coworkers built a slightly different two-component model of lifespan intellectual development: on the one hand fluid mechanics, i.e. intelligence as basic information processing (reasoning, spatial orientation, perceptual speed etc.), which is content-poor, universal, biological and genetically predisposed, and characterized by a declining trajectory (i.e. after 25/30 years of age) similar to g_f, and on the other hand crystallized pragmatics (verbal knowledge, semantic memory, some facets of mathematical ability), i.e. intelligence of cultural acquired knowledge, which is content-rich, culture dependent and experience based, and characterized by a trajectory similar to g_c (stable, beyond 25/30 years of age even increasing, smoothly declining in very old age) (Baltes, 1997).

INTELLIGENCE: LATENT CONSTRUCTS

Research and theories of intelligence have been developed synchronously and in reciprocal interaction with factor analysis methodology and its refinement and its sophistication (compare Spearman, Thurstone, Guilford, Cattell, Eysenck, Vernon, Burt, Horn, just to name a few of the scientists). The reason is that behavioural scientists who investigate phenomena such as intellectual abilities are rarely interested in single reponses to specific intelligence tasks or items (observed variables). Instead, such responses are treated as one of many possible indicators of the respondent's location to an unobservable, theoretically defined, or at least empirically abstracted scientific construct, such as verbal intelligence (latent variable). Consequently, change and development are described in terms of underlying ability dimensions as well, i.e. research is not too much concerned with age differences and age changes in specific measures but rather with differences and changes of underlying (latent) concepts and constructs. The primary mental abilities or g_c, g_f or pragmatics, mechanics, etc. are located on the latent variable level of the first or even respectively second order of abstraction.

TIME: LONGITUDINAL ORIENTATION

Descriptions of change and development (whether in observed or in latent variables) needs time-oriented designs, i.e. longitudinal observations and data, at least if the question is, how intelligence changes within individuals and/or what the conditions and antecedents of intraindividual changes, of interindividual differences and of interindividual differences in individual developmental trajectories.

Cross-sectional data are not relevant to these before-mentioned questions. Longitudinal designs and data are considered the *via regia* for conducting this type of research. However, the longitudinal study implies certain problems: sample comparability over time, selection and non-random selectivity processes. From a longitudinal perspective the attrition process of the sample, reflecting time-dependent biological, sociodemographic and psychological processes, reduces the generalizability of results, unless this selection process is mirroring the selectivity within the population; otherwise the generalizability can be maintained. However, it remains with the researcher to prove that there is no biasing selection effect working in the sample. Taking all these possible influences into account has an impact already on the sampling scheme and sampling plan, particularily with regard to disproportional sampling of these strata, which are expected to suffer extensively from an attrition process.

Of course, the longitudinal orientation offers a lot of advantages as well. A essential aim of a longitudinal study is, e.g., to extend the knowledge about the reciprocal relation between changes in various domains of psychological and physical functioning, i.e. the determination of structure of changes (Rudinger, Andres & Rietz, 1994). But also a simple description of interlaced series of changes (e.g. of cognitive functioning and

biochemical parameters as in the case of Alzheimer's disease) would follow from this paradigm in an interdisciplinary way. In the modern view in the longitudinal paradigm it is assumed that the extent, direction, and sequence of development are connected to stability and change of the whole person–environment system.

STABILITY, INVARIANCE, AND CHANGE

In addition to change and variability, stability has proved to be a central concept in the description of development. The multivariate developmental situation can mean stability or differences either between or within subjects over time. An excellent discussion of the various meanings of stability can be found already in Wohlwill (1973); for example, stability as predictability, as invariance, as regularity, as consensus, as the constancy of the relative positions within a group, and as the preservation of individual differences. The numerous attempts to establish developmental functions and growth curves, expecially in the area of cognitive functions (stability as regularity and predictability), make clear the importance of this concept.

This seems to be an anomaly in the study of behaviour change and development over time – that in many instances stability has been emphasized rather than lability as a target concern.

To explain this in more detail, for reasons of simplification, the Wohlwillian taxonomy will be reduced to three types of across-time change which may occur: structural, normative, and level. The latter two types of changes (stability) can only be examined if the structure of a concept that has repeatedly been measured did not change across time.

Structural Invariance

Structural invariance refers to the degree of continuity in the nature of the phenomenon under investigation. Two types of invariance need to be considered: (1) invariance across multiple age groups or cohorts, such as are usually found in cross-sectional studies or cohort comparisons, and (2) invariance across time for the same individuals measured longitudinally. For example, an intelligence construct may be considered structurally invariant when it is characterized by the same dimension, and when there is a persistent pattern of relationships among its component attributes across time (McArdle, 1996; Schaie, Maitland, Willis & Intrieri, 1998). This issue has received much interest especially in relation to the across-time development of cognitive abilities. The generally accepted criterion for structural invariance is that the factor structure of the concept of interest is the same at each wave of the study. Thus, if a particular concept consists of two related factors at one occasion with three items loading on each factor, a 'similar' structure should be obtained for follow-up measurement of this concept. If not, development has been discontinuous; the terms 'structural', 'qualitative', or 'configural' change have been used when referring to this issue.

Only when factorial invariance has been demonstrated can one assume that quantitative comparisons of differences in developmental trajectories truly reflect changes in the underlying constructs; based on factorical invariance one should compare estimated factor scores on the latent constructs. Factorial invariance involves the same relative magnitude of factor loadings of variables on factors (i.e. measurement equivalence, metric invariance) as well as the same degree of relations between the factors (i.e. structural invariance). The degree of relation between (oblique) factors can range from zero to one in correlational terms. The emergence of qualitatively new structures can be mirrored by relations between factors changing from one measurement point to another. Differentiation can be indicated by weaker and weaker relations across time, and dedifferentiation by increasing relations across time. The differentiation–dedifferentiation hypothesis suggests differentiation of dimensions of human behaviour during the growth stage, and dedifferentiation or reintegration as individuals age (Carroll, 1993; Reinert, 1970). Structural equation models can be specified that are suitable for statistical tests of most of the previously mentioned invariance assumptions (Rudinger, Andres & Rietz, 1994; Schaie & Hertzog, 1985).

Normative (Interindividual) Stability

Normative stability refers to the persistence of individual ranks or differences on an attribute of

interest (i.e. stability of interindividual differences). It is usually measured as the correlation between the measures of this attribute across time for a group of individuals (such correlations are sometimes referred to as 'autocorrelations'). Strong positive autocorrelations indicate that persons who received low (high) scores in relation to other members of this group at one wave of a study retained similar relative positions in a follow-up wave. Stability of the relative positions is reflected by parallel or monotonically ordered individual trajectories, and change by crossing individual trajectories (growth curves). In the case of monotonicity and crossing of the trajectories the variances of the measures in the sample can change as well across time (or remain stable) (Rudinger & Rietz, 2001).

Conversely, weak autocorrelations suggest that the relative position of the person in the study has changed strongly across time.

It is only meaningful to compare individual ranks on an attribute of interest across time if the meaning of this attribute has remained unchanged. So, in order to be able to say that a concept is normatively stable, the assumption that this is structurally invariant must be satisfied.

Level Stability/Quantitative Constancy

Level stability or 'quantitative' stability refers to persistence in the magnitude of a phenomenon across time. Level stability can be measured in terms of (the absence of) change in group means across occasions, such as when there is no change in average intellectual performance. Level stability can also be assessed at the individual level, by examining within-subject across-time scores in an IQ test. Like normative stability, the examination of level stability presumes that the concepts to be compared are structurally invariant across time.

In empirical research, investigations initially attend to the means. Analyses of differences or changes in means by *t*-tests, (M)ANOVA or non-parametric counterparts seem very simple and easily interpretable. In Structural Equation Modelling by contrast the basic analysis starts with variances and covariances. The analysis of mean structures in SEM is a non-standard procedure. One of the first explicit Latent Growth Curve (LGC) models for analysing co/variances and mean structures as well in a longitudinal context was published by McArdle (1986). For recent developments see McArdle (1998) and Rudinger and Rietz (2001).

Stability, Invariance and Change in Latent Variables

The different features – level and its statistical counterpart the mean, interindividual differences in variables under study or variability among individuals' respective variances, and relative positions of subjects within their reference group across time (normative stability), respectively the autocorrelation/test–retest correlation – are distinct and independent facets of change.

In addition to means, variances, and individual slopes of the trajectories across time as a further aspect, it has to be taken into account whether stability or change is located on the observed or on the latent level. Increasing variances of the observed variables across time could indicate a 'real' fan-spread change on the latent level (i.e. growing variances of the latent variables across time) or could indicate decreasing reliability across time, i.e. increasing error variances over time. It is possible that behind every facet of change in the observed world the same or a different process of change is hidden in the latent world, i.e. on the level of constructs.

These considerations provide additional reasons why Structural Equation Modelling (SEM) – explicitly differentiating between observed and latent variables – is extremely useful for the analysis of stability, variability, and change in the context of longitudinal data. In terms of SEM the definition of stability refers to the structural model, specifying the relations hypothesized within a set of theoretical concepts. Stability is 'operationalized' as the correlation of latent variables adjacent in time. Stability in this sense mirrors the consistency of interindividual differences at the level of latent constructs and refers to theoretical assumptions about the time-bound process.

Hypothesized relations of theoretical concepts to a set of measured variables (measurement model) serve the estimation of reliability, which describes the quality of measurement of the phenomena under study.

COHORT EFFECTS

Levels and forms of age gradients in intellectual abilities are shaped, to varying degrees, by history-graded systems of influence, such as enduring differences between people born at different points in historical time (cohort effects), specific influences of historical events across chronological age (period effects), or generalized and enduring shifts in the environment affections of individuals of all ages and subsequent cohorts (general environmental change). Discrimination among these varieties of environmental change is not easy.

The 'General Developmental Model' (Schaie, 1965)

These three sources of different influences reflect the three components of Schaie's (1965) 'general developmental model'. The general developmental model characterizes the developmental status of a given behaviour to be a function of three components A, C, and T. In this context, age (A) refers to the number of years from birth to the chronological point at which the organism is observed or measured. Cohort (C) denotes a group of individuals who enter the environment at the same point in time (usually but not necessarily at birth), and time of measurement (T; sometimes called period P) indicates the temporal occasion on which a given individual or group of individuals is observed or measured.

Like Cohort, Age and Period are not of much intrinsic interest to researchers: they are usually measured because they present convenient and readily measurable indicators of more basic 'underlying' concepts (A, T, P, C as proxy variables). For example, cohort Age may represent concepts such as maturation and biological or intellectual development (for birth cohorts), vocational career phase (for labour market cohorts), etc. Similarly, the meaning of the Period concept is much wider than its simple measurement suggests. It refers to all events relevant to the issue of concern that have occurred between the waves of the study.

The rather diffuse and imprecise measurement of the concepts that underlie the Age, Period, and Cohort variables pose the problem that the effects of these variables can rarely be interpreted unambiguously unless they are broken down to concrete possible impact variables.

Further, the three components are confounded in the sense that once two of them are specified, then the third is known (linear dependency). Nevertheless, each of the three components may be of theoretical interest in the developmental sciences. If there exist some assumptions about cohort, period and/or age effects, which imply constraints in the model set up for analysis, some statistical solutions of the confounding problem are available (Erdfelder, Rietz & Rudinger, 1996).

The Cohort Variables

The Cohort variable must be theoretically distinguished from the two related concepts (A, T/P). In cohort analysis, Age is measured as the amount of time elapsed since the cohort was constituted. The second related concept is T or P. Operationally, this refers to the moment of observation. The different age groups represent necessarily different cohorts, which differ in social and historical experiences like educational systems, professional and vocational trainings, historical changes in health services, etc. Cohort is just a proxy variable for a set of theoretical intermitting influences and determinants.

It is a well-known fact in medicine, sociology, and psychology that belonging to a cohort is a co-determinant factor of health, life-style and thus for the development of modes of experience and behaviour. Cohort membership influences also the formation of attitudes, convictions and values. The cohort variable indicates at least three points:

- the weakness of explanation by simple, generally valid and universal laws of development ('differential gerontology' is the more appropriate approach)
- the untenability of purely person-oriented, intra-organismic models of development, and
- the necessity of interdisciplines (sociology, economics, educational and political sciences, demographics, epidemiology) as the description and explanation of cohort differences exceed the psychological domain.

Cohort Sequential Studies

The basic cross-sectional study (comparing different groups at one point in time) and the basic longitudinal study (following one cohort

across time) are simple subsets of the general model. Using Baltes's (1968) terminology, a cross-sectional sequence usually involves the replication of a cross-sectional study so that the same age range of interest is assessed for at least two time periods, obtaining the estimate for each age level across multiple cohorts, where each sample is measured only once. By contrast, the longitudinal sequence represents the measurement of at least two cohorts over the same age range. Here also, estimates from each cohort are obtained at two or more points in time. The critical difference between the two approaches is that the longitudinal sequence permits the evaluation of intra-individual age change and inter-individual differences in rate of change, information about which cannot be obtained from cross-sectional sequences.

Developmental psychologists often find the cohort-sequential design of greatest interest because it explicitly differentiates intra-individual age changes within cohorts from inter-individual differences between cohorts (Schaie & Baltes, 1975). This design also permits a check of consistency of age functions over successive cohorts, thereby offering greater external validity than would be provided by a single-cohort longitudinal design.

In a typical longitudinal study, repeated measures are taken of the same subjects at different times. Another possibility is to use the same research design but with independent samples at each point on the longitudinal time scale. The independent sample procedure, used conjointly with the repeated-measurement procedure, permits estimation of the effects of experimental mortality and of instrumentation (practice) effects. The independent samples are initially drawn at each occasion; hence, they reflect the likely composition of the single sample the repeated-measurement study would have had if no subjects had been lost between testing – and, of course, if the subjects had not had any practice on the test instruments.

Cohort Effects on Intelligence

There have been marked generational shifts in levels of performance on tests of mental abilities (Schaie, 1996). Empirical findings suggest that later-born cohorts are generally advantaged when compared with earlier-born cohorts at the same ages. This phenomenon has been explained by increased educational opportunities and improved life-styles, including nutrition and the conquest of childhood disease, which have enabled successive generations to reach ever higher ability asymptotes.

Studies with cohort-sequential designs allow three kinds of comparisons across age: cross-sectional, longitudinal, and independent-sample, same-cohort comparisons.

Intellectual ageing as a multidimensional process in normal community-dwelling populations has been studied most intensively in the Seattle Longitudinal Study (SLS; Schaie, 1996). The principal variables in this study, which was extended thus for over a 35-year period, were five measures of psychological competence known as primary mental abilities (Thurstone & Thurstone, 1949): Verbal Meaning, Space, Reasoning, Number, and Word Fluency (the ability to recall words according to a lexical rule). During the last two test occasions, five multiple marked abilities were assessed at the factor level: Inductive Reasoning, Spatial Orientation, Perceptual Speed, Verbal Ability, and Verbal Memory.

A number of recent short-term longitudinal studies confirm that age changing in cognitive functions is a rather slow process.

Although by age 60 virtually every subject had declined on one ability, few individuals showed global decline. Virtually no one showed universal decline on all abilities monitored, even by the 80s.

Significant reductions in psychological competence occur in most persons as the 80s and 90s are reached. However, even at such advanced ages, competent behaviour can be expected by many persons in familiar circumstances. Much of the observed loss occurs in highly challenging, complex, or stressful situations. The often-voiced hope that the more able are also more resistant to intellectual decline remains generally unsupported. There are tremendous individual differences in level and rate of change. But those who start out at high levels remain advantaged even after suffering some decline, i.e. inter-individual stability.

Due to substantial cohort differences age-comparative (cross-sectional) studies show greater age differences than do longitudinal data. Typically, ages of peak performance occur earlier (for later-born cohorts), and modest age

differences are found by the early 50s for some and by the 60s for most dimensions of intelligence. Because of the slowing in the rate of positive cohort differences, age difference profiles have begun to converge somewhat more with the age changes from longitudinal studies.

FUTURE PERSPECTIVES

From research on the development of intelligence over the lifespan a couple of very interesting and intriguing topics have been derived (e.g. Baltes, Dittmann-Kohli & Dixon, 1984).

These are still here today and in the future the following ones will be:

1 Multidimensionality, the notion that intelligence is composed of multiple mental abilities, each with potentially distinct structural, functional, and developmental properties.
2 Multidirectionality, signifying that there are multiple distinct change patterns associated with these abilities.
3 Inter-individual variability, a conception reflecting the observed differences in the life-course change patterns of individuals.
4 Intra-individual plasticity, which indicates that, in general, throughout the life course individual behavioural patterns are modifiable.

While there is support for each of these, it is also the case that it would be possible to emphasize the converse principles of unidimensionality, unidirectionality, inter-individual stability, and intra-individual constancy from an examination of the present research body. Future research should clarify which of the mentioned perspectives is the appropriate and most plausible one.

CONCLUSIONS

Presenting a conclusion one can refer to Brody (1992) quoting the following statements:

1 There are secular increases in intelligence. These changes are not attributable to genetic influences.
2 Even the most ardent proponent of genetic influences on intelligence believes that there are environmental influences on the phenotype of intelligence.
3 (...) that genetic factors may be more important determiners of adult IQ than of IQ in childhood. This implies that the IQ index is not a measure of the same construct at different points of a person's life. If it were, the determinants of the construct would not change.
4 The content of intelligence tests changes over the life span. Items used to assess intelligence in 4 year old children are not the same as items used to assess intelligence in adults. In this respect, IQ is not like height, which increases but can be assessed by the same instruments at different times in a person's life. The means of assessing intelligence are not constant over the lifespan and hence the increase in intelligence is indexed by different instruments.
5 It has been argued that there are age-related changes in the biological basis of fluid intelligence over the lifespan. Therefore, some components of intelligence may be influenced by age-related changes in the biological basis of test performance.
6 While IQ test scores are stable, the test–retest correlation is less than perfect. IQ is only relatively fixed or unchanging. As the time between administrations increases, the test–retest stability of IQ decreases.
7 The intellectual skills that a person develops depend crucially on a person's 'cultural experiences'.

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RELATED ENTRIES

Intelligence Assessment (General), Personality Assessment Through Longitudinal Designs, Cognitive Decline/Impairment, Development: Intelligence/Cognitive, Cognitive Ability: Multiple Cognitive Abilities

INTEREST

INTRODUCTION

This entry briefly summarizes highlights of what is known currently about the assessment of interests including its underlying scientific basis. The history of the measurement of interests is briefly described. Structural issues are discussed and alternative ways to measure interests, including some of the currently used measures of interests, are briefly reviewed.

NATURE OF INTERESTS

Although they have been studied most comprehensively as they relate to *occupational* choices, interests identify aspects of a person that constitute enduring individual difference variables (Crites, 1999). Interests affect a number of life choices and activities in which people are likely to invest time, energy and attention; they appear to influence

both work and life satisfaction (Super, 1940; Super & Crites, 1962).

The definition of the term 'interests' that will be used here is the following:

> Interests are relatively stable psychological characteristics of people which identify the personal evaluation (subjective attributions of 'goodness' or 'badness', judged degree of personal fit or misfit) attached to particular groups of occupational or leisure activity clusters.

Occupational interests, the primary focus of this entry, have been studied since the early 1900s, were initially approached primarily as a useful dimension for predicting such issues as occupational choice and career satisfaction rather than as psychological dimensions of interest in their own right.

Interests, as measured by such early measures as Strong's 1927 *Vocational Interest Blank* (SVIB; Strong, 1943) and Kuder's *Preference Record – Personal* (Kuder, 1948; Kuder and Zytowski, 1991), were found to be markedly reliable and to predict well the college and occupational choices. The reason for this consistency partly attests to the psychometric excellence of the early measures but also to the nature of the underlying construct. Recent evidence (e.g. Gottfredson, 1999) points to a strong heritability component to occupational interests, perhaps as much as 50%. Such data would help explain the strong reliability of occupational interests and their limited susceptibility to change efforts.

Contemporary interest theory, largely based on, or deriving from, the prolific empirical and theoretical work of John L. Holland and his associates (e.g. Holland, 1997), reduced complex interest measures that typically had focused on individual items or item clusters in predicting career choices to six primary factors, which Holland has labelled 'occupational personality' types. These groupings were also used to describe the occupational environments in which people work, essentially collections of people in particular occupational settings sharing similar patterns.

Holland's six 'RIASEC' interest types (realistic, investigative, artistic, social, enterprising, and conventional; Holland, 1997) are now popularly used throughout the world to measure occupational interests. The interest 'types' have demonstrated both structural consistency and the ability to predict occupations likely to be found motivating and enjoyable (see Holland, 1997, for a comprehensive review). The interest types seem markedly resilient across ethnic groups, cultures and genders (Day & Rounds, 1998). Although the theory is described as being a six-factor one, in assessment practice individuals are typically classified on the basis of their three most highly endorsed vocational interest scales rather than just one, so that, in individual difference terms, 120 possible combinations of the three highest endorsed interest patterns are possible.

More recent work has sought to refine Holland's constructs, generally to encompass a smaller number of underlying structural dimensions of interests. Some of this research has identified two underlying poles, concerns with people vs. things and with data vs. ideas. Other underlying structural factors have also been suggested, e.g. gender-specificity of occupations and their perceived prestige, and alternative shapes of hexagons or geometric figures have been suggested to portray the relationship among the types. No theory or structure has yet displaced Holland's, either methodologically or in terms of practical measurement.

Less robust have been issues of the occupational environments and the bases for matching individuals to occupations and occupational settings. Alternative, sometimes derivative or expansionary, formulations (e.g. Dawis, 1996) have been offered to Holland's. This may be partly influenced by the stretch in trying to translate literally an individual difference variable into an organizational level one. Clearly many factors other than the interest composition of the employees combine to determine an organizational environment and therefore the fit between person and environment.

RELATIONSHIP OF INTERESTS TO PERSONALITY, VALUES, AND ABILITIES

Recent research has addressed the important questions of the relationship of vocational interests to other individual difference domains, most notably to personality and abilities. These efforts have proved more productive with

relationship to personality than to abilities. Research shows strong overlap between the RIASEC types and conceptually related personality dimensions (e.g. social and enterprising interests to extraversion and agreeableness; openness to agreeableness) (Holland, 1997). Interests and values have similarly long been jointly considered but the constructs overlap and interests appear to be superior in predicting occupational outcomes (Holland, 1997).

Concerning the relationship of interests and abilities, there is less research and less basis on which to draw conclusions. Although the topic has been studied for many years (e.g. Gottfredson, 1986), there is surprisingly little that can yet be concluded with confidence. Similar structures do appear to characterize both interests and abilities (Ackerman, 1996; Lowman, 1991; Prediger, 1999) but, due to minimally overlapping variance between the two constructs, it remains important to measure interests and abilities separately (Lowman, 1991).

CONTEMPORARY MEASUREMENT OF INTERESTS

By the 1940s considerable progress had been made in refining the measurement of interests, especially with the advent of the Strong Vocational Interest Blank (Strong, 1943). For many years the SVIB dominated the field of interest measurement. Both this and Kuder's measure (Kuder, 1948), also very popular, in different versions, have now outlived their authors and continue to be used in the contemporary measurements of interests. Like the SVIB, the early Kuder has been updated and now carries a different name, the Kuder Occupational Interest Survey (KOIS; Diamond & Zytowski, 2000).

The Strong, now called the Strong Interest Inventory (SII; Donnay & Borgen, 1996), remains a very widely used and highly regarded measure of occupational interests. The SII uses a variety of item types to gather information on interests including queries about interest in specific occupations and non-occupational interests as well. It incorporates the six Holland types and a number of other dimensions also of interest to vocational counsellors such as personal styles, akin to personality variables. Its normative base is excellent with a general norm sample of 18,951 (Harmon, Hansen, Borgen & Hammer, 1994). It has also been very responsive to the needs for ethnic diversity in the normative base. The RIASEC scales are incorporated into the test, which additionally includes test taking orientation (validity) indicators, specific occupational scales, and personality and educational predictors.

With the movement to Holland's (1997) theory-based occupational interest approach, newer instruments have also become very popular. These include two widely used measures of Holland's, the Vocational Preference Inventory (VPI; Holland, 1985) and the Self-Directed Search (SDS; Holland, Fritzsche & Powell, 1994; Spokane & Catalano, 2000). The VPI consists solely of occupational titles which respondents are asked to endorse or not as they appeal to the individual. The VPI measures the six Holland scores and several other related scales including validity, or test taking orientation, indicators (Infrequency and Acquiescence scales); a Masculinity–Femininity scale, and measures of Status and Self Control.

The SDS, also developed by Holland and his colleagues, is self-administered and scored. It is meant to simulate a career counselling experience and asks questions across a range of types of items, including occupational and activity preferences and self-ratings of abilities and competencies. Its summary scales include only the six RIASEC scores although a summary page provides scores for each of the component scales on the tests.

More recently, the Campbell Interest and Skill Survey™ (CISS; Campbell, 1994; Hansen & Neuman, 1999) was published, a test authored by one of the major researchers in occupational interests. This instrument combined a number of psychometrically valuable techniques, well-grounded theory, and the measurement of both interests and self-assessed abilities. It includes seven orientation scales (influencing, organizing, helping, creating, analysing, producing, and adventuring), which generally correspond to Holland's typology except for having two realistic analogues ('producing' and 'adventuring'). The test also encompasses 29 basic interest and skill scales (clusters of occupations and skills, such as mathematics and science grouped with 'write computer programs ... perform lab

Table 1. Comparison of psychometric and other characteristics of four major psychological measures of occupational interests

	SII[a]	CISS[b]	VPI[c]	SDS[d]
Coefficient alphas for RIASEC scales	0.90–0.94	0.75–0.90	0.81–0.91	0.90–0.94
Test–retest reliabilities for RIASEC scales	0.74–0.92	0.69–0.91	0.45–0.92	0.76–0.89
Subcategory: National norm				
Samples	Yes	Yes?	No	No
Validity indicators	Yes	Yes	Yes	No
Extensiveness of supporting validity evidence	High	High	High	Moderate

[a]*Source*: General Reference Sample, Harmon et al. (1994).
[b]*Source*: Campbell (1994).
[c]*Source*: Holland (1985).
[d]*Source*: Holland, Fritzsche & Powell (1994).

research' and sample occupations such as chemist and computer programmer). The test also incorporates normative data for 58 occupational samples. Two additional scales, academic focus and extraversion, identify basic academic and personality orientations.

A number of other measures can also be classified as interest related even though they do not measure interests per se. These include measures of career indecision and vocational identity. Increasingly also, researchers and practitioners have turned their attention to the computerization of interest assessment (e.g. Carson & Cartwright, 1997).

No single measure of occupational interests can be declared universally superior for use in all circumstances and with all populations. The relative merits and limitations of each measure among those most commonly used are counterbalanced by those of the others. The SII includes one of the most impressive normative bases and one that is regularly updated; the SDS lends itself to self-administration, scoring and interpretation; the CISS explicitly tries to measure self-ratings of competencies, etc. All of these approaches have value and all measures in one way or another incorporate Holland's factors. Still, more research is needed examining the shared variance across these measures and whether it practically matters, in the measurement of interests, which measure was used. In the meantime, practitioners need carefully to choose measures of interests relevant for the particular assessment population and task at hand. Interpretation of interests should be done in the context of the client's understanding of self and in association with other variables (see Lowman, 1991).

FUTURE PERSPECTIVES AND CONCLUSIONS

The measurement of interests is alive and vibrant at the turn of the century. As one of the most stable variables identified in the 20th century, the measurement of interests is well-established and a thriving commercial enterprise. Emerging theories, particularly those pointing to a simpler structure underlying the ones popularly used today, will undoubtedly generate their own measuring instruments. The next decades will benefit from refinements in the inter-domain models which seek, more complexly, to examine the relationships across domains, especially of the relationships of properly measured abilities and interests.

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RELATED ENTRIES

Personality Assessment (General), Attitudes, Emotions, Environmental Attitudes and Values, Self-Report Questionnaires, Personnel Selection, Assessment in, Applied Fields: Education, Applied Fields: Work and Industry

INTERVIEW (GENERAL)

INTRODUCTION

The interview can be defined as the assessment or research instrument that precedes any type of intervention to decision-making process, adopting an interactive format, given the very nature of the instrument and because it is part of the assessment-intervention continuum (see entry on 'Interview in Behavioural and Health Settings').

It was recognized in the 1970s as the most widespread assessment instrument in applied psychology, regardless of the assessor's theoretical frame of reference (Kanfer & Grimm, 1977; Haynes, 1978). This can be confirmed by examining any applied field.

In the 1980s there was particular concern over the need to adapt the instrument to the area of social services (Chandler, 1989), and since the 1990s there has been a tendency to employ interviews directed towards specific populations and objectives: selection of subjects for positions with well-defined requirements; alleged child victims of physical or sexual abuse; the elderly; abused women; depressed patients; and experts, whose knowledge can be represented using physical devices. In the case of experts, the aim may be didactic or to provide a support tool for decision-making.

In addition, the interview usually constitutes the first contact with patients, clients, applicants or research participants. It is the fundamental unit of connection between the psychologist or counsellor and the person or persons looking for help, advice or a job, or in need of psychological assessment. It requires, at least, the presence of two persons who interact; one of these would be the expert in charge of leading the interactive process.

As an interactive process, the interview has aroused considerable attention in relation to the study of its three components: interviewer, interviewee and information.

Different lines of research have coincided in dealing with aspects and variables of the complex sequences of interactive behaviour: the simultaneous processing of verbal and non-verbal signals (see: De Paulo, 1980; Rosenthal, 1981; Zuckerman and Driver, 1985); the significance and perception of roles of the participants in interactive situations (see: Zebrowitz, 1990); the effect of appearance, physical characteristics, sex, etc., widely studied during the second half of the twentieth century; the basic skills an interviewer should possess in order to manage all the formal aspects (see: Matarazzo & Wiens, 1972) and verbal aspects, considered by the long tradition that began with the pioneering studies on verbal conditioning (Greenspoon, 1955; Taffel, 1955; Verplank, 1955); and finally, the management of information in interactive situations (Hart, 1989; Márquez & Muñoz, 1994).

There was a progressive growth in expectations that the interview, as an essential assessment technique, could provide professionals with valid, reliable and accurate information.

In general terms, the guarantees of information obtained via the interview are closely linked to the type of interview (according to the degree of structuredness), its objectives and the context of its application. Thus, in personnel selection, as well as in mental health or learning disabilities classifications, the professional aims to maximize certain achievements considered as reference criteria: job success, number of abilities for successful learning, presence of symptoms. He or she obtains a record of the outcome and compares it with the prediction suggested by the interview: predictive validity is being assessed. In other situations, data-collection methods may already be in use, so that the user tries to determine whether the new data provided by the interview agrees with the information already obtained, in order to assess concurrent validity. The relationship between content and construct validity is examined in order to assess whether the information gathered using the interview gives a fair measure of performance in some important sets of tasks or behaviours, and to evaluate whether such information reflects basic principles, concepts and assumptions held by the theoretical model employed. Reliability studies give information about the consistency throughout a series of assessments using interviews. An inaccurate interview cannot be a good predictor. The interviewer usually wishes to know the person's position with regard to certain general or specific variables (criteria); the information gathered from responses or narratives elicited by interview questions or topics is considered representative of the client's position or placement in relation to these criteria.

In sum, the quality, utility and guarantees of the results of an interview depend on the skills of the interviewer, the type of interview used and its suitability with regard to objectives, group differences and cultural differences.

BASIC SKILLS

Effective listening skills constitute the foundation of a valid interview. A professional interviewer actively listens to a client in an effort to evaluate and understand his or her problems, concerns and expectations, and, where appropriate, to be an instrument of change that enables the client to reduce personal distress and worries.

The ability to conduct effective interviews depends on a consideration of the following aspects:

1 How to focus on what clients or participants (children, adolescents, professors, students,

older adults, job applicants) are communicating.
2 How to develop positive relationships with those people.
3 How to accurately evaluate subjects' responses to the type of interview being used.
4 How to efficiently obtain valid and reliable information about the individuals related to criteria or categories used by the interviewer.

The skills and resources to be managed are quite numerous, and their coordination complex, but some subsets have been more widely studied and have constituted priority objectives of training programmes. A large proportion of these derive from the work carried out in the 1970s by Matarrazo and Wiens (see: Matarazzo & Wiens, 1972; Wiens, 1976).

The basic skills are defined in terms of the following variables:

1 Duration of interviewer verbalizations: measure of the distribution of total time consumed in an interview. The use of this variable permits the management of time in favour of the interviewee, who is the source of information, and at the same time it is a potential indicator of the interviewer's effectiveness in different phases of the interview (introduction phase, opening, central body and closing phase).
2 Interviewer interruptions: this is a variable on whose management (inhibition or voluntary production of interruptions) depend positive effects such as reducing the frequency of verbalizations irrelevant to the purpose of the interview or observing samples of subject behaviour with regard to this type of interactive activity.
3 Inter-verbalization latencies: measure of the time interval in which absence of verbal communication can be observed. Management of this variable is related to quantity of information gathered, insofar as the end of the interviewee's verbalization and the interviewer's verbalization are sufficiently separated in time to guarantee that the former has not been interrupted or that there has been no partial inhibition of what s/he was trying to say.
4 Emission of reinforcements without semantic verbal content: the emission of reinforcements requires that the interviewer learns to use them with a specific contingency relationship in relation to stimuli (verbal emissions) that are equally specific, thus leading to an increase in their frequency and to an effect on the emotional relationship.
5 Eye contact: this variable was already referred to by Argyle (1969) as a regulatory function of communication processes. It influences the empathy perceived by interviewees and can be used in a similar way to the emission of reinforcements without semantic content.

Other highly relevant aspects have been stressed from various perspectives, important among which is the Rogerian approach (Rogers, 1969). The following are some of the several factors that make the process of becoming an effective interviewer difficult:

1 The importance of knowing yourself.
2 The ability to set up an environment that is conducive to the purpose of the interview.
3 The competence to efficiently evaluate how individuals are relating to the interviewer and the ability to prioritize information.
4 The acquisition of sufficient practice through specific training experience that allows professionals to master the interview situation.
5 The understanding of practical, ethical and legal implications pertinent to confidentiality.
6 The ability to take into account the fact that many social and cultural differences can potentially affect the interview; every client or person is part of a particular subculture with associated behaviour patterns and social norms.

TYPE AND STRUCTURE OF INTERVIEW

Two types of interview are commonly identified, depending on the role (directivity/non-directivity) adopted by the interviewer:

- Non-directive: applied when the interviewer adopts a passive, silent and expectant attitude to the potential provision of information by the interviewee.

- Directive: with regard to the objectives for action decided by the interviewer (explanations, suggestions, advice, urging), or according to the nature of the interview itself, in the sense that the information units on which it is proposed to work are more or less predetermined; this latter aspect is an indicator of the structure of the interview.

According to the structure of the interview the reference is the structured/non-structured continuum, and in this sense, interviews tend to be classified in the following way:

- Structured: when the questions followed by the interviewer have been predetermined pending specific and precise responses, structured in some kind of response-alternatives format, with the object either of exploring specific aspects, or of making inter-subject comparisons.
- Semi-structured: using an interview format with structured questions, as defined above, but with the expectation of open responses.
- Non-structured: in which both questions and answers are open.

Research has developed different models to describe the temporal and substantive structure of that which occurs during the interview as a global process. The following events and tasks take place in an interview:

1 Introduction phase: begins with the individual's first contact with the interviewer.
2 Opening: starts when the professional first makes an open-ended inquiry into the client's or participant's condition.
3 Body: focuses on information gathering. The type of information to be gathered depends on the purpose of the interview. The administration of tests and projective techniques is included here.
4 Closing phase: introduces a shift from information gathering to prepare individuals for an effective end.

These different phases correspond to some extent to the needs identified for fulfilling the general requirements of many types of interview (Ivey, 1993):

1 Establishing rapport and structuring
2 Gathering information, defining the problem and identifying assets
3 Setting goals
4 Exploring alternatives and confronting client incongruities
5 Encouraging generalization of ideas and skills to situations of daily life

Obviously, guarantees of the information gathered, according to the level of structuring of the interview, are a separate matter.

GUARANTEES OF THE INTERVIEW

There has been considerable insistence on the need to establish the scientific guarantees of the interview, both in classical psychometric terms (reliability, validity) and with regard to universes of generalization (Cronbach, Glesser, Nanda & Rajaratnam, 1972), given the complexity of the interactive process of elicitation of information from the interviewee by the interviewer (see: Cannel & Kahn, 1968).

Results on the reliability and validity of the information obtained in an interview suggest the use of structured interviews, and hence the increase in the use of questionnaires for identifying and delimiting specific problems within equally specific contexts: for example, autobiographical questionnaires (Lazarus, 1971), interview patterns whose aim is to identify the existence of behavioural excesses such as the consumption of psychoactive substances (Marlat, 1976), scales for assessing children to be completed by parents (Holland, 1970), psychiatric interviews (Endicott & Spitzer, 1978), etc. This type of interview permits the relatively straightforward study and establishment of reliability and validity indicators. Other types of interview rely necessarily on partial, more or less objective indicators, which allow the formulation of judgements on the quality of the information collected.

A first objective that should be considered is that of obtaining the relevant information required. Relevant information can be defined as the subset of information obtained referring to previously defined objectives to be studied. The relevance of the information is indicated by: (a) the prescriptions marked by the theoretical model the clinician adopts; (b) the profile of the job position or the profile of the tasks to be carried out by successful candidates; or (c) the model represented by the system or tool with which it is attempted to simulate the handling of expert knowledge.

The aspects that appear to be most directly related to the maximization of relevant information obtained in an interview are empathy, management of reinforcements (verbal and non-verbal) and control of formal variables, in the sense defined above (Matarazzo, Saslow, Wiens, Weitman & Allen, 1964).

In order to optimize reliability and validity in an interview, sampling strategies and recognition strategies are used, rather than open questions. An undesirable effect of the use of open questions are responses of a general or highly summarized nature; these responses are subject to reinterpretation and incorrect or ill-fitting interpretations on the part of the interviewer. Even though open and ambiguous questions are those most frequently used in the initial stages of the interview process, they would appear to be less frequent when what is sought is concrete and specific information. In this case it seems clear that the most suitable approach is to use sampling strategies; that is, the exploration of the subject's behaviour over time and across different situations (Fernández-Ballesteros & Maciá, 1992). Once the interviewee's different action alternatives have been determined, it is possible, subsequent to the interview, to present him/her with these alternatives so that s/he can consider in which situations s/he would apply them, thus allowing the checking of the information previously obtained. This corresponds to the use of recognition strategies.

ETHICAL ISSUES

Clients entrust interviewers with private information. In this sense, the professional is a kind of confidant. There are legal and ethical limits to confidentiality. Although every client (clinical, educational, forensic) is asked to be open and honest, there is some information that the interviewer cannot keep secret. Psychologists' associations, counsellors and social workers follow ethical guidelines pertinent to confidentiality.

A professional may disclose information in situations such as:

1 When the client's permission is given.
2 The client is suicidal and there is real danger.
3 The client is a child and there is evidence suggesting that s/he is being abused or neglected.
4 The professional has been ordered by a court to provide information about the client.
5 Professionals have evidence to believe that the client is abusing a minor.

It is nearly always appropriate to inform clients, at the onset of the interviewing process, of the legal limits of confidentiality.

INTERVIEWS WITH PERSONS OF DIFFERENT AGES AND SPECIAL SETTINGS

Working with children requires special considerations (see: Hodges, 1993). Interviewers that work with them frequently end up making some errors:

- They may believe they are fully capable of understanding children because they were children once.
- They may experience children as not yet fully part of the human world.

To interview children effectively there are educational and attitudinal requirements; psychologists must be especially attuned to the skills, training and knowledge of applied aspects of child development, as well as the use of tools and resources (arts and crafts).

Interviewing children and adolescents presents many challenges: their language skills are less well developed than those of most adults, they are most often brought to the interview by others (it is usually their parents who bring them), etc.

The relevant context of an interview usually includes the child's family situation, his or her school context and, if the young person is employed, the employer may be involved (see entry on 'Interview in Child and Family Settings'). A child welfare agency, other social agencies, the police, the courts or the neighbourhood community may be involved in the child's life. Other professionals, teachers or parents must be interviewed at the beginning of the assessment, and they must be informed of the results of the interviewing process. Information may be passed on, at least, to the police, the referring professional, guardians, courts, probation officers or lawyers (see: Barker, 1990).

Interviewing more than one individual is a challenging endeavour. Working with couples, parents, groups and families requires focusing on relationships. Specific assessment techniques have been developed to facilitate data-gathering with couples and families, such as the Family Environment Scale, the Family Genogram or the Marital Satisfaction Inventory.

Interviewing older adults is often associated with some type of assessment: cognitive functioning, emotional status, need for resources, social support networks, etc. The way in which the ageing process is conceptualized determines the use of particular assessment and intervention approaches. A reasonable interview approach related to an elderly individual must ameliorate cultural and professional ageism and take into account diverse areas of daily life and internal and external antecedents for the worries or needs expressed.

In the field of Industrial and Organizational Psychology, interviews are not among the assessment techniques that receive most emphasis (see: Vodanovich & Piotrowski, 1999 and entry on 'Interview in Work and Organizational Settings'). Most common in this field are assessment centres and honesty tests, followed by an assortment of personality, aptitude and vocational measures.

Selection is based on the knowledge of what to look for in the applicant. In interviewing to evaluate a person for a job we need to know what abilities and personality traits are necessary for success (see: Rumsey & Harris, 1994).

Many companies have developed job descriptions as a result of job evaluation programmes, but most job descriptions tell us what must be done rather than what abilities or personality styles are required. All the information obtained from preliminary interviews, application forms and aptitude tests is combined with that related to the individual's background, in order to make the final decision: information on experience, mental ability, motivation, maturity and self-control.

Interview validity, in the field of Industrial and Organizational Psychology, increases as structuredness increases. Meta-analyses of interview reliability show that inter-rater reliability is higher when interviews incorporate multiple ratings, interviewer training, and standardization of questions and response evaluation.

More dynamic models are needed to evaluate suitability for the organization, including personality characteristics and personal values. It is important that interviews incorporate BIODATA, biographical information related to cultural socialization, preference for group attachments and achievement-oriented pursuits.

Personnel selection is moving from focusing on the goals of the user (employer) toward the needs and goals of the applicants. Important research (Smith, 1994; Messick, 1995) related to Standards for Psychological and Educational Assessment suggests treating the validity of interviews as a unified concept that must incorporate the notion of consequences. It is necessary to distinguish between universals (characteristics required for success in virtually all jobs) and occupationals (characteristics required for a subset of a single job).

FUTURE PERSPECTIVES AND CONCLUSIONS

Most clinical and educational assessments have emphasized deficits; new developments are necessary in relation to the use of interviews to evaluate factors such as adaptation, personal competence, quality of life, hope, psychological well-being and intra-personal strengths.

Some problems related to interviewing throughout the lifespan and interviews carried out in different applied settings remain to be investigated.

The current multicultural global society requires that professionals take into account, during the interviewing process, the impact of cultural values expressed through dimensions of discourse strategies as well as in specific semiotic issues (meaning systems).

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RELATED ENTRIES

Interview in Behavioural and Health Settings, Interview in Child and Family Settings, Interview in Work and Organizational Settings

INTERVIEW IN BEHAVIOURAL AND HEALTH SETTINGS

INTRODUCTION

The concept *interview* within a psychological assessment context is employed with two different meanings: as an information tool and, in a broader sense, as the professional interaction between client and psychologist. In this study, we will employ the concept to talk about the procedure to gather

information both in clinical and health contexts. In both cases, the interview is the most used tool when a verbal interaction takes place between a professional and a client (or clients). The interview has a main goal: to obtain the maximum information possible in order to develop a functional analysis. This analysis will provide the basis to understand and to modify the problem when necessary. On the other hand, the interview, in addition to the use of questionnaires, is the only procedure available currently to obtain information on a client's cognitive responses, verbal-cognitive in this case (thoughts, attributions, belief system, etc.). Furthermore, it constitutes an economical tool to assess psycho-physiological responses (throbbing, muscular tension, etc.). Also, the interview is cheaper than the use of psycho-physiological devices, even though it is an indirect method (assessing the subjective perception that the client has).

In spite of its usefulness and popularity, only a few studies have analysed its reliability and validity. However, these studies obtained discouraging results (Hay, Angle & Nelson, 1979; Felton & Nelson, 1984).

DEFINITION

A clinical interview can be defined as the procedure followed by a professional (psychologist-interviewer) in a conversation with one person or more (clients) with the goal of getting desired information. Accordingly, it can be stressed that the basic interview characteristics within an assessment procedure are the following:

- An interaction between two or more people.
- A two-way route verbal communication.
- Some goals previously established by the interviewer who controls the procedure and withdraws the information from the interviewee.

In sum, the main goal of the interview as an assessment tool is to obtain information in order to build the behaviour-problem's functional analysis. In order to reach this goal, there should be followed several steps (Table 1). First, the problem description should be pursued in the most objective way available (behavioural, cognitive and psycho-physiologic responses). Secondly, the quantitative parameters that define the problem

Table 1. General interview guidance

1 Behaviour-problem delimitation
   - Problem identification
   - Problem description (behavioural, cognitive and psycho-physiologic responses)
   - Description of the last incident
2 Behaviour-problem parameters
   - Frequency (maximum and minimum)
   - Intensity (maximum and minimum)
   - Duration (maximum and minimum)
   - Recent frequency, duration or intensity of the behaviour-problem
3 Behaviour-problem determinants
   - Description of the situation/context in which the problem occurs
   - What does the client do when the behaviour-problem starts and finishes?
   - How do surrounding people react when the problem starts and when it finishes?
4 History of the behaviour-problem from its start
   - When was the problem first displayed and under what characteristics and parameters?
   - Evolution of the problem through its start until today
   - Differences and similarities between then and now
5 Impact of the behaviour-problem
   - How does the problem affect the client's life?
   - How does the problem affect other people around?
   - Client's motivation to solve the problem
6 Expectations and goals
   - Causal attributions
   - Personal or professional actions and intervention to solve the problem
   - Results obtained in the past
   - Recent expectations to solve the problem
   - What does the client expect?

should be specified and, thereinafter, delimitated antecedent and consequent elements in order to establish the behaviour functionality (antecedent stimuli, conditioned and/or discriminative and consequent stimuli and reinforcements). Once the fundamental aspects of the problem are assessed for current incidents, the history and the evolution of the problem should be inquired, as well as its impact in the client's life.

The interview should be displayed in a directing but flexible way. It should have an initial-facilitating phase (exploratory); an intermediate phase for clarification and specification; and a final phase focused on solving doubts and assuring congruency on the obtained data with the client. It is important to take into account that the interview is essentially an active interaction process between two or more people. Regardless of the goal of gathering information, the interview itself may also have therapeutic effects on the client. Therefore, it is critical to assure that the communication process is effective as a critical aspect to develop positive boundaries with clients. That is to say, when the treatment includes behavioural aspects, it is essential that the client is ready to accomplish the prescribed assignments to solve the problem. Therefore, a good communication and comprehension between professional and client should be maximized. Professional skills such as the ability of providing information, offering confidence, showing comprehension, operating management and, in sum, displaying basic technical and social abilities (therapeutic skills) are critical in order to develop an interview within a clinical or health assessment.

The language used by the professional during the interview has to be culturally adapted to the interviewee. As time goes by, the interviewee will acquire a behavioural language through a modelling and moulding process. Thus, the client will facilitate the required information with precision.

Another important aspect during the development of the interview is to collect the obtained information. Recording the information with an audiovisual device would be the best technique because it may allow registering of either verbal or non-verbal content. Another frequently used alternative is taking notes simultaneously while the client speaks. However, this method to collect information is somewhat problematic because it can impede and jeopardize the communication fluency. In addition, the professional may also lose important pieces both of verbal and non-verbal contents.

The client's role during the interview should be active and collaborative, even though it is the psychologist's responsibility to reach these goals by using his/her therapeutic skills (communication and operating management).

The interview completion requires a summary of the obtained information in order to guarantee its veracity according to the client's judgement. Eventually, it is usually required to complete the information with other evaluation procedures, especially questionnaires and the use of direct observation when possible within clinical and health assessment contexts.

FUTURE PERSPECTIVES

There was an attempt to outline the utility of the interview as a behavioural evaluation procedure during the 60s. In spite of the efforts accomplished to systematize the interview (Haynes, 1978; Linehan, 1977) during the 70s, it was not until the 90s that the importance of developing more investigation to identify the relative efficiency of the various components, procedures and strategies of the behavioural interview was taken into account. Recent discoveries led to a change that will affect both the evaluation and the therapy, in relation to the importance of verbal exchanges within a behavioural clinical context. From this perspective, investigations on verbal behaviour, especially from an operative conditioning perspective, represent one of the most fruitful lines on scientific psychology (Hayes, 1989). Taking in account that the interview is essentially a verbal exchange (regardless of the importance of non-verbal communication acts), studies focused on verbal behaviour are of high interest.

CONCLUSIONS

The interview is the most employed assessment procedure. However, its psychometrical properties have not been specified yet neither has the most effective method to carry it out. The main goal is to obtain relevant information on the behavioural sequence (what constitutes the problem to study and solve) in order to develop a functional analysis. Being an interpersonal

exchange of communication, it is not appropriate to neglect the importance of the communication proficiency (therapeutic skills) as well as the therapeutic effects that, independently of the assessment goal, may occur during the communicative exchange. The psychological interview is mainly directing, being the interviewer responsible to evoke relevant information in order to assess the problem.

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RELATED ENTRIES

Applied Fields: Clinical, Applied Fields: Health, Theoretical Perspective: Behavioural, Theoretical Perspective: Cognitive-Behavioural, Interview (General), Interview in Child and Family Settings, Behavioural Assessment Techniques

INTERVIEW IN CHILD AND FAMILY SETTINGS

INTRODUCTION

Interview can be defined as a system of communication, typically dyadic, aimed at acquiring information. The interview is a basic tool in many social sciences, including psychology. In every field of child psychology, from basic research to professional practice, sooner or later one will be faced with the task of discovering what a child thinks, feels or knows. Nevertheless, the validity of the interview (and more generally the use of verbal protocols; see Praetorious & Duncan, 1988) is continually debated, especially with children (Bruck & Ceci, 1996).

Interviewing is dangerously similar to everyday conversations. In fact, asking and answering are basic human activities (Flammer, 1981), which take place in the most varied occasions: a dialogue between friends, a school exam, a medical interrogation, a police questioning, and so on. In each of these situations, the communicative exchange is set by implicit, yet powerful rules (Schenkein, 1978). Some of these regulative factors apply to every dialogue, such as the need of turn taking, or the looks which signal the onset and the end of the verbal exchange; other rules, such as the degree of interpersonal distance, vary from one culture to another; still others, such as the degree of politeness required or the reciprocity of roles, depend on the characteristics of the partners and the content of the dialogue. We apply all these non-written rules based on tacit assumptions about speakers' roles and aims, and children more than anyone else do it unknowingly. It is hence clear that the first step towards interviewing well is to know the nature of this particular kind of verbal exchange, and to make it clear to the interviewees.

INVESTIGATIVE AND CLINICAL INTERVIEWS

Psychological interviews can be grouped in two broad classes, each roughly associated with some

general characteristics. In the first class – investigative interviews – we can include all the interviews aimed exclusively at discovering some respondent's mental contents, for research or forensic purposes. The second class comprises all kinds of clinical interviews, in which the need of obtaining useful information for the diagnosis is intertwined with that of establishing a therapeutic alliance. Investigative interviews are associated with: the interviewer as a main beneficiary of the obtained information; a strategy of non-interference with the interviewee's ideas and feelings; a preference for standardized formats. Clinical interviews are associated with: the interviewee as a main beneficiary of the given information; a legitimate intervention in the interviewee's ideas and feelings; a preference for highly flexible formats.

In practice, psychological interviews often escape such a clear-cut classification. For instance, with young children the maximum of possible standardization can be a list of contents to be orderly followed since it is necessary to adapt the actual phrasing to the child's language, attention span and tolerance for the interview situation as a whole.

Investigative interview techniques were first developed in the context of research about cognitive development. Piaget (1926) explained how it is possible to use interview as reliable sources for studying children's ideas, but he also outlined how easy it is to come up with useless answers. Children can answer randomly, if poorly motivated, tired, bored; or they can produce myths and fantasies, if they treat the interview as play; or they can parrot the interviewer's suggestions. Piaget's generalized guidelines on how to conduct valid interviews were incorporated in the research paradigm stemming from his work. Only recently, however, systematic studies have become common, especially under the pressure of the increasing number of child witnesses in legal cases of abuse or controversial parental custody (Pool & Lamb, 1998). In fact, legal court and psychological research are among the few situations in which children can be irreplaceable sources of information.

Clinical interviews with children and parents are an integral part of child psychoanalytic and psychiatric treatment (A. Freud, 1966; Winnicott, 1971; Sullivan, 1954; Rutter, Taylor & Hersov, 1994). In these contexts, three categories of patients can be distinguished: co-operative patients, who openly talk about their problems; 'resistant' patients, who conceal part of their problems; and patients unaware of their problems (Othmer & Othmer, 1994); accordingly, the interviewer is forced to use more direct questions to obtain relevant information. It is also clear that children belong more frequently to the third category, as they are often unaware that communicating certain experiences could help solve their problems; hence more guidance is needed when children are interviewed for diagnostic purposes. Moreover, it is always necessary to validate the information so obtained with data from other sources, usually parents and sometimes other figures (other relatives, teachers) (AA.VV., 1997). Direct observation during play sessions, or in everyday settings (e.g. school), is recommended with young children.

ESTABLISHING SETTINGS

In both investigative and clinical interviews, the first methodological precaution is to create an appropriate setting. The ambience should be pleasant and stimulating, but not too rich with distracting objects; it should be equipped for videotaping if testimony has to be collected. Some simple toys for symbolic play and materials for drawing and moulding should be at hand, depending on the child's age.

Children are often unaware of the reasons for their having been brought to the consultation, or (worse) they are led to believe that some unpleasant medical procedure would take place. In a simple and encouraging way, the interviewer must explain the aim of the questions, guarantee confidentiality and reaffirm the child's right to not answer. In the case of legal interviews, some authors also recommend ascertaining whether the child can distinguish between truth and lying (McGough, 1994), but the best ways to reach this goal are still a question of debate (Pool & Lamb, 1998). Instead, it has been experimentally demonstrated that children provide a larger proportion of correct answers about a previously witnessed event if they are told in advance that the adult does not know what happened and that they can answer 'I don't know' when appropriate (Mulder & Vrij, 1996). Another useful practice, in the preliminary phase of forensic interviews, is

to enhance the remembering of past events with the instructions provided by the 'Cognitive Interview' (Geiselman, Saywitz & Bornstein, 1993).

BUILDING A RELATIONSHIP AND BEGINNING THE INTERVIEW

A familiarization phase with the child is always necessary. For instance, in a clinical setting, it is not always opportune to begin the interview talking about symptoms. Talking for a while about neutral matters helps the child to develop a sense of self-assurance and trust (Angold, 1994), while the interviewer can appraise the child's communicative abilities. With young children playing or drawing can help break the ice. In forensic interviews, the child can be asked to talk about a recent, non-related event (Pool & Lamb, 1998). In clinical consultations, when the child or the adolescent arrives accompanied by parents, who will be also interviewed, it is necessary to give complete assurance that his/her point of view is important and will be respected as much as that of the adults.

STRUCTURING THE INTERVIEW

Some clinicians point to the advantages of open, non-directive interviews ('client-centred', Rogers, 1945, 1951) while others claim superior merit for structured interviews in one or another of their numerous formats (many of which are listed in AA.VV., 1997). It has been noted, however, that no interview can be really 'non-directive': it is sufficient for the clinician to smile or take notes to reinforce some answers (Cox & Rutter, 1985). It is better to manage explicitly the situation than to risk selectively distorting the child's answers under the influence of those 'confirmatory biases' widely documented by social psychology and inevitably as much present in the interviewer's as in anyone else's.

The choice of a structured interview does not necessarily imply abandoning personal initiative. This can be true for highly structured interviews ('respondent-based') but not for semi-structured interviews ('interviewer-based') (Angold, 1994) in which a series of key questions are listed, some of which can be omitted, while others can be elaborated in depth. In diagnostic settings, the course of the interview will depend on two key factors: the subject's age (see Barker, 1990) and the 'decisional tree' adopted by the clinician (analytical examples in Harrison & Eth, 1998). Investigative interviews can be highly structured when they are conducted for research purposes (but not necessarily so, *cf*. Lumbelli, 1993), and less structured in forensic contexts.

ASKING QUESTIONS

Questions are 'open' when they allow for a wide range of answers, and 'closed' if they admit only yes or no answers or allow for choosing between a few, ready-made options (multiple choice questions). The principal merit of open questions is that they reduce the interviewer influence. Interviewers should be aware that materials derived from interviews are rarely 'spontaneous'. When based on children's reflections about topics they had not considered before, answers are, at best, genuine, but 'provoked' (Piaget, 1926). Open questions are widely used in the legal field, to obtain narrative accounts of allegations. Young children, however, are not very productive in answering open questions, and resorting to closed questions in order to cover all relevant aspects is almost inevitable. Besides a correct setting, productivity can be enhanced by techniques such as mirroring (Rogers, 1945) or non-specific verbal prompts such as 'tell me all that you have seen' or 'all you have heard' (Elichsberger & Roebers, 2001).

EVALUATING ANSWERS

In clinical assessment, the conclusions drawn from an interview should be always conceived as hypotheses, verification of which relies on the continuing therapeutic process. The situation is different with investigative interviews, where the validity of the protocol should be in itself evident enough to be used as a proof. Methods of content analysis for evaluating protocols have been developed (Steller & Koehnken, 1989), based on the assumption that truthful narratives of events are different from inventions or biased descriptions (Undeutsch, 1982). Recent studies

(Orbach & Lamb, 2001) have shown that leading questions generate more contradictions than open, non-leading questions. Contradictions, then, can be used as indices of a poor interview and not only (or not always) of the interviewee's uncertainty or reticence.

AVOIDING ERRORS

Conversation in everyday contexts is a robust communicative tool, since participants can go back over unclear subjects in order to achieve reciprocal understanding. Adults capitalize on this when talking with children, often using new terms or complex linguistic forms (double negatives, passive verbs, subordinates) as occasions for linguistic apprenticeship (Wertsch, 1985). In an interview, instead, difficult or obscure forms should be carefully avoided, especially with young children. Misunderstandings that are easily remedied in everyday situations can create serious problems in an interview. For instance, if one includes two questions in a single utterance, children usually answer only one, and it can even be impossible to detect which one they have actually responded to (Walker & Hunt, 1998).

Some conversational styles are also sources of error in interviews. With children it is common to use rhetorical questions that are in fact orders ('would you please get up?') or suggestions ('it's a nice toy, isn't it?'). Not only should this kind of leading question be avoided, but it is also necessary to make clear to the child that there are no 'right answers' to guess. It is also safer to avoid repeating the same question, a way of talking which is often used in everyday life as a strong suggestion to change answer, and in fact has been found to elicit contradictions from young interviewees.

When it becomes necessary to resort to closed questions, multiple choice questions which allow a 'content' answer should be preferred to those eliciting yes–no alternatives, to avoid the effect of any subjective bias towards answering always yes (or always no) in case of doubt.

And above all, one should be aware that memorizing this list of errors, or a series of good practices, does not transform anybody by magic into an expert interviewer (Sternberg et al., 2001). On the contrary, only a long apprenticeship joined with deep intellectual honesty and a vibrant interpersonal sensitivity can help a person acquire the difficult art of interviewing children.

FUTURE PERSPECTIVES AND CONCLUSIONS

The interview is undoubtedly one of the most important psychological tools, and it promises to be employed in the future as much as it has been used during a century of psychological research practice. Perhaps the interview will become even more necessary, if the present popularity of cognitive theories does not decline, since these theories almost invariably require discovering the subject's perspective. The recognition that young children are most competent knowers than they were previously thought to be is another factor which has increased the population of potential interviewees, and this trend is likely to continue. The difficulty of avoiding suggestions and other mistakes while verbally interacting with preschoolers has led psychologists to refine the interviewing techniques, taking into account memory and language problems, as well as social roles as sources of bias. These advances will be beneficial for interviewing other 'special populations' such as immigrant adults with limited linguistic skills, or mentally retarded people. Most important, a new wave of experimental research on the interview has begun, which is especially concerned with the validity of interviews in forensic settings. It would be important if this effort of refinement and validation were to be developed to cover still other aspects of interviewing and extended to a wider variety of fields of application, including diagnostic and clinical. Finally, how to teach interviewing to psychology students and young practitioners is a question that requires special attention indeed: no instrument can be fully appreciated without those people capable of using it at its best.

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RELATED ENTRIES

Applied Fields: Clinical, Applied Fields: Education, Interview (General), Family, Child Custody

INTERVIEW IN WORK AND ORGANIZATIONAL SETTINGS

INTRODUCTION

This entry describes the central results of research on the selection interview. After a definition of the interview in psychological assessment main features of selection interviews are described. Prerequisites of psychological interviews are given and the central developments in the area of the selection interview are summarized. Then the results of meta-analyses on reliability and validity of selection interviews are presented. Finally conclusions and future perspectives on selection interviews are given.

DEFINITION

A psychological interview is a kind of conversation between one or more interviewers and one or more interviewees which follows implicit and explicit rules and aims at gathering information for the description, explanation or prediction of individual behaviour or the relationship between people, or at gathering information about the conditions that change or stabilize individual behaviour or the relationship between people.

FEATURES OF SELECTION INTERVIEWS

Most frequently, one person interviews another. A group of interviewers interviewing one applicant is called a panel or a board. A psychological interview has the following three sections: (a) planning, (b) realizing, and (c) summarizing. Rules for realizing the interview are very often agreed at the beginning of a psychological interview. These rules relate for example to aims, duration, themes, recording and summarizing of the psychological interview. In addition, both interview partners behave according to implicit rules for a conversation. All conceptions of psychological interviews which lead to psychometrically acceptable interview results have an explicit planning in common. Thus, these interviews are (at least partially) structured or completely standardized. In partially structured interviews the questions are prepared; in structured interviews, the sequence of questions is also prescribed. In standardized interviews, furthermore, explicit rules are given concerning all relevant conditions for realizing and summarizing the interview.

PREREQUISITES

In all fields of applied psychology, the abilities of interviewers have been initially overestimated and the complexity of planning, realizing and summarizing an interview have been systematically underestimated. If interviewers want to arrive at satisfying decisions, i.e. not to regret later the low procedural quality in these decisions, the following prerequisites must be fulfilled. They (a) need to plan an interview systematically and to base it on empirically well founded research results, (b) must be well trained individually in realizing an interview, and (c) must summarize, after individual training, the results of an interview according to explicit rules.

DEVELOPMENTS

In the last five decades there has been an increasing tendency to structure selection interviews. In addition to this, a growing number of selection interviews are founded on basic theoretical notions. The Situational Interview (Latham et al., 1980) is based on goal setting theory and its basic assumption is that people behave according to their goals. In contrast to this interview conception, the (Patterned) Behaviour Description Interview (Janz, 1982) is, like the Experience-Based Interview (Pulakos & Schmitt, 1995), based on the assessment prediction rule that the best predictor of future

behaviour is past behaviour. In traditional selection interviews, personality traits were assessed. This, however, did not prove to be very useful. More valid information results from selection interviews based on a requirement profile derived from an empirical job analysis. Selection interviews of the 'third generation', e.g. Schuler's (e.g. 1989) Multimodal Interview, combine all these measures relatively successfully.

RELIABILITY AND VALIDITY OF SELECTION INTERVIEWS

Reliability

Because reliability defines the upper limit of validity, Conway et al. (1995) published a meta-analysis on the reliability of the selection interview. Interview reliability is higher for panel interviews than for individual interviews, higher for trained interviewers than for untrained interviewers, and higher for highly structured interviews than for those with a lower degree of structuring. Structure was operationalized by three dimensions: standardization of questions, standardization of response evaluations (global rating vs. multiple-dimension ratings vs. ratings for each answer) and standardization of method for combining ratings (subjective vs. mechanical). Conway et al. (1995: 573–574) found that 'Estimates of upper limits of validity were 0.67 for highly structured interviews, 0.56 for moderately structured interviews, and only 0.34 for interviews with low structure. These upper limits represent the highest validities that could be achieved with a perfectly reliable criterion.' McDaniel et al. (1994: 604) reported higher mean reliability coefficients: 0.68 for unstructured interviews and 0.84 for structured interviews.

Validity

Hunter and Hunter's (1984) often cited meta-analysis found a validity coefficient of 0.14 for the selection interview. In contrast to this, later meta-analyses based on many more studies and people revealed that the 'received doctrine' of interview invalidity is false (Wiesner & Cronshaw, 1988). Structured selection interviews were found to have higher validity than unstructured interviews (Wiesner & Cronshaw, 1988; McDaniel et al., 1994; Huffcutt & Arthur, 1994). Furthermore, Huffcutt and Arthur (1994: 184) found that 'Interviews, particularly when structured, can reach levels of validity that are comparable to those of mental ability tests. Although validity does increase through much of the range of structure, there is a point at which additional structure yields no incremental validity. Thus, results suggested a ceiling effect for structure.' Mental ability tests are usually seen as the predictors with the highest validity. Structured selection interviews in particular can be as valid as mental ability tests (Huffcutt & Arthur, 1994). Contrary to widespread opinion, the results of a meta-analysis indicate that individual interviews are more valid than board interviews whether they are structured or not (McDaniel et al., 1994). The use of job-analytic information for the preparation of an interview yields higher validity coefficients (Wiesner & Cronshaw, 1988), which also accords with the data of Conway et al. (1995). Contrary to a variety of earlier studies, Wiesner and Cronshaw (1988) in their meta-analysis did not find any moderating effect of the sex and race of rater or ratee.

Reliability of Criteria

Validity of selection interviews can be evaluated by the application of criteria like success in training, job performance or tenure. These criteria are more reliable than psychiatrists' diagnoses, but they are far from being perfect in reliability and validity, which must be taken into account in meta-analyses. In meta-analyses, the lack of reliability in estimates of these criteria is used for assessing the true validity of selection interviews. Recent studies on the reliability of these criteria show, however, that they are better than estimated (e.g. Rothstein, 1990). This allows the conclusion that validity of selection interviews is underestimated by the meta-analyses.

Incremental Validity

There is a widespread opinion that selection interviews mainly assess verbal intelligence. The studies of Campion et al. (1994) and Schuler et al. (1995), however, indicate that selection

interviews can have incremental validity beyond that of cognitive tests, i.e. a correlation remains between interview data and criteria even when intelligence has been held constant. Both studies used carefully prepared interview guides based on an empirical job analysis, and standardized questions of the situational interview type as well as questions of the behaviour description type. Additionally, the interviewers had to evaluate as well as combine the answers according to explicit rules.

FUTURE PERSPECTIVES AND CONCLUSIONS

After ten years of meta-analytical work, we can state that a well structured selection interview based on empirical job analysis can measure highly reliable predictors which cannot be measured by tests. There are a lot of hints on the potential influence which interindividual differences of interviewers and interviewees can have on the selection interview result (for an overview see Graves, 1993), but these differences seem to be of no practical influence in highly structured interviews (Pulakos et al., 1996).

The following question must still be answered: what constructs can be assessed only by interviews or more efficiently by interviews than by other methods? (See Conway et al., 1995; Pulakos & Schmitt, 1995; Roth & Campion, 1992; Schuler, 1989).

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RELATED ENTRIES

Applied Fields: Organizations, Applied Fields: Work and Industry, Personnel Selection, Assessment in, Centre (Assessment Centres), Interview (General)

IRRATIONAL BELIEFS

INTRODUCTION

Cognitive-behavioural assessment is a technique used to test the thought processes which define many psychological disorders. A major component of cognitive-behavioural assessment is the measurement of irrational thoughts and beliefs. The tests of irrational thinking developed thus far have grown out of the work of American clinical psychologists Albert Ellis and Aaron Beck.

IRRATIONAL BELIEFS IN CLINICAL PSYCHOLOGY

Albert Ellis developed rational-emotive therapy (RET), now known as rational-emotive-behaviour therapy (REBT), during the 1950s as a result of his discontent with the efficacy of psychoanalysis (Ellis, 1962). The main hypothesis of REBT is that beliefs about events are the most important cause of appropriate or self-defeating emotions and behaviours. REBT is based on the ABC model of psychopathology, in which unpleasant activating environmental events (A) do not cause undesirable emotional and behavioural consequences (C); instead they are caused by the irrational beliefs (B) held about the event.

Irrational beliefs are beliefs by which external events are interpreted which are absolutistic and self-defeating observations. They are self-statements, unlikely to find empirical support, that reflect unspoken assumptions about what is necessary to lead a meaningful life. In a person holding irrational beliefs, inevitable setbacks will lead to inappropriate negative behaviours and emotions. Rorer (1989: 484), in describing the absolutistic nature of these beliefs, referred to them as 'beliefs that the world or someone or something in it should be different than it, she, or he is, because one wants it to be'. One very common irrational belief noted by Ellis is that people believe they must be completely competent in everything they do. When an inevitable error is committed, it becomes catastrophic because it is a violation of the belief in personal perfection.

Another version of the ABC model was provided by Beck (1976). According to Beck's theory, numerous disorders are caused and maintained by negative thinking styles and negative beliefs that people have about themselves, their current circumstances, and the future. Included among these cognitive errors are assuming excessive personal causality for negative events, and thinking of the worst believing that it is most likely to happen. These cognitive errors, referred to as distortions, guide the interpretation of new experiences and increase vulnerability to psychopathology.

The theories of both Ellis and Beck describe the logic of people with behaviour disorders as faulty in that they make exaggerated negative inferences about what happens to them. However, recent research suggests that for REBT, demandingness, thinking that someone or some circumstance must be a certain way rather than preferring that something be a certain way, is the main quality of all irrational beliefs. It is in this way that the theories of Ellis and Beck differ; for REBT disorders occur if beliefs are demanding rather than preferential (McDermut, Haaga & Bilek, 1997).

The aim of REBT is to eliminate self-defeating beliefs via cognitive restructuring. Therapists forcefully dispute clients' irrational beliefs by questioning the evidence for the belief. The eventual goal is the integrating of cognitive, affective, and behavioural processes in order to bring about the desired therapeutic result. As in the case of REBT, the goal of Beck's cognitive therapy (CT) is to alter systematic errors in logic or misinterpretations about events which predispose an individual to develop pathological behaviours. Consequently, accurate assessment of irrational beliefs is essential for treatment. Perhaps more importantly, as REBT and CT are receiving increasing empirical scrutiny, valid measures of irrationality are necessary to furnish evidence of their scientific status.

EARLY MEASURES BASED ON THE ELLIS MODEL

Initially, assessment of irrational thinking was conducted via clinical interviews, which owing to problems with replication, are not appropriate for research purposes. The first objective measures were based on Ellis' (1962) original list of 11 specific irrational ideas. Nearly all tests of irrational beliefs are in the form of questionnaires.

Irrational Beliefs Test (IBT)

Jones (1968) developed the 100-item IBT which requires subjects to indicate their level of agreement or disagreement with each of the 100 items on a 5-point scale (such as 'I frequently worry about things over which I have no control'). Half of the items indicate the presence of a particular irrational belief, the other half its absence.

Adult Irrational Ideas Inventory (AII)

The AII (Fox & Davies, 1971) is a 60-item scale for adults based on an earlier version for children developed by Zingle (1965). The response mode is a four-point Likert scale, from 'strongly agree' to 'strongly disagree'. Item statements were presented so that strong agreement was sometimes very irrational and sometimes very rational.

Self-Inventory

The Self-Inventory (Plutchik, 1976) is a 45-item scale in the form of simple statements that can be answered 'Yes' or 'No' in terms of self-descriptions. The Self-Inventory was designed as both a therapeutic screening and evaluation index, and a research instrument. A German questionnaire, the *Fragebogens Irrationaler Einstellungen* or FIE (Joorman, 1998), includes translations of items used in the Self-Inventory.

Rational Behaviour Inventory (RBI)

Developed by Shorkey and Whiteman (1977), the 38-item RBI was designed as an instrument for treatment planning and assessment of REBT clients. The answers range, on a 5-point Likert scale, from 'strongly agree' to 'strongly disagree'. There are 11 rationality factors plus a total score; the higher the score, the more rational the person is.

Idea Inventory

The Idea Inventory (Kassinove, 1977) is a 33-item 3-point Likert scale, with each of Ellis' 11 irrational beliefs measured by three items. All items are presented as an irrational idea; consequently any disagreement represents rational thinking. The questionnaire results in a total irrationality score plus scores on each individual belief.

Articulated Thoughts in Simulated Situations (ATSS)

ATSS (Davison, Robins & Johnson, 1983) is unlike the questionnaire format of previous measures of irrationality in that it provides a constant analysis of participants' thoughts while they imagine themselves in four negative or stressful scenarios. Narrated events are presented via audiotape; respondents vividly imagine that the events are happening to them. The respondents' thoughts are taped and later evaluated for irrationality.

SECOND GENERATION MEASURES BASED ON THE ELLIS MODEL

Despite their widespread use, subsequent research has questioned the discriminant validity of many of these early measures in that they appear to be confounding irrational beliefs with negative affect. More recent measures have been designed to maximize discriminant validity by excluding items consisting of emotional statements.

Belief Scale (BS)

Malouff and Schutte (1986) created the 20-item BS, with the intention of devising a scale which was shorter and which had more construct validity than previous measures (no items asked about anxiety reactions). Respondents indicate the degree to which they agree with 20 statements on a 5-point Likert scale ranging from 'strongly disagree' to 'agree strongly'.

General Attitude and Belief Scale (GABS)

Burgess (1986) developed a 96-item measure of irrationality which excluded items referring to behavioural or emotional consequences. Bernard (1990) established a 55-item version of the test (on a 5-point scale), which provides a total irrationality score, six irrationality subscales, and one rationality subscale. The GABS was again shortened to form the 26-item shortened GABS or SGABS (Lindner, Kirkby, Wertheim & Birch, 1999).

Survey of Personal Beliefs (SPB)

The SPB (Demaria, Kassinove & Dill, 1989) is a 50-item self-report scale scored on a 5-point Likert format. It was created as a measure of irrational beliefs free of affectively worded items. Further, the test items reflect more recent conceptualizations of irrational beliefs. The SBP assesses Ellis' four core irrational beliefs of awfulizing, demandingness, low frustration tolerance, and self/other rating (shoulds) as well as providing a total rationality score.

Irrational Beliefs Inventory (IBI)

This 50-item scale developed by Koopmans, Sanderman, Timmerman, and Emmelkamp (1994) is based on the item pool of the IBT and the RBI. The IBI, answered via a 5-point scale, consists of five subscales plus a total irrationality score. The IBI is distinguishable from negative affect in that it measures cognitions rather than anxiety or depression.

BECK'S COGNITIVE MODEL

Central themes of Beck's cognitive model of psychopathology are dysfunctional attitudes (shoulds and musts) and cognitive errors in response to negative life experiences. These errors are interpretations and predictions which are not justified by the information provided. Beck's model led to the development of measures designed to assess these negative thinking styles and dysfunctional beliefs.

Dysfunctional Attitude Scale (DAS)

The DAS (Weissman, 1979) is a 100-item measure, answered on a 7-point Likert scale from 'totally agree' to 'totally disagree'. It identifies beliefs that might interact with a stressor to produce psychopathology. The short form devised by Dyck (1992) comprises 56 items representing 8 subscales. This form provides an indication of the general level of dysfunctional thinking as well as specific types of dysfunctional thought represented by the individual subscales. Lower scores represent greater maladaptive thinking.

General Cognitive Error Questionnaire (CEQ)

The General CEQ (Lefebvre, 1980) was designed to measure cognitive errors or distortions related to general life experiences. The General CEQ consists of 24 short vignettes followed by a dysphoric cognition about that vignette. Vignettes were categorized according to four cognitive errors identified by Beck, including catastrophizing and personalizing. Respondents are asked to rate how similar the cognition is to the thought they would have had. The 5-point rating scale ranges from 'almost exactly like I would think' to 'not at all like I would think'.

FUTURE PERSPECTIVES AND CONCLUSIONS

Many early measures of irrationality remain in use. The IBT and RBI remain popular tests and are frequently cited in the research literature. This is despite criticisms that the questionnaire versions are dated (they reflect Ellis' earlier theories of irrational thinking), and because they do not measure irrational beliefs independently of the affect they were theorized to cause. Second generation tests based on the Ellis model are recognized as having higher discriminant validity because they do not refer to affect in their items. The DAS and CEQ based on Beck's model are regarded as valid measures of irrationality and continue to be cited frequently as well.

REBT and CT are based on theories which are continuously evolving due to rigorous research on the role of irrationality in behaviour disorders.

Both have shown that they are receptive to research findings. Similarly, as theory changes, the measures of irrationality have changed as well. The SPB (Demaria et al., 1989) reflects changes in REBT from 11 irrational beliefs to 4 core ideas. Newer measures will continue to be created to further test the thesis that there is a relationship between behaviour and irrational beliefs. These measures will have enhanced content validity by aligning item content with theoretical changes.

There are several areas of future concern in which irrational beliefs assessment will play a key role. They include: (1) discovering if specific types of irrational thinking are associated with specific disorders; (2) paying particular attention to the evaluation of change in irrationality due to treatment; (3) studying the effect of cultural influences in the development of irrational beliefs; and (4) determining if rational training prevents psychological disorders.

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RELATED ENTRIES

Applied Fields: Clinical, Theoretical Perspective: Cognitive, Theoretical Perspective: Cognitive-Behavioural, Cognitive Styles, Emotions, Attributional Styles

ITEM BANKING

INTRODUCTION

Item banks are used in a variety of contexts ranging from individual classrooms, schools, districts, state or other governmental units, to large scale computer-based testing programs. Typically, the purpose of developing an item bank is to assist, improve, and automate the test assembly process. In developing an item bank, a number of decisions about two factors need to be considered. These factors are the design of the bank and the methods for maintaining and refreshing it once it has been created.

Designing an item bank is analogous to creating a database. At the simplest level, the designer must decide what data elements to store and then how to structure the data in order to facilitate data extraction and reporting, test assembly, and possibly even test administration functions. For item banks these functions are realized through item selection and test assembly processes. Item selection and test assembly processes can be placed into two broad categories: one in which human intervention is heavily relied upon and another in which automation is heavily relied upon (e.g. through the use of computerized algorithms). Each of these approaches place differing requirements on an item bank. Ultimately, if a bank is to be used to assist humans in the assembly process, the challenges of building the bank are less difficult to meet. This is in contrast to the context in which tests must be administered directly from a bank without human intervention, requiring full automation of the test assembly process.

A typical item bank contains four classes of information about each item: (a) the actual item text and associated graphical or stimulus material, (b) some classification information about the item characterizing its non-statistical properties such as relevance to educational standards, cognitive processes required to produce a successful solution and content, (c) some form of statistical and performance data about the item, and (d) some representation of the history of an item's use.

BANK DESIGN

Most automated test assembly algorithms rely on item statistics that have been placed on a common scale. Although transformations of the proportion correct (Gulliksen, 1950) and biserial correlations can be used, the most popular of these are based on Item Response Theory (IRT, Lord, 1980). In fact, the majority of literature on the topic of item banking has focused on methods and procedures for developing and maintaining an IRT scale. The interested reader might find the December 1996 volume of *Applied Psychological Measurement*, a special issue dedicated to item banking, helpful, and papers by Rudner (1998) and Flaugher (2000).

For traditional paper-and-pencil tests, assembled in advance of test administration, the amount of item classification data stored is relatively small. Although by no means incomplete, the data elements stored tend to be the minimum set required to guide a human assembly of a test with the added assumption that the test will be reviewed and revised before use. For a Quantitative measure, this might include:

(a) Math Content – Arithmetic, Algebra, Geometry, or Calculus
(b) Level of Context – Pure Math or Word Problem
(c) Response Format – Multiple Choice, Short Answer, or Numeric Entry
(d) Correct Answer

A number of features tend not to be stored. These include many aspects of the item's content that only became an issue with respect to other items assembled into a single test. For example, in a Verbal measure, the fact that a reading passage is about the works of Charles Dickens is typically not a feature that is stored or even explicitly considered. If two passages about Dickens are selected in a draft assembly, a human reviewer would note this and one of the passages would be replaced. As a second

example, two Analogy items might rely on the test taker knowing the definition of 'inflammable'. It is generally considered unacceptable practice to include multiple items in the same test that rely on specific vocabulary. Here again, key vocabulary is not typically an attribute that is stored for each item. Other types of interactions between items rely on global human impressions rather than extensive item classifications. For example, it might be found that a test is well within statistical specifications, but that a test reviewer has the impression that this collection of items is unusually time consuming to complete.

As test assembly becomes dynamic and performed in real time during a test administration it becomes necessary to codify, at the item level, every aspect of a form that should be controlled. This requires a priori specification of every item property of concern. While this seems relatively intuitive for the examples above, when extended to controlling the number of references about medical conditions, colours, boats, etc. in a test, it becomes apparent that the complexity and richness of the classification scheme is the key to the success of item bank development.

Historically, these item properties and their interactions with each other have been evaluated by having a human actually perform all pairwise comparisons and identify those items that should not appear in the same test. This avoids the need to delineate all of the specific features that would be of concern and to identify whether each item does or does not have the feature. While a viable, albeit time consuming, practice when banks contain hundreds of items, this practice becomes untenable when banks include thousands of items. Every addition to the bank requires a redefinition of the lists of items that should not appear together. Thus, as the bank becomes large, management of these lists becomes intractable and the information becomes stored in a classification scheme as a list of features that the item does or does not have.

With on-demand testing, it has become necessary for the lag between uses of an item to become smaller. Most testing programmes simply don't have the resources to have a new test or pool in the field every day. This introduces a number of security concerns. Way, Steffen and Anderson (1998) detail one method for mitigating the potential risks of this practice. The core idea is to reuse items only when necessary and then restrict use, to the degree possible, to items that were seen by fewer test takers than other items. The implications of any such plan for an item bank is that it is now necessary to track the complete history of usage for every item. That includes any pool to which the item has been assigned, the administration period of that pool, and the number of test takers delivered the item during that administration period.

BANK MAINTENANCE/ REFRESHMENT

There are a number of commercially available software packages that perform all of the functions described above, including the IRT calibration/scaling functions (e.g. CAT Builder [2001], FastTEST [2001]). However, the effective use of an item bank requires careful consideration of a number of issues that software cannot address. This includes deciding how often to augment or refresh the bank, what types of items to write, when items should be retired, what kinds of content and statistical reviews should precede an item's entry into the bank, how many items should be included in the bank, and an item tryout/calibration plan so that new items can be screened, calibrated, and scaled.

Performance standards for including items in the bank can take a variety of forms. For paper-and-pencil testing programmes, these criteria typically involve some classical item analysis statistics (Henrysson, 1971). The proportion correct cannot be too high or too low, some minimum level of item-total score correlation is required as well as empirical verification that there is only a single correct response. For IRT-based programmes, this is usually done with some form of model-data fit statistic (Kingston & Dorans, 1985; Thissen, Steinberg & Fitzpatrick, 1989). Adaptive testing programmes also add criteria about the magnitude of the parameters themselves. For example, with maximum information item selection, items with discrimination parameters that are low (e.g. less than 0.40) have virtually no chance of being selected for administration. Thus, if resources allow, these items might be discarded. More recently, computer-based testing programs have begun to incorporate criteria for item latencies into the item screening process. Based on item tryout data, it is

possible to identify items that require inordinately more time to answer than other items that have similar content and statistical characteristics. These items are actually discarded, thus reducing the risk that tests that appear parallel to the assembly algorithm are differentially speeded.

On-demand pool-based testing programmes have been exploring the issues of minimum bank size for several years. The concerns focus mainly on security issues. Unfortunately, definitive answers have yet to appear in the literature; we simply do not know how often an item can be administered before its subsequent performance is altered.

Refreshing a bank is conceptually straightforward. The goal is to create at least as many new items as are retired. The difficulty is anticipating which items will be retired. For linear paper-and-pencil testing programmes this is relatively easy since items in a test form are retired as a unit, and specifications are constant across forms. However, for adaptive testing programmes, items are not used equally. In order to obtain desired levels of measurement precision with fewer items, adaptive algorithms seek to deliver highly informative items at higher rates than in paper-and-pencil tests. Additionally, high and low performing test takers are administered a greater number of items with extreme difficulty than typically appear in a single paper-and-pencil test. In order to avoid administering the same items to all of these examinees, large numbers of items of extreme (high and low) difficulty are needed. These tend to be the most challenging items to develop.

FUTURE PERSPECTIVES AND CONCLUSIONS

An item bank can be a powerful support tool for test development activities. However, the creation of an item bank is not an activity to be undertaken lightly. It is important to keep in mind that item banks are developed to support a test assembly algorithm. The constraints imposed by an algorithm should influence, if not determine, the decisions made about the design and maintenance of the item bank. Clearly, more research on topics such as the optimal design of item banks, item selection, and the maintenance of item banks can be expected in the coming years.

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Manfred Steffen and Martha Stocking

RELATED ENTRIES

Achievement Testing, Adaptive and Tailored Testing, Computer-Based Testing, Criterion-Referenced Testing. Methods and Procedures, Item Response Theory: Models and Features

ITEM BIAS

INTRODUCTION

Methods for detecting differential item functioning (DIF) and item bias typically are used in the process of developing new measures, adapting existing measures, or validating test score inferences. DIF methods allow one to judge whether items (and ultimately the test they constitute) are functioning in the same manner in various groups of examinees. In broad terms, this is a matter of measurement invariance; that is, is the test performing in the same manner for each group of examinees? What follows is a brief introduction to DIF and item bias, including the context in which DIF methods arose. The goal is to provide some organizing principles that allow one to catalogue and then contrast the various DIF detection methods. This entry will end with a discussion of current and future directions for DIF.

CONTEXT IN WHICH DIF METHODS AROSE

Concerns about item bias emerged within the context of test bias and high-stakes decision-making involving achievement, aptitude, certification, and licensure tests in which matters of fairness and equity were paramount. Historically, concerns about test bias have centred around differential performance by groups based on gender or race. If the average test scores for such groups (e.g. men vs. women, Blacks vs. Whites) were found to be different, then the question arose as to whether the difference reflected bias in the test. Given that a test is comprised of items, questions soon emerged about which specific items might be the source of such bias.

Given this context, many of the early item bias methods focused on (a) comparisons of only two groups of examinees, (b) terminology such as 'focal' and 'reference' groups to denote minority and majority groups, respectively, and (c) binary (rather than polytomous) scored items. Due to the highly politicized environment in which item bias was being examined, two inter-related changes occurred. First, the expression 'item bias' was replaced by the more palatable term 'differential item functioning' or DIF in many descriptions. DIF was the statistical term that was used to simply describe the situation in which persons from one group answered an item correctly more often than equally knowledgeable persons from another group. Second, the introduction of the term 'differential item functioning' allowed one to distinguish item impact from item bias. Item impact described the situation in which DIF exists because there were true differences between the groups in the underlying ability of interest being measured by the item. Item bias described the situations in which there is DIF because of some characteristic of the test item or testing situation that is not relevant to the underlying ability of interest (and hence the test purpose).

Traditionally, consumers of DIF methodology and technology have been educational and psychological measurement specialists. As a result, research has primarily focused on developing sophisticated statistical methods for detecting or 'flagging' DIF items rather than on refining methods to distinguish item bias from item impact and providing explanations for why DIF was occurring. Although this is changing as increasing numbers of non-measurement specialists become interested in exploring DIF and item bias in tests, it has become apparent that much of the statistical terminology and software being used is not very accessible to many researchers.

FRAMEWORKS FOR CONSIDERING DIF

At least three frameworks for thinking about DIF have evolved in the literature: (1) modelling item responses via contingency tables and/or regression models, (2) item response theory, and

(3) multidimensional models. Although these frameworks may be seen as inter-related, they are freestanding. Each framework provides useful organizing principles for describing DIF and developing methods for detecting DIF in items.

MODELLING ITEM RESPONSES VIA CONTINGENCY TABLES AND/OR REGRESSION MODELS

A statistical implication of the definition of DIF (i.e. persons from one group answering an item correctly more often than equally knowledgeable persons from another group) is that one needs to match the groups on the ability of interest prior to examining whether there is a group effect. That is, the definition of DIF implies that after conditioning on (i.e. statistically controlling for) the differences in item responses that are due to the ability being measured, the groups still differ. Thus, within this framework, one is interested in stating a probability model that allows one to study the main effects of group differences (termed 'uniform DIF') and the interaction of group by ability (termed 'non-uniform DIF') after statistically matching on the test score.

This class of DIF methods, in essence, consists of conditional methods in that they study the effect of the grouping variable(s) and the interaction term(s) over-and-above (i.e. while conditioning on) the total score. In this sense, they share a lot in common with analysis of covariance (ANCOVA) or attribute-by-treatment interaction (ATI) methods. Building on this similarity, it is important to recognize that nearly all DIF methods are applied in what would be called an observational or quasi-experimental study design and so one must keep in mind all of the commonly known caveats around making causal claims of grouping variable effects in observational studies involving intact groups.

This framework for DIF has resulted in two broad classes of DIF detection methods: Mantel–Haenszel (MH) and logistic regression (LogR) approaches. The MH class of methods (Holland & Thayer, 1988) treats the DIF detection problem as one involving, in essence, three-way contingency tables. The three dimensions of the contingency table involve (a) whether one gets an item correct or incorrect, (b) group membership, while conditioning on (c) the total score discretized into a number of category score bins. The LogR class of methods (Swaminathan & Rogers, 1990) entails conducting a regression analysis (in the most common case, a logistic regression analysis as the scores are binary) for each item wherein one tests the statistical effect of the grouping variable(s) and the interaction of the grouping variable and the total score after conditioning on the total score. One clear contrast between the MH and LogR methods is that one needs to discretize the conditioning variable in the MH methods whereas one does not have to do so with the LogR methods. The MH assumes no interaction (like ANCOVA) whereas the LogR allows for an interaction (like ATI methods).

ITEM RESPONSE THEORY

Referring back to the definition of DIF in the previous section, one can approach DIF from an item response theory (IRT) framework. In this case, one considers two item characteristic curves (ICCs) of the same item but computed from two groups. In the IRT context, if the items exhibit DIF, then the ICCs will be identifiably different for the groups. The ICCs can be identifiably different in two common ways. First, the curves can differ only in terms of their threshold (i.e. difficulty) parameter and hence the curves are displaced by a shift in their location on the theta continuum of variation. Second, the ICCs may differ not only on difficulty but also on discrimination (and/or guessing) and hence the curves may be seen to intersect. Within this context, the former represents uniform DIF (i.e. a main effect of group) whereas the latter represents non-uniform DIF (i.e. an interaction of group by ability).

In its essence, the IRT approach is focused on determining the area between the curves (or, equivalently, comparing the IRT parameters) of the two groups. It is noteworthy that, unlike the contingency table or regression modelling methods, the IRT approach does not match the groups by conditioning on the total score. That is, the question of 'matching' only comes up if one computes the difference function between the groups conditionally (as in MH or LogR). Comparing the IRT parameter estimates or ICCs is an unconditional analysis because it implicitly assumes that the ability distribution has been

'integrated out'. The mathematical expression 'integrated out' is commonly used in some DIF literature and is used in the sense that one computes the area between the ICCs *across the distribution* of the continuum of variation, theta.

A problem occurs in the IRT context because it is a latent variable modelling approach. Because the scale for theta in any IRT model is arbitrary, one must set it during calibration. How is this resolved? Computing algorithms like BILOG (and other such 2PL/3PL varieties of calibration software) set the mean of the ability distribution at zero. Some Rasch calibration software typically set the mean of the item difficulties at zero whereas others fix a single item parameter estimate, much like one does in confirmatory factor analysis to fix the scale of the latent variable.

The issue that arises in DIF is that if the two groups have different ability distributions, then the scales for the groups will be arbitrarily different. This is a problem because, in the case of DIF, one wants the two groups on the same scale or metric. If the two groups are not on the same metric, any DIF results will be impossible to interpret. This matter of a common metric is important to highlight because, in several recent studies, some Rasch analysts have ignored this matter and computed the difference between the item difficulty parameter for the two groups with a t-statistic, falsely relying on Rasch invariance claims to justify the computation and incorrectly ignoring the need for a common metric.

Because it is also relevant to the multidimensional framework that follows, more detail is provided on how to establish a common metric. In many IRT applications, one way to do this is to estimate the item parameters for a subset of items common to each group and use these item parameters to estimate abilities on the common metric. Then, one recalibrates the items, one at a time, for each group using this common metric. The most appropriate way of doing the DIF analysis is to leave the item(s) of concern out of the calibration, estimate the abilities on the common metric (without being influenced by the response patterns of the item(s) of concern), and then do the separate calibration of just the studied item using the uncontaminated ability estimates as fixed values that 'anchor' the scale.

The most common IRT methods for DIF include: signed area tests (which only focus on uniform DIF), unsigned area tests (which allow for non-uniform DIF), and nested model testing via a likelihood ratio test, which is most easily conducted for uniform DIF. In addition, one can approach this via non-parametric IRT using the software TestGraf (Ramsay, 2001). An advantage of non-parametric IRT is that it provides a graphical method and needs far fewer items and subjects than other IRT approaches.

MULTIDIMENSIONAL MODELS

There has been a longstanding framework for DIF based on the dimensionality of items. This framework begins with the assumption that all tests are, to some extent, multidimensional. The informal rationale has been that there is typically one primary dimension of interest in a test but there may also be other dimensions within that test that produce construct-irrelevant variance. For example, in a problem-based test of mathematics, the test will consist of some primary dimension that reflects mathematics ability as well as some other dimensions that may reflect other secondary abilities such as reading comprehension or verbal abilities. These other dimensions are often correlated with the primary dimension. As part of this informal rationale, it was not uncommon to think of DIF as arising from dimensions other than those of primary interest in the test. Ackerman (1992) provides a thorough discussion of the basis for the multidimensional framework.

Stout and his colleagues (e.g. Shealy & Stout, 1993) formalized some of this thinking and introduced a new DIF test statistic, simultaneous item bias test (SIBTEST) based on their framework. The multidimensional approach to DIF, as implemented in SIBTEST, allows for a variety of scenarios that comprise differential dimensionality as the source for DIF. Because this method involves a type of factor analysis, it requires the analyst to study sets (or bundles) of items, rather than individual items, for DIF.

Because the multidimensional framework, like IRT, is a latent variable approach, it must be noted that the above discussion regarding the importance of a common metric and how one establishes a common metric using subsets of items also applies

to the multidimensional approach. This similarity is often overlooked in the literature.

A FINAL COMMENT ON THE THREE FRAMEWORKS

Although the three frameworks are freestanding, as a set they have provided a powerful lens for describing DIF, developing statistical methods for detecting DIF, and thinking about the sources of DIF. As a final layer to cataloguing and contrasting the various DIF methods, the first framework described above can be seen to use observed score methods (because MH and LogR generally condition on the observed total score) whereas the latter two frameworks are latent variable approaches.

CONFIRMATORY VERSUS EXPLORATORY METHODS

Each of the above sets of methods could be used in a confirmatory or exploratory manner. That is, as has been noted by the proponents of the multidimensional approaches to DIF detection, the conventional manner in which one investigates DIF is to individually examine all items on a test for DIF and then, if the results suggest DIF, those items are further studied by content specialists and others to ascertain possible reasons for the observed DIF and determine whether item impact or bias is present. Given that such DIF studies usually occur in the context of observational (rather than experimental) studies, the sources or causes of DIF may be difficult to establish. Thus, the conventional approach is an inductive or exploratory approach to investigating DIF.

Alternatively, one could approach the DIF detection issue from a more theory-based and hypothetico-deductive strategy. That is, one would consult (with the aid of a content specialist) the relevant literature and determine whether any predictions (i.e. scientific hypotheses) can be made for where and why and for who DIF may be present. Once this has been accomplished, one then goes about testing the predictions using any of the DIF detection methods. The attractiveness of this strategy for many is the hope that a theory-based approach will provide an explanation for why DIF would be present (i.e. from a multidimensional framework, the literature would identify the secondary dimension(s)) and whether the DIF reflects item impact or bias. Of course, the confirmatory (i.e. theory-based) strategy is most fruitful when the content literature is well developed.

FUTURE PERSPECTIVES

The direction and focus of DIF research has been shaped by its origins in test bias and high-stakes decision-making involving achievement, aptitude, certification, and licensure tests. Current directions in DIF research find their inspiration from considering many testing situations outside of test bias, per se. Today, in addition to matters of bias, DIF technology is used to help answer a variety of basic research and applied measurement questions wherein one wants to compare item performance between or among groups when taking into account the ability distribution. At this point, applications of DIF have more in common with the uses of ANCOVA or ATI than test bias per se.

This broader application has been the impetus for a variety of current and future directions in DIF development, such as test translation and cross-cultural adaptation. Many novel applications of DIF occur because previous studies of group differences compared differences in mean performance without taking into account the underlying ability continuum. An example of such an application in language testing would be a study of the effect of background variables such as discipline of study, culture, and hobbies on item performance.

Moving beyond the traditional bias context has demanded developments for DIF detection in polytomous, graded-response, and rating scale (e.g. Likert) items. Furthermore, because DIF methods are being used increasingly by non-measurement specialists, it has been necessary to develop more user-friendly software and more accessible descriptions of the statistical techniques as well as more accessible and useful measures of DIF effect size for both the binary and polytomous cases.

Finally, ongoing research is focusing on complex data situations wherein one has students nested within classrooms, classrooms nested within larger school organizations, and a myriad of contextual variables at each level that are potentially related to DIF. New methods are being developed to study the contextual variables while remaining true to the complex data structure with random coefficient models and generalized estimating equations.

CONCLUSIONS

It is important to note that in this entry we have focused on 'internal' methods for studying potential item bias, i.e. within the test or measure itself. It is important for the reader to note that there is also a class of methods for studying potential item bias wherein we have a predictor and criterion relationship in the testing context. For example, in some industrial and organizational contexts, one has a test that is meant to predict some criterion behaviour. Item (or, in fact, test level) bias then focuses on whether the criterion and predictor relationship is the same for the various groups of interest.

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RELATED ENTRIES

Achievement Testing, Criterion-Referenced Testing: Methods and Procedures, Assessor's Bias

ITEM RESPONSE THEORY: MODELS AND FEATURES

INTRODUCTION

Educational and psychological testing has been undergoing major changes in recent years. Demands for new psychological measures, increased interest in diagnostic assessment, the influence of cognitive psychology on testing, introduction of new test item formats, and the role of computers in test administration, scoring, and score interpretations are five of many changes taking place in testing practices today. Less well known among psychologists is the fact that the basic psychometric theory for developing educational and psychological tests and evaluating tests and test scores is changing too and these changes should make the construction and evaluation of tests and the interpretation of test scores easier and potentially more valid.

Psychologists have seen occasional references to the Rasch model, the three-parameter logistic model, latent trait theory, item response theory,

latent ability, item characteristic curves, computer adaptive testing, etc. in popular psychological testing texts, test manuals, and journals (see, for example, Anastasi, 1989). These new psychometric terms are associated with modern test theory, known as 'item response theory'. The purposes of this entry are (1) to describe some of the shortcomings of classical test theory, models, and methods, (2) to introduce item response theory and related concepts and models, and (3) to identify some of the advantages of item response theory and associated methods for psychologists.

SHORTCOMINGS OF CLASSICAL TEST THEORY AND METHODS

Classical test theory has provided the statistical underpinnings for both educational and psychological tests. While popular psychological testing books such as those of Thorndike and Hagen, Anastasi, and Cronbach do not provide the relevant theory and derivations, all of the popular measurement formulas and approaches for constructing tests, evaluating tests, and interpreting scores that appear in these books (e.g. Spearman–Brown formula, standard error of measurement, corrections for score range restrictions) are derived from the classical test model.

Despite the usefulness of classical test theory and models in psychometric methods, shortcomings in the basic theory underlying psychological testing and measurement procedures for test construction have been recognized for over 50 years (see Gulliksen, 1950). One such shortcoming is that classical item statistics – item difficulty and item discrimination – depend on the particular examinee samples from which they were obtained. A consequence of this dependence on a specific sample of examinees is that these item statistics are only useful when constructing tests for examinee populations that are similar to the sample of examinees from which the item statistics were obtained. Unfortunately, one cannot always be sure that the population of examinees for whom a test is intended is similar to the sample of examinees used in obtaining item statistics. Preferable would be statistics for test items which are independent of the particular sample of examinees in which they are obtained. 'Invariant item statistics over samples' is the goal.

Not only are popular classical item statistics used in test development samples dependent, but so are other important test statistics such as test reliability and validity. Test reliability is higher when estimated in heterogeneous samples of examinees rather than in more homogeneous samples of examinees. Correction factors are often used to adjust reliability estimates for this problem but the fact is that the dependence of reliability indices on the choice of examinee sample is troublesome. Again, test statistics independent of examinee samples would be valuable.

A second shortcoming of classical test theory is that comparisons of examinees on the test score scale are limited to situations where examinees are administered the same (or parallel) tests. The seriousness of this shortcoming is clear when it is recognized that examinees often take different forms of a test or even different sections within a test. For example, one medical board requires candidates to take a 'core section' and then three of six additional sections of the test. Examinees are compared using scores based on a test consisting of the core and three optional sections. Since the sections are not equally difficult and there are twenty different combinations of three sections possible, comparisons among candidates become difficult. In fact, it is *not* fair to require the same passing score for candidates who have been administered tests that differ, perhaps substantially, in difficulty. When several forms of a test that vary in difficulty are used, examinee scores across non-parallel forms are *not* comparable unless one makes use of equating procedures, which are often quite complex.

There are many situations where the use of non-equivalent tests are of interest. Out-of-level achievement testing in schools is one example. More effective administration of a battery of aptitude tests by adapting the battery to the examinee's ability is another. Starting examinees at different points in an intelligence test based on some prior information about the examinee is another example. But these examples create a problem at some point and that is examinees who have taken different forms of the test needed to be compared to each other, or to a norm group

who took a different version of the test. As test scores are sample dependent (test scores depend on the set of items administered), they are not an adequate basis for score reporting or using norms tables, when examinees are administered tests that are non-equivalent in difficulty.

A computer-adaptive test (CAT) is another excellent example of the problem of item dependent scores. A CAT is a test administered by a computer, where the items administered are dependent on the candidate's performance on previous items: perform well and the computer selects harder items; perform poorly and the computer selects easier items. But, again, the non-equivalence of test forms makes comparisons among examinees or comparisons of examinees' test scores to passing scores difficult without the use of complex equating methods. Other shortcomings of classical test models have been described by Hambleton and Swaminathan (1985) and Hambleton, Swaminathan, and Rogers (1991).

What is needed, if the goal is to tailor or adapt the administration of tests to examinees, is an approach to ability estimation which is not test dependent. The influence of the particular items on the test administered to the examinee needs to be accounted for.

ITEM RESPONSE THEORY

Frederic Lord and Harold Gulliksen from the Educational Testing Service in Princeton, New Jersey, and many other psychometricians in the 1940s and 1950s, were interested in producing a psychometric theory by which to assess examinees in a way which did not depend directly on the *particular* items which were included in a test. The idea was that an examinee may score high on an easy test or lower on a hard test, but there is a more fundamental ability that the examinee brings to any given testing situation which does not change as a function of the sample of items administered. It is that more fundamental characteristic of the examinee which is usually of interest to the psychologist and it is that more fundamental characteristic, referred to as a 'latent variable', which is of interest in modern test theory. This construct of interest is more fundamental than test score because ability unlike test score does not change with the particular choice of items in a test. It could change, however, over time, because of instruction, life changes, experiences, etc.

Ability is the term used by psychometricians to describe the construct measured by a test. It might be verbal or numerical ability, intelligence, creativity, or mathematics achievement. It might also be self-esteem, achievement motivation, or attitudes about school. The label 'ability' is used to describe whatever construct validation studies have shown that a test measures.

Item response theory (IRT) purports to overcome the shortcomings of classical test theory by providing a reporting scale on which examinee ability (the construct measured by the test) is independent of the particular choice of test items administered. What began in the 1940s and 1950s as a goal of psychometricians, became reality beginning in the 1960s and 1970s. By the early 1970s, the theory was developing nicely, computer software was available, and applications of IRT were beginning to appear. Today, IRT is well developed and being used by test publishers, large testing agencies, test developers, and researchers to address technical problems such as the design of tests, the study of item bias, equating test scores, and computer-adaptive testing.

IRT, in its basic form, postulates that (1) underlying examinee performance on a test is a single ability or trait, and (2) the relationship between the probability that an examinee will provide a correct answer (or agree to a statement, in the case of a personality or attitude survey) and the examinee's ability can be described by a *monotonically* increasing curve. We would expect examinees with more ability to have a higher probability of providing a correct answer than those with less ability so this feature is highly desirable. Or in the case of (say) an instrument measuring student attitudes towards a topic, we would expect those persons with very positive attitudes to agree with a statement more frequently than those persons with less positive attitudes.

The curve representing the relationship between the probability of a correct response and ability is called an 'item characteristic curve' (ICC). Figure 1 shows the item characteristic curve for the three-parameter logistic model which can be applied to test items scored 0 or 1. Each item in the model is described by three parameters: the *c*-parameter is the probability of

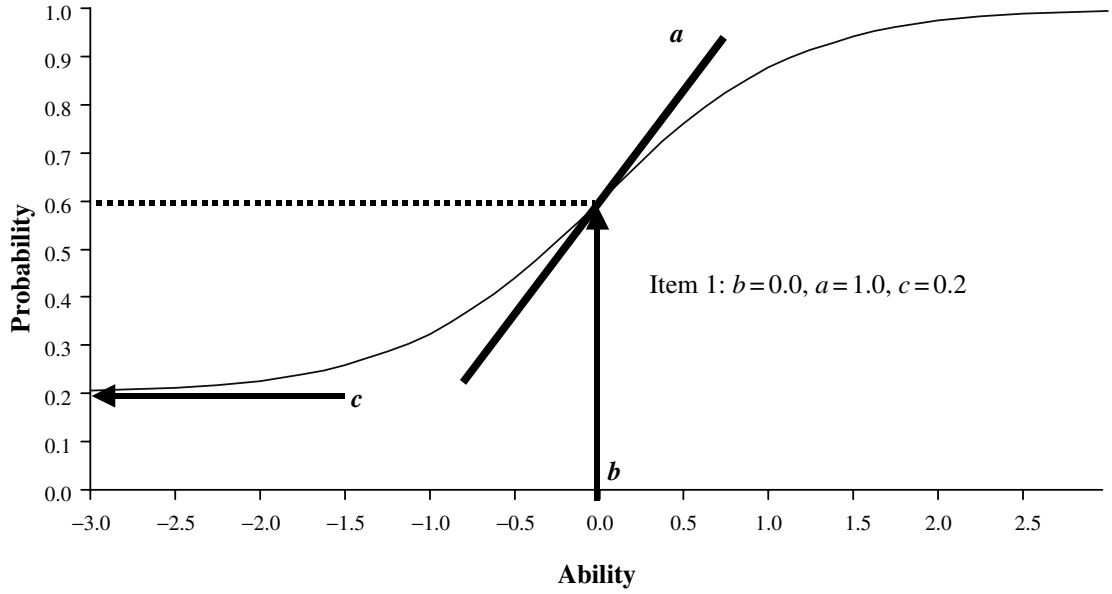

Figure 1. A typical item characteristic curve for the three-parameter logistic model.

low-performing examinees answering an item correctly by guessing (0.20 is a typical value), the *b*-parameter is the point on the ability continuum where an examinee has a probability of $(1 + c)/2$ of giving a correct answer (this parameter corresponds to item difficulty in the classical test model), and the *a*-parameter is proportional to the slope of the curve at the point b on the ability continuum (this parameter corresponds to item discrimination in the classical test model). The particular values of the item parameters for any item determine the exact shape of the ICC. The choice of IRT model dictates the mathematical form of the ICCs and the number of item parameters in the model. With highly discriminating items, the kind of item a test developer wants, the ICCs are very steep; for easy items, the ICCs are shifted to the left end of the ability scale, and for hard items, the ICCs are shifted to the right end. It is typical to scale ability scores to a mean of zero and a standard deviation of one in research work. For score reporting, a more convenient scale is used – one without decimals and negatives.

ICCs for dichotomously scored items (e.g. correct/incorrect or true/false) are typically described by one, two, or three parameters. The number of parameters identifies the IRT model. With the popular Rasch model, or one-parameter model, items are described by a single item parameter, called the 'item difficulty statistic'. This would mean that all of the test items would have the same shape, but the items could vary in their difficulty. With the two- and three-parameter models, items have more degrees of freedom for fitting data – but with improved fit and flexibility, come complications in parameter estimation.

Figure 2 highlights another attractive feature of IRT models. It is the concept of 'item information'. Here, the contribution an item makes to the precision of ability estimation at each ability level can be determined. The item shown in Figure 2 will be most effective for estimating ability of examinees in the interval, say, between about −0.50 and 1.0. The sum of the item information curves for items selected in a test produces the test information curve which indicates the precision of ability estimation at each point along the ability continuum.

Within an IRT measurement system, ability estimates for an examinee obtained from tests which vary in difficulty will be the same, except for the usual measurement errors. Some samples of items are more useful for assessing ability, and therefore the corresponding errors associated with ability estimation will be smaller. But the ability parameter being estimated is the same

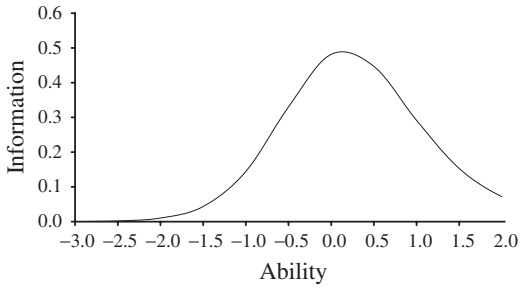

Figure 2. The item information curve corresponding to the item characteristic curve shown in Figure 1.

across items unlike in classical test theory where the person parameter of interest, true score, is test dependent. This invariance feature in the ability parameter is obtained by incorporating information about the items into the ability estimation process. Sample invariant ability estimates are of immense value in testing because tests can be matched to the ability level of examinees to minimize errors of measurement and maximize test appropriateness, while at the same time, comparisons in ability scores can be made because the ability estimates are *not* test dependent.

The concept that ability and item parameters do not change as a result of different samples of persons and items is known as *ability parameter invariance* and *item parameter invariance*, respectively. In theory, this is because when the item parameters are estimated, ability estimates are used in the item parameter estimation process (which is not the case in classical test theory). Also, when examinees' abilities are estimated, item parameter estimates are incorporated in that process (again, this is not the case in classical test theory). Both ability estimates and item statistics are reported on the same scale, so they look different from classical test scores and item statistics. Finally, IRT provides a direct way to estimate measurement error at each ability estimate (score level). In classical test theory, it is common to report a single estimate of error, known as the standard error of measurement, and apply that error to all examinees. Clearly, such an approach is less satisfactory than producing an error estimate at each ability score level.

IRT models (e.g. the one-, two-, and three-parameter logistic models) provide both invariant item statistics and ability estimates. Both features are of considerable value to test developers because they open up new directions for assessment such as adaptively administered tests and item banking. Of course, the feature of *invariance* will not always be present. Item and ability parameter invariance will be obtained when there is (at least) a reasonable fit between the chosen IRT model and the test data. Not surprisingly, then, considerable importance is attached to determining the fit of an IRT model to the test data. This point is addressed briefly in the next section.

There are IRT models to handle nominal, ordinal and equal-interval educational and psychological data: one-, two-, and three-parameter normal ogive and logistic models; partial credit and graded response models; multidimensional normal ogive and logistic models; cognitive component models; rating scale model; nominal response model; and many more. There are at least 50 IRT models in the measurement literature (see, for example, van der Linden & Hambleton, 1997).

MODEL FIT AND IRT SOFTWARE

Details on item and ability parameter estimation can be found in Embretson and Reise (2000) and Hambleton, Swaminathan, and Rogers (1991). As for IRT software, Assessment Systems Corporation has provided a great service to the measurement profession by collecting books and software from many of the publishers and making them available through their own catalogue (see www.assess.com). In addition, they publish the MicroCAT System and IRT parameter estimation software (e.g. ASCAL, RASCAL). Some of the Rasch model and its extensions software (e.g. FACETS and BIGSTEP) can be obtained from MESA at the University of Chicago. Other publishers of software include Scientific Software (e.g. MULTILOG, PARSCALE) and Computer Adaptive Technologies (CAT), Inc.

Figure 3 shows an example of how model fit at the item level can be addressed. The item characteristic curve is estimated and assumed to be correct. For intervals along the ability continuum (denoted 1, 2, 3, 4, 5, 6 and 7 in the figure) the actual item performance of examinees in each interval is calculated. A comparison is made between the actual item

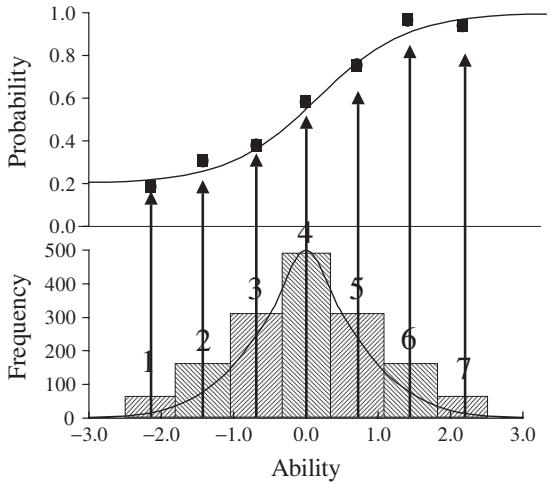

Figure 3. Assessing model fit.

performance and the predictions assuming the model to be true, and when the differences between actual item performance and predictions assuming the model to be true are small, as they are in Figure 3, the model is considered to fit the available data. Normally, what is desired in these model fit studies are differences (called 'item residuals') to be small and randomly distributed around the ICC. Of course the process must be repeated for each item, and there are many other analyses that are often carried out to investigate model fit including studies to assess the assumption of unidimensionality, and checks on item and ability parameter invariance. Statistical tests are also available.

FUTURE PERSPECTIVES AND CONCLUSIONS

Presently, item response models, especially the one- and three-parameter logistic models for analysing 0–1 data, are receiving increasing use from testing agencies. Other models not discussed here are models for handling polytomous response data and multidimensional data (see, for example, van der Linden & Hambleton, 1997). Measurement specialists are also exploring the uses of IRT in preparing computerized banks of test questions and in computer-administered and computer-adaptive tests.

The various applications have been sufficiently successful that researchers in the IRT field have shifted their attention from a consideration of IRT model advantages and disadvantages in relation to classical test theory to consideration of such IRT technical problems as goodness-of-fit investigations, model selection, parameter estimation, and steps for carrying out particular applications. Certainly some issues and technical problems remain to be solved in the IRT field, but it would seem that item response model technology is more than adequate at this time to serve a variety of uses in the testing field. Useful introductory references include Embretson and Reise (2000), Hambleton, Swaminathan, and Rogers (1991) and Wright and Stone (1979). For more advanced material, Hambleton and Swaminathan (1985) and van der Linden and Hambleton (1997) may be suitable.

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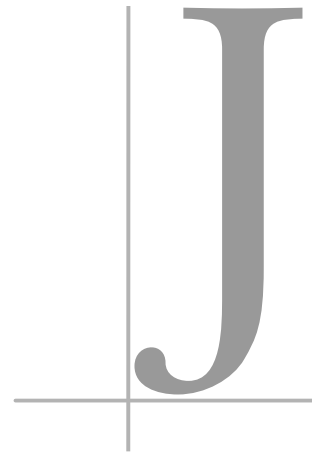
Ronald K. Hambleton and Michael Jodoin

RELATED ENTRIES

Adaptive and Tailored Testing, Automated Test Assembly Systems, Classical Test Theory, Computer-Based Testing, Multidimensional Item Response Theory.



JOB CHARACTERISTICS

Motivation and achievement at work is an interactive phenomenon it results from the intricate interplay between characteristics of the job and characteristics of the person. The nature of job characteristics, though, is changing at a much faster pace than personality variables. Job changes are related to changing organizational designs and structures, caused by environmental pressures, such as the increased globalization, rapid technological changes and tougher competition. The increased reliance on autonomous but temporary teams leaves fewer clearly defined job positions. Consequently, the area of research on job characteristics has become more challenging than ever. There is a strong need for conceptualizing dimensions of job characteristics which are universal and stable in a period of transition, filled with both a lot of uncertainty and arising opportunities.

INTRODUCTION

Two broad orientations and theoretical preconceptions may be distinguished when describing job characteristics. The first orientation is job-oriented and yields information about job outputs, guidelines, job contexts and tasks. Examples for this approach, which are provided in the section about tests, are the *Job Diagnostic Survey* (JDS), and *Functional Job Analysis* (FJA). The second orientation is worker oriented and yields information about aptitudes, abilities, critical incidents, behaviours and personality traits needed for succeeding in a particular job. Examples given in the section about tests are the *Position Analysis Questionnaire* (PAQ), the *Holland Position Classification Inventory* (PCI) and critical incident techniques like *Behavioural Expectation Scales* (BES).

Both approaches are complementary. Thus, job-oriented information can be used for drawing inferences about worker characteristics, and worker-oriented information can be used for gaining insights about jobs. The former has been demonstrated by Gottfredson (1997): job complexity is increasing with technological change and globalization. It follows, that intelligence or general mental abilities must be increasingly critical for success, which is indeed the case. The latter has been illustrated by the work of Holland (1997). His theory began with a worker-oriented, personality test approach, but over the years has moved toward an ecological, job-oriented perspective. Gottfredson and Holland (1996) classified all occupations in the *Dictionary of Occupational Titles*, which is based on FJA, in terms of a personality typology. Thus, jobs may also be described as 'personality niches' that elicit, develop and reward basic patterns of interests, competencies and behaviours (Gottfredson & Richards, 1999).

JOB CHARACTERISTICS IN A CHANGING ECONOMY

Jobs are the building blocks of organizations (Ghorpade, 1988). If organizations have to change, job characteristics must also change. In fact, technological changes and globalization tend to affect jobs first, which consequently become the building blocks of organizational change (see Figure 1).

In times of rapid changes, the following questions arise: what will change in job requirements? Can new performance patterns be foreseen or already perceived? Which job characteristic dimensions will be or will remain useful? The differentiation of job-oriented and worker-oriented approaches will be of heuristic value to gain some answers to these questions.

A Worker-Oriented Approach to Job Characteristics

Holland's theory (1997) provides a parallel way of describing people and environments since environmental profiles are characterized in ways analogous to personality profiles. The six environmental models are described in Table 1.

It is predicted that occupations will reflect particular patterns of job characteristics and rewards depending on which of the Holland environmental models they most resemble. It is further predicted that workers will be attracted to environments which closely match their personality. Thus, people are motivated to create congruence between their personality type and their working environment. It should be mentioned, however, that job choices are often also based on choices by significant others, driven by market forces, risk considerations, and are by no means so deliberate and conscious as the Holland model suggests.

Will the Holland model provide a useful description of a job characteristics dimension as well as the interaction of person and environment in the future? It can be expected that one of the most pervasive influences of technological innovations and globalization on job characteristics from a worker-oriented perspective may be sketched as follows: jobs will be less consistent

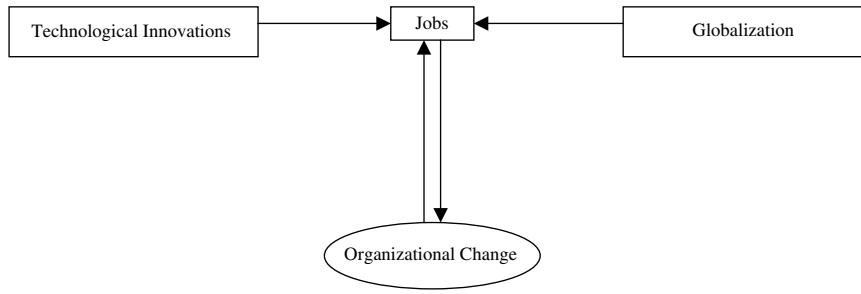


Figure 1. Jobs as building blocks of change.

Table 1. The six environmental models in Holland's theory (see Holland, 1997: 43–48)

Environment	Demands, values and competencies
Realistic	Using machines and tools; technical competencies; rewards people for having traditional values
Investigative	Symbolic, systematic, and creative investigations; scientific and mathematical competencies; rewards people to be complex, abstract and independent
Artistic	Create art forms or products; creativity; rewards people for enjoying ambiguous, free, unsystemized activities
Social	Inform, train, develop, cure others; empathy; rewards people for seeing the world in flexible ways
Enterprising	Selling or leading others; dominance and speaking abilities; rewards people for striving for power and status
Conventional	Ordered and systematic manipulation of data; clerical competencies; rewards people for being dependable and conformist

and differentiated in terms of the personality types they demand. Thus, job environments will represent more diverse demands and rewards, and the gap between the highest and lowest of the six job aspects described in Table 1 will decrease.

This is illustrated by the increased reliance on autonomous but temporary teams and fewer clearly defined job positions in the new economy. For example, many jobs today are organized around the 'cross-functional team' where technicians, computer experts, scientists, marketing specialists and human resource managers closely work together to create new business solutions. Consequently, no single type as described in Table 1 suffices to describe all demands, values and competencies needed in a 'cross-functional team'. Thus, jobs in the new economy will probably be more undifferentiated and thus less narrow concerning the involved personality traits than traditional jobs. They will stimulate and afford a wider range of behaviours, beliefs, and competencies on the one hand, but also provide more ambiguous guidance (Weinert, 2001). In an extreme case, a 'cross-functional team' may demand and reward all six Holland environments at close points in time and may actually ask for all six personality types. Nevertheless, differentiation will remain a valid job characteristics dimension. Undifferentiated job environments which demand, for example, Artistic, Enterprising, and Investigative competencies at neighbouring points in time will be a challenge both for job-analysis as well as for personnel selection.

Job environments in the new economy may function like a melting pot for diverse personality traits and behaviours in organizations. This is unlikely, though, for another trait – intelligence. Already in the past the major distinction among jobs has been their general intellectual complexity level (Gottfredson, 1997). This is shown by factor analysis of job analysis data revealing that the first factor obtained is the mental complexity of the work required from workers to perform. For example, attributes loading highly on this factor are the PAQ factors *using various information sources*, and *communicating judgements*. Also high-level information-processing activities according to FJA – like compiling, planning, reasoning and decision making – are highly correlated with patterns of intelligence. There is strong evidence that technological change as well as globalization both make jobs increasingly intelligence-loaded. Jobs become more and more enriched by content-diverse mental tasks involving learning, problem solving, and information processing, which is the essence of intelligence.

> *Where the old industrial economy rewarded mass production of standardized products for large markets, the new post-industrial economy rewards the timely customization and delivery of high-quality, convenient products for increasingly specialized markets. Where the old economy broke work in to narrow, routinized, and closely supervised tasks, the new economy increasingly requires workers to work in cross-functional teams, gather information, make decisions, and undertake diverse, changing, and challenging sets of tasks in a fast-changing and dynamic global market.* (Gottfredson, 1997: 121)

From a worker oriented view of job analysis, thus, general mental ability as a highly general information-processing capacity has been one of the most critical personality characteristics for being successful in a wide range of jobs, and will be increasingly so. Over the decades, strong evidence has accumulated that there appear to be minimum IQ patterns that increase steadily with job level and rise constantly with time. It can be expected that jobs will uniformly demand higher general mental ability on the one hand and more diverse social competencies, traits, and values on the other hand.

A Job-Oriented Approach to Job Characteristics

A job-oriented approach is devoted to the content of jobs. An example is the research concerning the Job Characteristic Model (JCM) of Hackman and Oldham (1976, 1980). This job design theory identifies five core job characteristics: task identity, task significance, skill variety, feedback from the job and from agents and autonomy. According to Hackman and Oldham, these job characteristics give rise to three psychological states (feelings of meaningfulness of the work, knowledge of results achieved and responsibility for one's own work outcomes) which in turn affect personal work outcomes of the job incumbent like general satisfaction and internal motivation. Thus, the JCM is devoted to the motivational capacity of a job.

All five job characteristics can be combined to create an index of overall job complexity, and as

has been argued above, technological innovations as well as globalization increases complexity of jobs. Advanced manufacturing technology makes it possible for workers to produce large parts of or even whole products (task identity), and often demands cross-functional manufacturing solutions (skill variety). Skill variety is also increased since people will often not remain in one job or area of speciality for a long period of time (Weinert, 2001). 'Boundaryless' career principles like protean careers and career ownership will result in greater autonomy in the job. 'High involvement work teams' coordinate schedule, and distribute the work on their own, giving the individual a large amount of responsibility and independence. Tougher competition between organizations for talented employees results in more feedback from agents, as is indicated by the increasing use of '360-Degree-Feedbacks' in many organizations. It seems like an open question, though, if changing organizational designs and structures as reaction to increasingly specialized markets will also lead to more task significance.

While the five core job characteristics identified by JCM are clearly of relevance also in the new economy, it has been criticized because of its limitation for advanced manufacturing technology. Jackson et al. (1993) have proposed a set of other job characteristics as significant determinants of employee well-being and performance which are listed in Table 2.

Another important job characteristic is production uncertainty which may be defined as the degree to which a qualified incumbent faces unexpected problems in the course of job performance (Wright & Cordery, 1999). As mentioned above, contemporary work systems are increasingly characterized by instability and unpredictability. Uncertainty should receive explicit treatment as a variable within job analysis since it may moderate the impact of other job characteristics on personal work outcomes. For example, affective well-being seems to decline under more traditional job designs as uncertainty increases, but seems to increase under empowered job designs (Wright & Cordery, 1999).

The JCM may also be criticized because of its individualistic bias. Cross-cultural research suggests that social interdependence is an attribute with significant motivating potential especially in collectivistic cultures (Marcus & Kitayama, 1991). Job attributes which effect a response of experiencing responsibility for the work of others are increasingly important also in countries with an individualistic background, but have yet received too little attention. Van der Vegt et al. (1998) distinguished between initiated task interdependence, received task interdependence, and outcome interdependence, and report substantial and combined effects of the three social interdependence dimensions on personal work outcomes of individual team members. Note that the three social interdependence dimensions affect personal work outcomes via *responsibility of others work*, a variable originally not included in the JCM.

In sum, the JCM will remain at the core of interest of job analysis. It should be supplemented, though, by job characteristics which reflect ongoing technological change (like problem-solving demand) and globalization (outcome interdependence).

TESTS

The function of job analysis is to clarify job responsibilities, to develop selection systems and to identify training needs. A large array of instruments is available today to meet these functions. Table 3 provides a brief overview over some frequently used tests and procedures.

Table 2. Job characteristics which are significant especially for advanced manufacturing technology (see Jackson et al., 1993)

Job characteristic	Description
Timing control	Opportunity to determine the scheduling of his or her work behaviour
Method control	Individual choice in how to carry out given tasks
Monitoring demand	The extent of passive monitoring required
Problem-solving demand	Cognitive processing required to prevent or recover errors
Production responsibility	The cost of errors in terms of lost output and damage to equipment

Table 3. Frequently used tests and procedures in job analysis and some of their advantages and disadvantages

Test/procedure	Advantages	Disadvantages
Position Analysis Questionnaire (PAQ, McCormick, Jeanneret & Mecham, 1972)	Gives an understanding of cognitive job components	Provides little information regarding the non-cognitive characteristics that are fundamental to perform
Holland Position Classification Inventory (PCI, Gottfredson & Holland, 1991)	Assigns scores to a job for each of the six Holland dimensions (Realistic, Investigative, Artistic, Social, Enterprising, and Conventional).	The six dimensions may be too broad for the definition of specific jobs
Behaviour Expectation Scales (BES, Smith & Kendall, 1963)	Offers a customized way of strategic job analysis; may have highly motivating effects on incumbents	Is time consuming; problems with transferability between different organizations or departments
Job Diagnostic Survey (JDS, Hackman & Oldham, 1975)	Offers an operationalization of the job characteristic model	May not be valid in societies and organizations with a collectivistic/interdependent background

Probably the most frequently used instrument of a worker-oriented job analysis is the PAQ (McCormick, Jeanneret & Mecham, 1972). The PAQ primarily measures information-processing demands of the worker in the job and gives us an understanding of cognitive job components. It provides little information, though, regarding the non-cognitive characteristics that are fundamental to perform.

The latter is addressed more directly by the recently developed PCI (Gottfredson & Holland, 1991), which is an application of Holland's theoretical formulations in classifying jobs. The PCI is designed to assign scores to a job for each of the six Holland dimensions (Realistic, Investigative, Artistic, Social, Enterprising, and Conventional). Respondents are asked to indicate what people have to do in their job, what are the personal characteristics and skills exercised, and what personal values are expressed. Maurer and Tarulli (1997) were able to show that the PCI yields expected correlations between traditional job analysis variables and the Holland constructs. For example, *variety* and *autonomy* were positively related to the Investigative and Artistic dimensions and negatively related to the Conventional construct. De Fruyt and Mervielde (1999) demonstrated the fruitfulness of the PCI environmental typology also from the perspective of the Big Five model of personality description.

Worker-oriented approaches to describing job characteristics will remain influential, because personality characteristics like intelligence, extraversion or conscientiousness have a strong genetic component and will be important for jobs at any time in human evolution. As has been mentioned above, though, it can be expected that workers will have to exercise a wider range of personal characteristics in the new economy. The PCI could be too undifferentiated to describe most of these personal characteristics fundamental to perform in the future.

Job-oriented approaches also face a problem: we need to do job analysis for jobs which do not exist yet (Schneider & Konz, 1989). Thus, in times when new jobs can be created almost overnight many practitioners need a flexible method of designing their own strategic job analysis. Behavioural Expectation Scales provide this flexibility since they are developed through an iterative procedure that results in scaled expectations of independent performance behaviours.

This technique, which involves three distinct steps, has been first reported by Smith and Kendall (1963). In the first step, behavioural episodes or critical incidents are generated which illustrate job performance dimensions. This first phase has been proven to be an excellent way of worker-oriented job analysis, especially if many organizational perspectives (managers, peers, subordinates, clients) are involved in the process of defining and clarifying success-critical behaviours for the job. The first phase of constructing BES is a meaningful job analysis for incumbents because they uniquely

understand the jargon and situations used in the content of behavioural anchors. It also holds a high motivational potential, since it may be considered as an 'empowered' form of job analysis in the eyes of subordinates.

Also, the second and third phase may be considered as part of a job analysis. In the second step, the behavioural incidents are retranslated into performance dimensions. Incidents are retained only if they are reliably placed in the dimension for which they were generated. Needless to say all three phases are done by different people (around 10 per step). The third phase scales each remaining incident according to the level of performance it represents. In this last step, different perspectives between superiors and subordinates arise reflecting different perceptions of the job. However, only those incidents make up the final BES where inter-rater-agreement is at least 80% in the second and third step. This procedure results in worker-oriented job scales with excellent reliability and very high face validity and, thus, a common 'reference system' for all incumbents. A very advantageous side effect of BES is the motivation superiors and subordinates gain by constructing this common 'reference system'.

Another future-oriented job analysis process is an instrument based on the JCM (Hackman & Oldham, 1975). The JDS is designed to assess the motivational capacity of jobs. It contains items measuring the extent to which workers feel the characteristics are present in their job and statements about job characteristics on which workers must agree or disagree. There is considerable evidence that variations in the job characteristics measured by the JDS exert an influence on people's feelings and motivation at work. Job significance (the combined effect of task identity, task significance and skill variety) is positively correlated with meaningfulness of work. Feedback positively influences knowledge of results. Autonomy is positively associated with responsibility for own work (Van der Vegt et al., 1998). These job characteristics are also positively correlated with empowerment conceptualized as a gestalt of autonomy, competence, meaningfulness and impact (Gagné et al., 1997). Wright and Cordery (1999) showed that job characteristics leading to higher job control may positively influence intrinsic motivation and job satisfaction only under conditions of high production uncertainty.

Functional job analysis (FJA) has been in the forefront of analysing job characteristics since the 1930s. It will remain influential since it is based on a very simple theory: FJA systems are based on the notion that job situations call for some involvement on the part of the worker with data, people and things which are expressed through sets of common functions or activities. FJA currently consists of three systems: The Department of Labour system, Sydney Fine's Functional Job Analysis and the Job Information Matrix Systems (Ghorpade, 1988). All job analyses consist of defining functions of the job and placing them within the hierarchy of complexity. Figure 2 shows the hierarchy of worker functions in the Job Information Matrix Systems with the most complex function at the top and the least complex at the bottom.

FUTURE PERSPECTIVES

The area of research on job characteristics has become more challenging than ever in a rapidly changing economy. We often do job analysis for jobs which do not exist yet. This forces practitioners to conceptualize dimensions of job characteristics which are universal and stable, and which consequently hold the promise to be relevant also in the future. A worker-oriented job analysis seems to be adequate since personality variables are highly stable and will clarify job responsibilities also in the future. It has been noted, though, that there is no well-researched method for identifying personality characteristics for *specific* jobs. The Big-Five approach as well as the Holland types must be considered as too general to be linked to valid personality predictors of specific job performance. Five to six personality factors are sufficient only to define *job families*. In the future, we need to define job characteristics in terms of more specific personality descriptions as provided, for example, by the CPI.

There also is a strong need for more research on the universality and stability of job-oriented dimensions of job characteristics. For example, research concerning the JCM must demonstrate that the core job characteristics unfold their motivational capacity also in collectivistic societies and organizations. Since about 70% of the world's population comes from collectivistic societies this seems like a rather important question. A related topic is the following: some

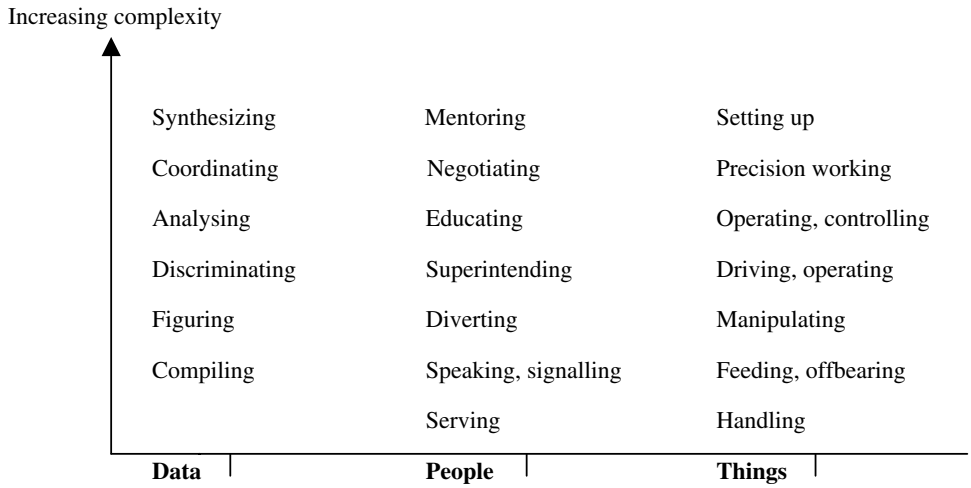


Figure 2. Worker functions (see Ghorpade, 1988: 237–254).

authors have suggested that the inclusion of non-task factors as independent variables in the JCM have important effects in many jobs which primarily consist of dealing with other people. For example, a study by Landeweerd and Boumans (1994) indicates that variables like job satisfaction, health complaints, and experienced significance of nurses can be better predicted if the JCM includes work dimensions like social-emotional leadership of the head nurse and patient attending. Since in post-industrial societies a rising percentage of jobs are in the customer service, the measurement of social relationships and interdependence as part of the job characteristics is of increasing importance.

CONCLUSIONS

Psychological job analysis will be able to prove its significance for the future if it becomes truly interdisciplinary. At a basic level, this means to fully appreciate that motivation and achievement at work is an interactive phenomena, which results from the intricate interplay between characteristics of the job and characteristics of the person. At a more general level, this also means to acknowledge influences of technological changes, globalization effects, migration and even demographic factors. Thus, research on job characteristics really seems to provide an exciting laboratory for related disciplines like psychology, sociology, business administration and job engineering.

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RELATED ENTRIES

Applied Fields: Work and Industry, Centres (Assessment Centres), Personnel Selection, Assessment in

JOB STRESS

INTRODUCTION

Job Stress Assessment (JSA) stands for methods claiming to capture stress in occupational settings. Consequently, JSA deals with phenomena occurring at work, like drop in performance and productivity, psychological and somatic complaints as well as health disorders attributed to work conditions. These phenomena are conceived as the result of a process called stress which is induced by stressors and leads to strain (stress reactions).

ASSESSMENT APPROACHES AND MODELS

Basic Common Assumptions of Stress Models

In the history of stress research (see e.g. Appley & Trumbell, 1986) some approaches focused on physiological and behavioural response patterns as stress reactions (e.g. Cannon, Mason, Selye, Levi, Frankenhaeuser, Ursin) and some identified and differentiated stressors (e.g. Dohrenwend). Others promoted the modelling of the mediating stress process between stressors and strain as an interactional or even transactional process indicating the individual coping behaviour in a given situation (Lazarus, Cox, McGrath).

There is agreement that JSA should consider all aspects mentioned below (see e.g. Cox & Griffiths, 1999; Chmiel, 2000; Schabracqu et al., 1996): characteristics of the job in relation to the individual and situational resources, mentioned as demand–resource discrepancies (stressors), the efficiency of compensatory regulation (coping), motivational patterns of conflict and negative emotions (strain) and long term effects on health (disorders).

There are two mainstreams of approaches with different topics and methods (Gaillard, 1993): the 'experimental' approach on the background of

cognitive and physiological psychology focuses on mental load, whereas the 'correlational' approach of social and health psychology concentrates on affective well-being, complaints and psychosomatic disorders. Therefore, we differentiate between mental load models corresponding with the 'experimental' approach and health models related to the 'correlational' approach.

Mental Load Models

These models are dealing with the imbalance between task demands and individual resources and the coping behaviour resulting from it. They either focus on effort-regulation (Hockey, 1997; Sanders, 1983; see Gaillard, 1993), problem solving (Hockey, 1997; Schönpflug in Appley & Trumbell, 1986) or multiple level hierarchy of regulatory control (Frese & Zapf, 1994; see Semmer in Schabracqu et al., 1996). The models differ with respect to the sort of job and personal characteristics. Sanders' cognitive energetics model considers task variables and energetic resources, while Hockey's compensatory control model, just like Schönpflug's economic approach, relates task and environmental variables to the management of effort and performance regulation. Various types of data are obtained: performance data (reaction time, errors), self-assessment data (subjective load measures) and physiological data of different systems, e.g. the cardiovascular system, the adrenocortical (cortisol) and adrenomedullar system (adrenaline, noradrenaline) and, recently, the immune system. The methods are from the same type when dealing with workload assessment (see Tattersdal in Chmiel, 2000). The action-oriented approach is methodologically somewhat different, however, describing performance patterns to fulfil task-related goals under limiting conditions (Semmer in Schabracqu et al., 1996).

Health Models

These models consider job features and their influences on job-related health (see Le Blanc et al., 2000 for the following references). They are mainly based on observational, interview and questionnaire data. According to the early Michigan Model (Kahn et al., 1964) psychological stressors develop from an imbalance between job characteristics and job expectancies which are related to individual resources. Stressors such as role conflict, role ambiguity and role overload lead to strains as precursors of psychosomatic complaints and psychosomatic diseases. Recent models assume patterns of job variables as predictably (linear, curvilinear) related to strain and mental health, e.g. the person–environment (P-E) fit model of French et al. (1982), Warr's vitamin model (1994), the job demand-control model of Karasek (1979), the demand control–support model by Johnson (1989) and the effort–reward imbalance model by Siegrist (1996).

OBJECTIVES AND MEASUREMENT INSTRUMENTS

JSA refers to the objectives listed below. Due to different mainstreams of approaches ranging from epidemiology to psychophysiology different types of instruments are deployed. For overviews (inclusively all references below) see Hurrell, Nelson and Simmons (1998), Dunckel (1999), Fahrenberg and Myrtek (2001).

Measuring Discrepancies between Demands and Resources

Measures of discrepancies between demands and resources can refer to job contents, working conditions, employment conditions or social relations at work. Within each category we can describe discrepancies between demands and resources. For instance, with regard to working conditions the following discrepancies can be described: the discrepancy between the demand at a given *time of day* and *energetic resources* (e.g. shift work, sleep deprivation, jet lag); between *time on task* and *capability of sustaining effort* (e.g. fatigue after long driving); between the *time pattern* of demand and *performing capability* (e.g. time pressure).

There are methodological aspects concerning the type of measurement which should be used:

- *Analytic–synthetic aspect*: Only feeble attempts have been made in measuring demand–resource discrepancies analytically so that measures for both, demands and resources, are considered. Instead, research is dominated by 'synthetic' job stressor

measures which get their status by means of implicit assumptions about discrepancies.

- *Objective–subjective aspect*: By means of most job stressor measures, those conditions are identified as stressful which are perceived as aversive or which even have high incidence of strain. Consequently, it is controversially discussed how measures precisely separate antecendents (stressors) from consequences (appraisal, strain) (see Kasl, 1998). Objections are raised against self-report measures especially if they focus on transactional appraisal rather than on work. It seems that the more specifically we study a job the more input is made to get objective or even analytically derived measures.
- *Demand–resource aspect*: Sometimes job stressor measures are either conceived in terms of work-demand (e.g. time pressure) or in terms of resources (e.g. temporal degree of freedom). It remains indistinct whether the same phenomenon is measured.
- *Stressor–moderator aspect*: Often job variables are categorized into stressors (e.g. time pressure) and moderators (e.g. type A personality, low social support). The distinction, however, only makes sense for testable models, e.g. when hypotheses on intermediate processes between stimulus and the final response can be studied. From a demand–resource discrepancy perspective, the moderator-variables belong to resources (individual, situational). Consequently, if there are different sources of discrepancies the pattern of those should be regarded.

Analytical Approaches

- *Laboratory job simulation studies* are suitable to identify demand–resource discrepancies analytically, e.g. the simulation of an office job (Schönpflug; see Chmiel, 2000) allows determination of the demand–resource discrepancy by measuring the number of task operations per time and the capacity of working memory under the influence of situational capacity limiting conditions (noise, negative feedback).
- *Job surveys* may be analytically designed if a theory gives criteria explicitly for the evaluation of discrepancies as models like the action theory does (TDS; Semmer in Schabracqu et al., 1996).

Observational Job Stressor Measures

Observational methods for job analyses are based on observation of job processes and interviews with job incumbents and supervisors (see Dunckel, 1998). Deployed methods are:

- PAQ – Position Analysis Questionnaire (Mecham, McCormick & Jeanneret; see Hurrell et al., 1998): stressors like repetitive work, shift work, physical discomfort, vigilant tasks, worker autonomy etc. Adaptations in non-English speaking countries, e.g. the German FAT and AET (see Dunckel, 1999), also new developments, e.g. the German TAI (see Dunckel, 1999).
- TBS – activity evaluation system (Hacker et al., 1995; see Dunckel, 1999), an instrument based on action theory: temporal and procedural degree of freedom etc. (26 scales [s]).
- ISTA – instrument for stress-related task analysis, observational version in analogy to a self-report version with the intention to apply both, objective and subjective, measures (German: see Dunckel, 1999): task complexity, task variability etc. (19s).

Self-Report Measures

Most methods are based on self-reports of employees (see review by Hurrell, Nelson & Simmons, 1998).

- SDS – Stress Diagnostic Survey (Ivancevich & Matteson, 1984): role demands, workload, time pressure, task demands, etc. (15s).
- WES – Work Environment Scale (Moos, 1981) assesses the perception of work climate: work pressure, control, task orientation, peer cohesion, etc. (10s).
- JCQ – Job Content Questionnaire (Karasek, 1985); refers to Karasek's model: psychological job demand (workload and role conflict), skill utilization, job decision latitude (3s).
- OSInv – Occupational Stress Inventory (Osipow & Davis, 1988): role overload, role insufficiency, role ambiguity, role

boundary, responsibility, physical environment (6s).
- OSInd – Occupational Stress Index (Cooper, Sloan & Williams, 1988): job and organizational characteristics (6s); revision: PMI – Pressure Management Index (Williams & Cooper, 1998).
- GJSQ – Generic Job Stress Questionnaire (Hurrell & McLaney, 1988): workload, responsibility, role demands, etc. (13s).
- JSS – Job Stress Survey (Spielberger, 1994): Severity and frequency for job pressure and organizational support (2s).
- JDS – Job Diagnostic Survey (Hackman & Oldham, 1975): feedback, task significance, task variety, task identity, interaction with coworkers, autonomy (6s).
- ISTA (see above).

Measuring Efficiency of Compensatory Regulation

The stress process develops when the applied coping strategies are inefficient in managing the discrepancies between demand and resources. Costs of performance protection may be additional regulation expenditure (effort, time, strategies), new problems and demands (e.g. not in time), changed goals, reduced aspiration levels, and negative external feedback.

Laboratory Work Simulation Studies

Well controlled experimental studies are needed to describe processes related to compensatory control and its efficiency. Examples are laboratory work simulation experiments on performance and suboptimal energetic resources and on resource management under stress (e.g. Hockey in Chmiel, 2000). Usually, the costs of compensatory control in protecting performance are studied in experimental settings by measuring the following behavioural patterns:

- *Performance measures* focus on secondary performance decrements (selective impairment of low-priority task components, neglect of subsidiary activities, attentional narrowing) and strategy changes (shift to simpler procedures).
- *Subjective and physiological measures of regulatory costs* indicate increase of effort (e.g. SWAT – subjective work load assessment; TLX – task load index: see Chmiel, 2000; heart rate variability) and fatigue (e.g. eye-lid parameters: see Backs & Boucsein, 2000).
- *Behavioural measures* relate to post-task preference for low-effort activities, risky decision making etc.

Analyses in Occupational Settings

Some of the self-report job stressor instruments include measures of coping, e.g. OSInd: coping strategies. Occasionally, self-report measures of coping strategies are obtained (e.g. in form of diaries) in field studies focusing on transactional processes. However, elaborated methods are not available. Attempts to incorporate scales of coping have not been successful due to unsufficient reliability.

Motivational Pattern of Conflict and Negative Emotions

As a consequence of inefficient coping, a motivational pattern results which is characterized through the hopelessness of reaching goals, the conflict between goals, e.g. the ambivalence to engage sufficiently in coping, a state of emotional tension and job dissatisfaction, and low competence to regulate negative emotions. Epidemiologists use questionnaires and interviews. Psychophysiologists study physiological response patterns.

Self-Report Measures

Some examples of a large variety of self-report measures follow (for a review see Hurrell et al., 1998):

- Emotional tension (tense, anxious, worried, non-calm, -relaxed, -contented)
  - STAI – State–Trait–Anxiety Inventory (Spielberger et al., 1970)
  - Index of job-related anxiety (Caplan et al., 1975) on the basis of STAI
- Fatigue (fatigued, tired, weary, non-alert, -energetic, -lively)
  - Subscale of many mood adjective check lists (e.g. ADCL by Thayer)

- Other mood aspects, like depression, anger-hostility etc.
  - Adjective check lists: POMS – Profile of mood states (McNair et al., 1971), and similar versions
- Physiological complaints
  - Symptom lists, like the GHQ and SCL (see below), CMI – Cornell Medical Index (Brodenan et al., 1949), FBL – Freiburg complaints list (see Fahrenberg & Myrtek, 2001)
- Job dissatisfaction: subscales in JCQ, ISTA.

Physiological Response Measures

Measurement procedures for the following physiological systems can be found in, e.g., Backs and Boucsein (2000) or Fahrenberg and Myrtek (2001).

- Cardiovascular activity: e.g. blood pressure, heart rate variability, emotional heart rate
- Hormonal activity: catecholamines (noradrenaline, adrenaline) in blood or urine, cortisol in serum and saliva
- Immunological indices: immunoglobulines and cytokines.

Measuring Long Term Effects on Health

Research is focused on chronic states of mental and somatic disorders. Special interest refers to the burnout syndrome: 'a state of physical, emotional and mental exhaustion caused by long term involvement in emotionally demanding situations' (Pines & Aronson, 1988). With respect to diseases emphasis has been placed on coronary heart disease. However, also diseases of other systems have been studied, e.g. the respiratory system and the gastro-intestinal system. Nowadays diseases of the immune system are of increasing interest.

Self-Report Measures

Examples of frequently used self-report measures are (for a review, see Hurrell et al., 1998):

- SCL – Symptom-Distress Checklist (Derogatis, 1977): somatization, hostility, phobic anxiety, depression, paranoid ideation, etc. (9s).
- GHQ – General Health Questionnaire (Goldberg, 1978): (4–8s).
- BM – Burnout Measure: physical, emotional and mental exhaustion (Pines & Aronson, 1988) (3s).
- MBI – Maslach Burnout Inventory (Maslach & Jackson, 1986): emotional exhaustion, depersonalization, personal accomplishment (3s).

Objective Measures

These measures include parameters of physiological response patterns (see above) and behavioural indices, like stress-related absenteeism, consumption of drugs, alcohol and nicotine.

Summary

Table 1 gives a summarized overview of typical and frequently used JSA measures mentioned above.

METHODOLOGICAL PERSPECTIVES

Combined Field and Laboratory Studies

A combination of field and laboratory studies may be an efficient methodology to improve our knowledge about job stress and the methodology of testing hypotheses. Field studies describe phenomena of a certain type of job stress and laboratory studies test the assumed interrelations between stressors and strains. Examples are provided by studies on office workers (e.g. see Schönpflug in Appley & Trumbell, 1986).

Analysis of Causal and Temporal Sequences

Experimental research is explicitly concerned with detecting causal and temporal sequences between stressors and strains. Correlational survey studies referring to the wide range between stressors and health problems often confine to causal and temporal interpretations. There are, however, testing procedures and statistical methods available which allow such

Table 1. Job stress assessment: summarized overview of measures with regard to objectives

Objectives	Measures			
	Registration	Observation	Self-report	Combined measures
Discrepancies: demands–resources (stressors)	R within AM	PAQ, TBS,	SDS, WES, JCQ, OSInv, OSInd, GJSQ, JSS, JDS	ISTA: O-S
Efficiency: compensatory regulation (coping)	TM: secondary task efficiency and strategy BM: post-task preferences PM: Indices of effort and fatigue		Effort: SWAT, TLX Coping: OSInd	
Motivational pattern of conflict and negative emotions (strain)	PM: response pattern		Tension: STAI Fatigue: ADCL Mood: POMS Complaints: GHQ, SCL, FBL Job dissatisfaction: JCQ, ISTA	
Long term effects on health (disorders)	BM: absenteeism PM: response pattern		GHQ, SCL; BM, MBI	
Combined objectives	AM		AM	AM

Abbreviations: R – Registration, O – Observation, S – Self-report, AM – Ambulatory monitoring, BM – Behavioural measures, TM – Task-performance measures, PM – Physiological measures

interpretations to be tested (e.g. Frese, 1985). As long as job stress assessment is to a large extent based upon subjective reports, causal and temporal sequence conclusions cannot be drawn unless method variance due to response sets and styles (e.g. negative affectivity bias) is tested. Analytical research designs and data analysing methods, e.g. using structural equation models, are available.

Ambulatory Monitoring as a Bridge between Surveys and Laboratory Testing

Today and even more in the future, portable equipment and enhanced methodology does and will allow objective real life assessment of job conditions as well as behavioural and physiological activity (see Fahrenberg & Myrtek, 1996, 2001). These objective measures become less expensive and difficult to obtain in comparison to the so far cheaper, more easily available and more convenient self-report measures. By means of ambulatory monitoring it is possible to study the processes at work more directly as by means of surveys. In comparison to laboratory studies they have the advantage of greater external validity. Furthermore, longitudinal studies are more feasible to design. Exactly these are needed to study the development from strain to diseases. Finally, ambulatory monitoring may bring together the two approaches, mental load and health models.

FUTURE PERSPECTIVES AND CONCLUSIONS

So far, job stress assessment comprises models and methods belonging to a wide range of approaches like epidemiology and psychophysiology, correlational and experimental methodology, micro-level and macro-level analysis. We should enhance interaction and communication between the approaches. Models and methods for job stress assessment have to be referred to a more ecological and concrete context of occupational jobs. Both will improve the more stress will be longitudinally studied as the process between demand–resource discrepancies and disorders.

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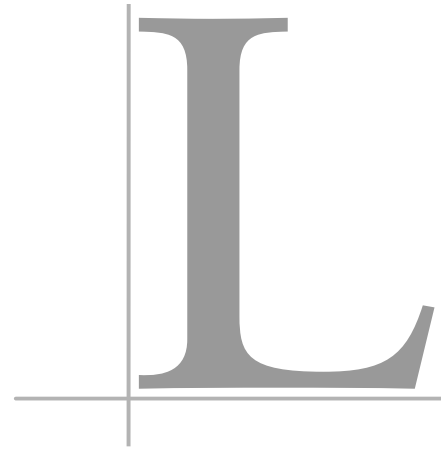
RELATED ENTRIES

Applied Fields: Work and Industry, Stress, Risk and Prevention in Work and Organizational Settings, Burnout Assessment, Caregiver Burden



LANDSCAPES AND NATURAL ENVIRONMENTS

INTRODUCTION

As commonly used in behavioural research, 'natural environment' refers to a large outdoor area with little or no apparent evidence of human presence or intervention (Pitt & Zube, 1987). In contrast, 'landscape' refers to a view over or into an area of land, or the area and landforms encompassed by a view (Daniel, 2001). Although research and practical efforts may focus on a landscape as the visual aspect of a natural environment, definitions of landscape often eschew the human exclusion criterion typically used in defining a natural environment. Landscape designations such as 'cultural', 'pastoral', and 'natural' imply varying degrees of human involvement.

In line with these definitions, most landscape assessment work treats the person as a viewer, whereas assessments concerning natural environments commonly treat people as visitors seeking an appropriate setting for outdoor recreation activities, including but not limited to viewing scenery. Work in both areas serves descriptive and evaluative purposes (Craik & Feimer, 1987). Whether relying on experts, technical devices, and/or perceptual capabilities of an appropriate panel of human observers, descriptive assessments characterize landscapes and natural/recreational settings in terms of physical or other attributes that are grounded in some conception of environmental quality, such as scenic beauty. Evaluative assessments document observer responses to landscapes or natural/recreational settings using criterion variables that reflect on an underlying conception of environmental quality, such as ratings of scenic beauty or the importance of escape from stressors. Together, descriptive and evaluative assessments can provide a basis for predicting public responses to changes in the environment.

Pressing concerns about human impacts on the possibilities for realizing valued outcomes drive much of the assessment work on landscape and natural environments. Human activities can add to scenic and other amenity values, or they can diminish or destroy them. Recent decades have seen demand for buildable land, natural resources, and infrastructure increase alongside demand for outdoor recreation. Environmental policies in many countries now direct environmental managers to weigh the demands of competing uses and users. To fulfil this responsibility, managers need information on how users experience and evaluate not only environments as they now exist, but also environmental changes associated with different management alternatives.

APPROACHES AND THEORIES

Daniel and Vining (1983; see also Daniel, 2001) overview several landscape assessment

approaches. Ecological and formal aesthetic approaches rely on biologists and other experts to classify landscapes using ecological or formal attributes as a basis for scenic quality judgements. For example, a landscape architect applying the Visual Management System (USDA, 1974) would render an area's features (e.g. rock outcroppings, lakes, streams, vegetation) in terms of form, line, colour and texture. He or she would then assign the area to one of three scenic quality categories according to the diversity of its formal attributes. When joined with other information, such as the number and type of users, the classification would support decisions about the suitability of activities that would alter the formal attributes of the landscape, such as timber cutting. Problems with expert approaches include the uncertain validity of chosen attributes as indicators of visual quality; potential disagreement by experts on landscape classifications; lack of sensitivity to variations in visual quality given broad quality categories; and lack of public input despite differences between expert and public aesthetic preferences.

In contrast, a psychophysical approach relies on public input (Daniel & Vining, 1983). For landscapes viewed on-site or with the aid of surrogates, observers provide judgements of scenic beauty, preference, naturalness or some other variable. They do so using rankings, paired comparisons, a rating scale, or some other method. The objective is to then develop a mathematical model that relates their judgements to practically meaningful physical variables on one or more scales (e.g. land use type; number of trees of a given diameter per unit area; amount of grass covered surface per unit area; presence of water features). With accurate and reliable psychophysical models comprising variables that they regularly monitor, managers can estimate visual quality impacts of environmental changes without having to survey new samples from an affected public. Relatively reliable and sensitive assessments are claimed for this public perception-based approach. Daniel and Boster's (1976) Scenic Beauty Estimation procedure is a widely used example.

Daniel and Vining (1983) associate theorizing on the visual experience of landscape with a second type of public perception-based approach to landscape assessment, the psychological. Like the psychophysical approach, the psychological approaches locate scenic quality in the meeting between person and environment, not in either alone. In contrast to the psychophysical approach, they have a basic research interest in affective, cognitive, and behavioural processes that mediate the relationship between environment and scenic beauty or preference judgements. Their utility for environmental management, however, still requires linking the psychological variables they comprise to specific physical referents.

Several theories propose that aesthetic and evaluative responses to landscapes originate in an evolved capacity to rapidly evaluate environmental conditions according to their relevance for survival. For example, Kaplan and Kaplan (1989) assert that an evolved evaluative capacity serves ongoing needs for making sense of and acquiring information from the environment. When viewing a scene, order perceived among visual elements (coherence) serves understanding, whereas their number and diversity (complexity) serve information acquisition. The visual array also enables inferences about staying oriented (legibility) and acquiring new information (mystery) when going further into the environment. In several studies guided by this theory, some participants have used rating scales to indicate how much they liked each of a sample of scenes while others have rated each scene in terms of one or more of the informational predictors (e.g. a single item for coherence: 'How well the scene ''hangs together''. How easy is it to organize and structure the scene?'). Regression analyses then treat the scenes as cases (for a review of such studies, see Kaplan & Kaplan, 1989).

North American, European and Asian samples consistently prefer scenes of natural landscapes over urban scenes (Ulrich, 1993). Although this general finding may reflect adaptedness to the (natural) environments of human evolution, theorists accept that learning processes also shape preferences, as through repeated pairing of beneficial experience with natural environments. Interweaving evolutionary with cultural and personal explanations for aesthetic responses to landscapes, various syntheses converge on the theme of the preferred natural landscape as the visual aspect of a setting for beneficial experience (e.g. Appleton, 1996).

This theme echoes in assessments for outdoor recreation management, exemplified by the

research carried out for land management agencies in the USA. Driver and Bruns (1999) describe the management of outdoor recreation areas as a production process that starts with the recreationist's desires, expectations, and preferences; proceeds through the recreationist's interactions with the (managed) environment; generates recreation opportunities; and ultimately results in psychological benefits, among other outputs. Management efforts have over time encompassed successive aspects of this process, each of which implies particular assessment needs. Activity-based management has focused on supplying opportunities to perform particular activities, but without considering the psychological dimensions of recreation opportunities or recreation quality. Experience-based management (EBM) extended the focus to the psychological experiences sought in recreation. Net benefits-based management extends EBM by encompassing the full range of recreation benefits (and costs) over a longer term. To support these management approaches, researchers have assessed motives for, satisfaction with, and benefits from recreation experiences. They have developed various measures for these purposes, such as the Experience Preference Scales (e.g. Manfredo et al., 1996). Work in this area has also considered how desired outcomes relate to environmental attributes such as level of development (e.g. Williams & Knopf, 1985), as well as the acceptability of varying numbers of other recreationists (e.g. Manning et al., 1999) and levels of human-induced change in the recreation environment (e.g. Hollenhorst & Gardner, 1994).

Reviewing a multidisciplinary array of studies on outdoor recreation motives, Knopf (1987) considers what they tell us about recreation in natural settings versus recreation activities in general. The motive studies do commonly attest to a desire to experience nature per se. Stress reduction also recurs as a potent motivation. The desire to escape stress appears to covary with crowding and other stressful conditions in recreationists' everyday environments.

As important benefits of nature recreation, stress recovery and other forms of psychological restoration will remain a concern for outdoor recreation managers. Their efforts can benefit from developing theory and research on restorative environments, which extend from studies of landscape perception and outdoor recreation. One theory views psychophysiological stress recovery as a form of change supported by natural scenes with particular stimulus properties (e.g. moderate complexity) and contents (e.g. water) (Ulrich, 1993). Attention restoration theory (Kaplan & Kaplan, 1989) attributes renewal of a depleted attentional capacity to psychological distance from routine mental contents (being away); immersion in a coherent environment of sufficient scope to sustain exploration (extent); effortless attention engaged while making sense of and exploring the environment (fascination); and congruence between personal inclinations, environment demands, and environmental supports for intended activities (compatibility). Hartig et al. (1997) have published initial measures of these four factors, but further work is needed.

These theories guide a growing number of field and laboratory studies on the restorative values of natural, urban and other environments (e.g. Hartig et al., 1991). Experiments have consistently documented relatively beneficial affective, cognitive, and/or physiological changes in natural versus urban environments following stressful or demanding experiences. However, these studies have used severely limited samples of environments.

GENERAL METHODOLOGICAL CONCERNS

Assessment involves sampling from the environment to represent variation in relevant visual or recreational attributes. Relevance has to do with what people see and use, not necessarily the full range of physical or ecological variation. In landscape assessment, sampling takes into consideration the vantage points from which observers view the landscape. As a given vantage point offers numerous views that may vary widely in their character, sampling also considers viewing direction and visual angle. Additional concerns relate to the dynamic character of the landscape; visibility, the quality of light, the presence and colour of vegetation, and other visual attributes change with the time of day, season of the year, and atmospheric conditions. Beyond such variables, Hull and Revell (1989) note that the scenes people select for viewing

vary with their purposes, the meanings they attach to landscape features, their speed of movement, their emotional state, and the presence of scenic features that command attention. Such concerns, in particular the activity pursued, also hold when assessing the recreational quality of outdoor settings.

Constraints on environmental sampling relate to the method used to present environments to the people who provide descriptive judgements or evaluative responses. Respondents may not always be available on-site, and even when they are, evaluations of future conditions present a problem. Given the costs involved in transporting people to multiple field locations or a need to represent possible changes in the environment, assessments frequently use visual surrogates or simulations to depict the environment. These represent a landscape or recreation setting in its current condition or, through the manipulation of images, how it might appear, as with different timber cutting alternatives. Presentation methods have evolved substantially, and emerging virtual reality (VR) technologies can help to reduce sampling constraints grounded in the use of static images such as photographs (Orland et al., 2001).

The validity of a given presentation method rests in part on the equivalence of an observer's response to the visual surrogate vis-à-vis the place portrayed. Although high correlations or a lack of significant differences between field and photo-based ratings have often been taken as evidence of validity, Palmer and Hoffman (2001) note reasons to question these approaches to establishing response equivalence. For example, a large correlation between ratings obtained on-site and with a surrogate indicates similarity in a pattern of responses, but not whether the absolute levels of the rated variable are the same in the two conditions.

FUTURE PERSPECTIVES AND CONCLUSIONS

Population will continue to increase in the coming years, and with it competition between commodity and non-commodity uses of landscapes and natural environments. This will drive further demand for information on the visual and recreational values of landscapes and natural environments. Improved environmental sampling and representation methods will aid the acquisition and application of such information. In the broadest sense, assessments concerning landscapes and natural environments will continue to play a role in sociocultural evolution by informing decisions that weigh multiple demands placed on the natural environment (Craik & Feimer, 1987).

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RELATED ENTRIES

Observational Methods (General), Person/Situation (Environment) Assessment, Theoretical Perspective: Behavioural, Unobtrusive Measures

LANGUAGE (GENERAL)

INTRODUCTION

The practice of language assessment, both in children and adult populations, has been undertaken from various perspectives, and its evolution mirrors to some extent the development of Psychology as a scientific discipline from the first decades of the twentieth century. In this regard, there are two most influential lines of thought, generally known as the *psychometric* and the *cognitive* approaches. Since there are a number of background theoretical issues concerning the nature of language as an object of scientific inquiry that have an important bearing on either approach to language assessment, we will begin by briefly addressing these theoretical issues. This will lead us to describe the main strategies used for language assessment purposes, and to review the main components or processing levels of language and the tasks that are used in adult language assessment for each component, together with the major variables that should be taken into account in the assessment process. Finally, we will review some problems, both theoretical and methodological, that assessment procedures have to face.

THEORETICAL BACKGROUND

Language is a very peculiar object of study. It is both a declarative body of knowledge possessed by adult competent speakers, and a set of procedures (or abilities) by which such knowledge is put to use in a variety of ways in linguistic activities. Furthermore, language can be viewed primarily as a means of communication among conspecifics (human language being the most developed and sophisticated code), but also as a means of representing and conveying thoughts and intentions, as a symbolic tool or device relating sound and meaning. In this regard, the psychological study of language is at least a twofold enterprise, for it must address (1) a wide array of information types and processing levels involved in understanding and speaking (which in principle can be selectively impaired); and (2) the intimate connection between the

speakers' linguistic knowledge and abilities, on the one hand, and their cognitive and communicative capacities at large, of which linguistic skills are but a subset.

The *psychometric* approach to language assessment (e.g. Burt, 1940; Carroll, 1941; Hakstian & Cattell, 1978; Thurstone, 1938; Vernon, 1950) views language as a set of performance skills that rest on a number of underlying, more or less permanent, abilities. Although this view of language seems to parallel the competence–performance distinction proposed by Chomsky (1965), it does not carry any commitment to a rule-based account of linguistic competence or an information-processing view of the cognitive operations underlying linguistic performance. Rather, it defines 'verbal' (as opposed to 'linguistic') abilities in crudely operational terms; that is, as a direct reflection of the subject's performance in a number of standardized linguistic tasks. Language, more properly called 'verbal ability', is thus seen as a factor (or number of factors) of intelligence along which subjects may show quantitative variations. Verbal intelligence is alternatively viewed as a unitary ability, or as a set of distinct factors (e.g. 'verbal comprehension', 'verbal fluency', etc.) that can be independently evaluated. From this perspective, the targets of language assessment, or the components of verbal ability, are defined by crossing the main modalities of language use (spoken vs. written language) with the major linguistic tasks (comprehension and production), rendering the four basic language skills, namely listening, speaking, reading and writing.

The *cognitive* approach to language assessment entertains an entirely different conception of linguistic abilities. Language is seen as a cognitive faculty; that is, as a set of mental processes that operate on linguistic representations by means of a system of abstract rules that are mentally represented (as declarative but largely unconscious knowledge) (Clark & Clark, 1977; Chomsky, 1957, 1965; Fodor, 1983; Fodor, Bever & Garrett, 1974; Levelt, 1989; Pinker, 1994). Basic linguistic competence is by assumption equal to all healthy adults, who can in turn differ in their processing skills. Accordingly, language assessment procedures are theory-governed: processing models in various linguistic domains or components guide the elaboration of assessment tasks and materials. These domains are individuated in terms of the kinds of linguistic information each one of them is supposed to process. The emerging picture of the language faculty consists of a set of autonomous processing components (or levels) – acoustic, phonological, lexical, syntactic, semantic – working in a coordinated fashion to perform complex linguistic tasks (e.g. word, sentence and discourse comprehension and production).

As for cross-modal differences in language processing, no particular assumption is made about the relative autonomy of processing modalities; it is claimed at most that the processes subserving language performance may be modality-specific at the periphery, due to specific input–output constraints, but are most likely to share the same central processing mechanisms. Moreover, the cognitive approach to the study of language views the language faculty as a (partially) autonomous processing device (or module) itself with regard to other cognitive abilities or faculties (e.g. visual perception, auditory perception, motor control, musical processing, etc.), though it may make use of a common pool of processing resources in terms of attention, working memory, etc.

Since both psychometric and cognitive approaches see language simultaneously as a *unitary* and a *multiple* ability, the psychological assessment of language could provide two kinds of information: (1) information about the subject's *general* capacity to communicate by means of well-formed linguistic messages, both spoken and written; and (2) detailed information of the various components of linguistic knowledge and processes involved in the performance of language tasks, either to evaluate the level of proficiency attained in each of these components, or to ascertain the nature and possible causes of language impairments.

The assessment procedures intended to measure the level of language proficiency have been mostly used in educational settings, as a tool either in the teaching of a second or foreign language, or in the diagnosis and rehabilitation of children with language development disabilities (see entry on 'Development: Language'). On the other hand, the assessment procedures employed in the diagnosis and rehabilitation of adult language impairments (see Kremin, in this volume) have normally developed from

neuropsychological studies with brain injured patients.

LANGUAGE ASSESSMENT METHODS

From a methodological standpoint, language assessment is roughly based on three different strategies: (1) the application of *standardized tests*; (2) the *analysis of samples of speech*; and (3) the use of *experimental tasks*.

Standardized tests for language assessment are sets of highly structured tasks intended to assess subjects' knowledge of various linguistic components and their ability to carry out the processes underlying the comprehension and production of spoken/written language. In a few cases, these tests were designed to assess one particular component of linguistic knowledge or modality (e.g. 'The Token Test', de Renzi & Vignolo, 1962; 'The Object and Action Naming Battery'; Druks & Masterson, 2000), whereas in most others (e.g. 'The Boston Diagnostic Aphasia Examination'; BDAE; Goodglass & Kaplan, 1972) they include subtests that address several components of language in spoken/written modalities: phonology/orthography, lexicon (including word form and word meaning), and syntax.

As Tables 1 and 2 show, a wide variety of linguistic tasks have been developed so far. A range of different variables are thought to influence subjects' performance in these tasks, according to the results from psycholinguistic research.

In many classical neuropsychological batteries, such as the BDAE, the assessment is based on a small number of tasks with a few items in each, which makes it somewhat difficult to manipulate and control the relevant variables that influence linguistic performance, and might bring incorrect generalizations about the processing capabilities or limitations of the subjects examined.[1] In contrast, neuropsychological batteries following a cognitive approach (e.g. PALPA; Kay, Lesser & Coltheart, 1992) provide different tasks and item lists for the evaluation of particular linguistic components, allowing a more detailed and controlled assessment of the subjects' preserved and impaired abilities (while demanding a careful selection of tests on the part of the examiner).[2]

Analysis of speech samples: The need to exert close control over the variables involved in language performance, together with the influence of Chomskyan linguistics on many areas of psycholinguistic research, have strongly biased the structure and contents of standardized language tests, which are mostly restricted to the assessment of phonological, lexical and morphosyntactic domains. However, the increasing interest of linguists and psychologists in pragmatics from the late 1970s has broadened the scope of psycholinguistic research to cover the comprehension and production of complex texts, discourses and conversations.

The evaluation of *text and discourse processing* is intended to provide information about the subject's ability to understand and use broader linguistic units comprising several interrelated sentences with complex and coherent meanings. The *analysis of conversation*, in turn, reveals the subject's capacity to produce and interpret relevant messages that are tuned to the listener's informational demands, to comply with the implicit rules regulating turn taking in conversational exchanges, to properly convey communicative intentions, etc. (see 'Communicative Language Abilities' in this volume).

Discourse and conversation analyses require the recording of spontaneous (or elicited) linguistic samples: narratives elicited by pictures where the examiner controls for the content and complexity of the information expressed; story-recall texts that allow the researcher to manipulate the content and linguistic complexity of stories; conversational discourse about topics with different degrees of relevance for participants, with familiar and unfamiliar partners, etc. Once the speech samples have been transcribed (or the texts are written), a host of techniques and measures can be used to describe how subjects organize and relate their ideas across sentences (see Table 3).[3]

Discourse and conversation analysis techniques have been extensively used to examine the patterns of preserved and impaired discourse behaviour in clinical populations and normal adults. These techniques provide *qualitative* information about the subjects' ability to organize their linguistic productions, thus revealing the complex relationships between language, social context and cognitive and communicative abilities. However, given the absence of normative data, the

Table 1. Tasks used in the assessment of spoken language, and relevant factors to be controlled

Components of linguistic knowledge and processing	Tasks	Relevant factors
Phonology	Phoneme discrimination (minimal pairs) Non-word repetition Phonological phrasing Judgements on rhymes	Acoustic/phonological similarity Length of sequence Phonemic context
Lexicon		
Word form	Identification of spelled words Repetition of words and non-words Word–picture matching Picture naming Identification/naming of real objects (body parts, furniture, etc.) Auditory lexical decision task	Words vs. non-words Word frequency Familiarity Imageability Abstractness Word length Grammatical class of words (open/closed) Morphology
Word meaning	Naming from definitions Synonymity judgements Semantic association/discrimination Semantic classification Generation of exemplars from categories Questions about word knowledge	Distractors (response choices) Homophones Age-of-acquisition
Syntax	Acting-out tasks Spoken sentence–pictures matching Comprehension of verbs and adjectives Comprehension of prepositions and adverbs Comprehension of arguments in sentences Elicited production of sentences Elicited production of changes in verbal inflection Sentence repetition Grammaticality judgements	Length of sentence (number of words) Grammatical structure of sentences (active/passive, empty categories, locatives, reversible/non-reversible, etc.) Type of referents (animate/inanimate, abstract/concrete, etc.) Prosodic variations Knowledge of vocabulary

interpretation of results yielded by these techniques requires the examiner to possess an extensive knowledge of the psychological processes involved in these activities, which lie at the border between language and reasoning.

Experimental tasks: A recent methodological development in the assessment of language involves the use in clinical contexts of experimental procedures originally devised for psycholinguistic research. The justifying assumption is that both normal and impaired language processes are affected by the same sorts of variables. In neurologically intact subjects, the influence of these variables can only be detected with very sensitive measures such as reaction time, whereas in impaired subjects these variables may prevent the responses altogether. Therefore, both error rates and reaction times can be taken as appropriate measures for patients with language deficits and normal unimpaired subjects alike.

Although experimental procedures are still seldom used for clinical purposes at large, there is an increasing trend to employ computer-based tasks in the presentation of stimuli and the recording of time-locked responses from patients with language impairments. One well-known example is the use of *priming techniques*, which have been extensively used in Experimental Psychology. In semantic priming studies, for

Table 2. Tasks used in the assessment of reading and writing abilities, and relevant factors to be controlled

Activity	Linguistic component	Tasks	Relevant factors*
Reading	Phonology/ Ortography Lexicon Syntax/ Semantics Discourse	Discrimination/identification of letters Matching letter names (sounds) and orthographic representation Matching allographic representations of letters and words Visual lexical decision task Reading of words Reading of non-words Matching spoken and written words (multiple choice tests) Synonymity judgements with written words Cloze tests (with/without multiple choice tests) Questions about written sentences (open questions, true/false questions, or multiple choice tests) Summarization tasks	(Only for cloze tests) Grammatical/semantic dependence (within-clause, across-clause, across-sentence, extra-textual) (Only for text comprehension tests) Discourse genre (narrative vs. expository texts) Conceptual organization of ideas in text
Writing	Phonology Lexicon Syntax Discourse	Writing letters and numbers by dictation Writing words and non-words by dictation Copy of allographs Writing spelled words Writing names from pictures Writing sentences by dictation Narrative writing (e.g. description of pictures)	Regular vs. arbitrary orthography of words (Allograph copying tasks) Common nouns vs. proper names

*Only specific factors for the visual modality are included here, that have *not* been previously listed in Table 1.

Table 3. Parameters for language assessment that can be obtained through the analysis of discourses, texts and conversations

Spoken discourse/Written texts	Cohesion devices (syntactic, lexical and semantic relations that link linguistic items across sentences) Local and global coherence of ideas Hierarchical organization of ideas and propositions Narrative/expository schemata (global macrostructure)
Conversations	Turn-taking mechanics Conversational breakdowns and repairs Pragmatic functions (directives, responses to directives, comments and representatives, expressives, requests for objects, actions and clarification, etc.) Topic manipulation

instance, subjects are presented with a target stimulus (e.g. a written word to be identified or pronounced) preceded by a semantically related prime (e.g. *doctor* immediately followed by *nurse*). In normal speakers, the prior presentation of the prime facilitates the recognition or naming of the target word. In contrast, brain injured patients and patients affected by Alzheimer-type dementia appear to be unaffected by the semantic relationship between both words,

which seems to show that there is a functional disconnection of the lexical and semantic systems in such patients.

FUTURE PERSPECTIVES AND CONCLUSIONS

The functional complexity of human language raises a host of problems and challenges for assessment. First of all, the examiner is bound to gather detailed information about a huge number of relatively autonomous linguistic components and processing systems, which are influenced by a range of different variables. This makes it advisable to combine different tasks and procedures in the evaluation of every single component. In addition, it makes it necessary to acknowledge the close connection between some linguistic processes and other non-linguistic domains of information processing in humans, which nonetheless play a prominent role in linguistic performance (e.g. conceptual knowledge, attentional and working memory resources – whose demands are sharply increased as linguistic units become more complex, etc.).

Language assessment, as well as the clinical (and theoretical) interpretation of its outcomes, must be driven by theoretical models and by the conceptual distinctions they propose. A particular case in point is the distinction between *implicit* vs. *explicit* forms of information retrieval (see 'Memory (General)' in this volume). The observation that jargon aphasics are incapable of making semantic similarity judgements (an *explicit* task) while showing semantic priming effects (an *implicit* task) may serve as an illustration of the need to find out whether the deficits shown by a patient only affect strategic/conscious language processes or also interfere in automatic/non-conscious processes.

Another problem that commonly arises when assessing language deficits is the issue of whether selective impairments should be seen as caused by a disruption of the subject's *store* of information within a specific component of the language system (e.g. the phonological input lexicon, the semantic system), or by a trouble with *accessing* otherwise intact information within that particular component. This problem is further complicated by the fact that performance deficits can arise as a consequence of a loss of processing resources: therefore, a shrinking of the working memory span could be claimed to underlie some language impairments which were traditionally interpreted as affecting *specific* kinds of linguistic information (e.g. bound morphemes and closed-class words) in children language impairments and adult agrammatic aphasia. A useful strategy to clarify this issue involves the joint application of specific tests intended to sort out the possible underlying causes of the deficit (e.g. the use of general and language working memory tests alongside standard sentence processing measures, like sentence–picture matching).

A final question that deserves some attention is the assumption of a modular architecture for the language processing system. This can be seen both as a theoretical claim and as an empirical issue. Assessment procedures inevitably take for granted that linguistic abilities form a relatively closed set, but it is in the interest of researchers and practitioners to clarify the pattern of associations and dissociations between the different components of the language faculty, and between the language faculty as a whole and other related cognitive abilities. More importantly for assessment purposes is the need to define in a psychologically plausible fashion the nature of the internal components of the language faculty.

The traditional view that these components should be distinguished in terms of complex behavioural tasks (i.e. listening or spoken comprehension, reading, spoken production and writing) bluntly contradicts the assumptions of the cognitive view of the language system, which views the architecture of the language faculty as a set of processing devices individuated by information types (phonological processing, word recognition and selection, syntactic processing, semantic and pragmatic processing) rather than tasks or modalities. The overcoming of these theoretical differences is currently pursued by cognitive psychologists and neuropsychologists of language within the broad framework of the Cognitive Neurosciences (Gazzaniga, 1995, 2000). Undoubtedly, this new framework brings the promise of future payoffs for language assessment endeavours.

Notes

1 For instance, the auditory discrimination task in the BDAE includes only 6 words with widely different frequencies of use ('chair', 'key', 'glove', 'feather', 'chaise-longue' and 'cactus'). As Byng et al. (1990) pointed out, if a patient responds correctly to two of these items (2/6), it turns out that she will have a very defective auditory discrimination. However, the correctly identified items might be those with highest frequency names (say, 'chair' and 'key'), in which case this patient might have a normal auditory discrimination for high frequency and an impaired discrimination for medium and low frequency items.
2 In classical neuropsychological batteries, the examiner has to go through a closed catalogue of tests to be applied as a whole.
3 The analysis of speech samples can also be used to gather information about the morphosyntactic features of the subject's discourse, by examining its grammatical structure, errors, etc.

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José Manuel Igoa and Mercedes Belinchón

RELATED ENTRIES

THEORETICAL PERSPECTIVE: COGNITIVE, DEVELOPMENT: LANGUAGE, COMMUNICATIVE LANGUAGE ABILITIES, TESTING IN THE SECOND LANGUAGE IN MINORITIES, APPLIED FIELDS: NEUROPSYCHOLOGY, NEUROPSYCHOLOGICAL TEST BATTERIES

LATENT CLASS ANALYSIS

INTRODUCTION

Latent class analysis is a statistical tool for classifying objects or individuals according to their values on a set of observed, i.e. manifest, variables. Like cluster analysis, it is aimed at identifying clusters of individuals or objects that are in some sense 'similar'. In order to

separate to the terminology of cluster analysis, the groups of individuals are called 'classes' or 'latent classes' in latent class analysis (LCA) instead of clusters.

Unlike cluster analysis, the grouping is not done by means of some measure of similarity or distance between each pair of objects to be classified. There is also no need to define some criterion of cluster distance (or similarity), nor to select one of the various cluster algorithms (e.g. agglomerative, centroid method, etc.). In contrast, latent class analysis classifies objects according to their probabilities of the values of all observed variables (feature patterns of the objects). This distinction allows for two significant indications of cluster analysis or latent class analysis, respectively.

First, cluster analysis is to be preferred for small numbers of objects to be classified, LCA for large numbers of objects, say $N = 50$ or $N = 100$ be the criterion of applying one or the other. This is because in LCA the probability distributions of all manifest variables have to be parameterized (and estimated) for each latent class (which requires large numbers of observations), whereas in cluster analysis each object has to be measured according to its distance to each other object (which is more tractable for smaller sets of objects).

Second, LCA is better suited for categorical or ordinal data (where each manifest variable has a small number of values, e.g. yes–no responses or rating scale responses to some questionnaire items), whereas cluster analysis is better suited for metric variables (where some distance measure between the objects, like the Euclidean distance, is unproblematic).

But there is a third difference between cluster analysis and LCA that is significant for specifying submodels and extended models: cluster analysis is aimed at identifying a manifest classification, i.e. each object is assigned to one and only one group or cluster (which is also true for some borderline cases, that have the same distance to two or more clusters and may, therefore, be assigned to a single cluster only with high uncertainty). LCA, in contrast, assumes a latent grouping variable, so that each object belongs to each latent class with a certain (assignment) probability. This distinction may be regarded as a more academic distinction, but it has enormous practical implications. The most prominent of them is the possibilty of defining specific statistical models for each latent class. Whereas cluster analysis can only clump together objects that are more or less similar, LCA is capable of identifying classes of objects that can be described by different statistical models. Latent class analysis belongs to the family of (discrete) mixture distribution models, whereas cluster analysis does not. But before going into the details of different variants of LCA, a brief introduction to the assumptions and ideas of LCA is given.

THE MODEL AND ITS HISTORY

The concept of LCA has been developed 50 years ago by Paul Lazarsfeld (1950) who considered it as part of the more general framework of latent structure analysis. The idea of latent structure analysis was based on the distinction between manifest and latent variables. While manifest variables can be directly observed, like socioeconomic variables, item responses in a questionnaire or some codification of observed behaviour, latent variables cannot be observed or measured by means of a yardstick. The notions of a disposition, hypothetical construct, or intervening variable, incorporate the idea that theories in psychology or sociology usually are built on the basis of latent variables like intelligence or socioeconomic status, but all that can be assessed are manifest indicators like income and success or failure in an intelligence task (Lazarsfeld & Henry, 1968).

The insight that manifest variables have to be linked to latent constructs was not new at that time, since the methodology of factor analysis was well developed and often applied in various fields of research. However, there are three significant distinctions between factor analysis and the ideas of latent structure analysis. Factor analysis applies to metric or quantitative manifest variables, factor analysis introduces metric or quantitative latent variables (the 'factors'), and factor analysis does this on the basis of the correlations among the manifest variables, i.e. only considers the bivariate associations of the observed variables. Latent structure analysis, in contrast, has been developed on grounds of the philosophy that observable variables in sociology and psychology

usually are categorical, i.e. nominal or ordinal, that also the latent variable needs not to be metric but should be conceptualized as a categorical variable, and that it is insufficient to only consider bivariate associations when working with many manifest variables, among which interactions among three or more variables may exist.

The paradigm of latent structure analysis is the principle of local independence, which means that the observed associations of the manifest variables are caused by a latent construct or a latent variable. If this latent variable is held constant, the associations between the observed variables vanish. For example, income, level of education, and the brand of the owned car are associated in any representative sample. If it is true that the socioeconomic status can be described by three levels only, i.e. lower, middle, and upper class, then the associations between income, education, and brand of car are not given, when only persons of the same class are investigated. This is to say that the criterion of identifying latent classes is the absence of associations between the observed variables within each class.

Local independence means that all observed variables are independent for the same locus of the latent variable. It is a rather fundamental principle in statistical analysis and a powerful tool for constructing models. Latent class analysis is the basic model of this family of local independence models. It simply assumes that the probability of observing a pattern of indicators x, y, and z, given a latent class A, is the product of the probabilities of each single indicator, given that class:

$$P(x, y, z|A) = P(x|A) * P(y|A) * P(z|A)$$

The second assumption is that these classes (say A, B, and C) are mutually exclusive and have proportions in the population that sum to unity:

$$P(A) + P(B) + P(C) = 1.$$

Then, the model of latent class analysis is defined as:

$$\begin{aligned} P(x, y, z) = {} & P(A) * P(x, y, z|A) + PB) \\ & * P(x, y, z|B) + P(C) * P(x, y, z|C) \end{aligned}$$

Although the basic structure of this model seems to be rather simple, it could not be applied for a long period of time, since no algorithms for estimating its parameters were available. Only the work of Leo Goodman (1974) made an application of the model to realistic sets of data possible. Goodman's algorithm later turned out as a special case of the nowadays famous EM-algorithm described by Dempster, Laird and Rubin (1977). Today, some excellent software products are available for estimating the model parameters and applying the model to large sets of data (e.g. WINMIRA, Davier, 2000; LATENT GOLD, Vermunt & Magidson, 2000; the GIBBS-sampler, Hoijtink & Molenaar, 1997; PANMARK, van de Pol, Langeheine & de Jong, 1996).

These software products cover many more models than the simple basic model of LCA as described before. WINMIRA is specialized to so-called mixed Rasch models, i.e. latent class models where the Rasch model (Rasch, 1960, 1980 [2nd ed.]) holds within each latent class, but with different item difficulty parameters between the classes (Rost, 1990, 1991, 1996). Another feature of WINMIRA are latent class models for ordinal data (Rost, 1988a and b). Other programs have their own advantages and some very powerful LCA programs exist that are not commercially distributed but have to be requested from the authors (Linear Logistic LCA, Formann, 1992a and b; or LAT, Haberman, 1979).

APPLICATIONS IN PSYCHOLOGICAL ASSESSMENT

Although the field of possible applications in psychological assessment is by far larger than the number of applications available in the literature, its number is high enough to not be listed and commented here. A collection of different applications is provided in the book by Rost and Langeheine (1997), which is now available from the Internet (www.ipn.uni-kiel.de).

As an example for a typical latent class analysis in the field of psychological assessment, the analysis of social needs in a study of environmental behaviour is described in the following (Gresele, 2000).

Each five items for assessing the social need for affiliation, conformity, influence and approval have been constructed on the basis of existing questionnaires on social needs. Two items aimed at assessing the need for approval had to be removed due to failures of item construction. The remaining 18 items were analysed by means of LCA and revealed 4 latent classes that can be interpreted as social need types. Figure 1 shows the response profiles of the 4 types on the 18 items of the questionnaire. Since the response format was a 4-point rating scale, the ordinate of this figure ranges from 0 to 3, indicating the mean (expected) response of the types on the items of the questionnaire.

Only one profile is low on the items of affiliation, giving reason to call them the *introverts*. In fact, they have an intermediate need for conformity, the lowest need for influence, and a relative low need for approval, which fits to the interpretation of this type as the introverts. This class (no. 4) covers 21 per cent of the students.

The profile of class one (27%) shows lowest values on the approval items, i.e. these students are independent of approval or *self-determined*. These students have intermediate needs for conformity and influence (which underlines their self-determination) but are high on the affiliation items.

High on influence but low on conformity is the profile of the *leader* type (class 2; 27%). These students are not oriented at the norm of their peer group, but they are themselves opinion leaders. Of course, they are high on affiliation and have a high need for approval, which they strive for by leading and influencing others.

As compared to the leaders, class 3 (26%) has a stronger need for conformity but a lower one for influence. Their needs for affiliation and approval are relatively high, so that this type can be identified as the *sociables*.

This example is to illustrate that the assessment of psychological variables by means of latent class analysis needs no assumption of dimensionality of the items and goes beyond the pairwise correlations of the item responses. The analysis considers the entire pattern of item responses and identifies groups of individuals that have similar response patterns in terms of response probabilities. Hence, latent class analysis can be seen as the qualitative counterpart to quantitative item response theory: it assesses latent types instead of latent traits (Langeheine & Rost, 1988).

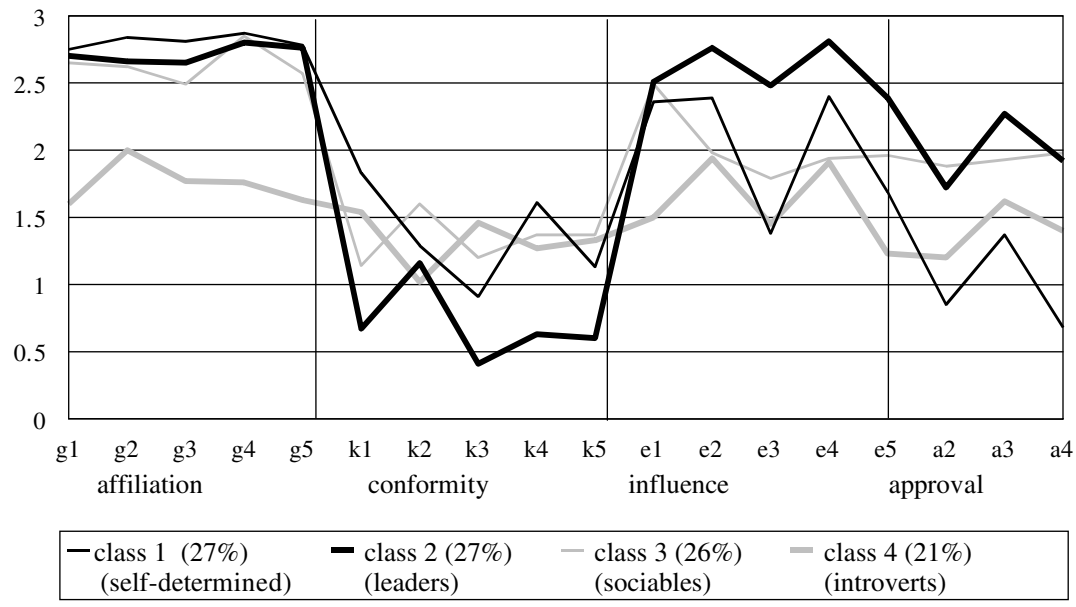

Figure 1. Social need profiles.

FUTURE PERSPECTIVES

Models based on the idea of latent class analysis constitute a growing field of methodological research. Many kinds of statistical models, like factor analysis or linear structural equation models, are going to be generalized to discrete mixture models. It certainly will become a standard for statistical data analysis to first try to unmix given data before applying some model to the entire population. The consequence for psychological assessment may be that the assessment of types of individuals will turn to be a focus of research and diagnosis, additionally to that of trait analyses.

CONCLUSIONS

Latent class analysis is only the basic model of a growing type of statistical models, that are better labelled as discrete mixture models. As a probabilistic model based on the concept of local independence, LCA parallels the models of item response theory. Moreover, latent class models may be applied when latent trait models fail to fit the data (Rost, in press).

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RELATED ENTRIES

Item Response Theory: Models and Features

LEADERSHIP IN ORGANIZATIONAL SETTINGS

INTRODUCTION

From an organizational standpoint one major element that sets apart successful from unsuccessful organizations is leadership, which should be dynamic and effective.

Leadership can be seen as the activity to influence others to willingly achieve specified objectives; it is clearly dependent on individual behaviours and a set of attributes which characterize a leader.

Peter F. Drucker referred to business leaders as the basic and scarcest resource of any enterprise. Therefore, it should not be a surprise that organizations are looking at the selection process for candidates (Drucker, 1954).

Trying to respond to the question of how to assess leadership at the individual level, several tools have been developed and tested during the last decades.

The entry on 'Leadership Personality' in this Encyclopedia, by Robert Hogan and Robert Tett, includes a complete summary of outside and inside assessment methods, with demonstrated validity for predicting leadership personality.

Leadership assessment at the organizational level should focus on extending the evaluation of the individual, looking at the effectiveness of the organization as a whole (Bennis & Nanus, 1985; Burns, 1978).

This entry is intended to review the concept of leadership and what attributes the followers expect from their leaders and supervisors. It will summarize the way existing tools, like Total Quality Management, are being used in the assessment process of organizational leadership.

Extending the basic traits of leadership to the entire organization, we shall cover in detail organizational leadership assessment, from a Total Quality Management standpoint (Bradford & Cohen, 1984). We shall discuss, as well, some other assessment instruments available today.

Whenever individuals attempt to affect the behaviour of other people without using a coercive form of power, we describe it as leadership. Specifically, 'leadership is an attempt at influencing the activities of followers to willingly cooperate through the communication process toward the attainment of some goal or goals' (Fleishman and Hunt, 1973).

This definition suggests that the ability to influence other people is essential to leadership and, consequently, all relationships can involve it. Besides that, communication appears to be of critical importance for this purpose.

On the other hand, the definition includes the attainment of goals. Leadership effectiveness at the individual, group or organizational level is measured by the accomplishment of one or a combination of goals.

In a hierarchically structured organization, the managers and supervisors may direct, instruct or command, but unless followers have the choice to follow or not follow, there is no leadership.

There is a clear distinction between managing and leading: the latter emphasizes 'get others to want to do' versus get others to do.

Managers get subordinates to do through objective setting and the classical management functions (planning, organizing, directing and controlling). Leaders get followers to want to do, by inspiring a vision, modelling the way, innovating, developing their people and always setting the example (see Cleveland, 1985).

LEADERSHIP CHARACTERISTICS

Much of the early work on leadership focused on identifying the traits of effective leaders. Most research was designed to identify intellectual, emotional, physical and other personal traits of successful leaders: intelligence, personality, physical characteristics or supervisory ability were investigated. In this way, a number of trait theories emerged (Gibson, Ivancevich & Donnelly, 1988).

On the other hand, the word 'charismatic' frequently comes up in discussions of leadership. For example, people might think that some leaders have charisma and other leaders don't. Leaders

don't have charisma; followers give leaders charisma. We have all seen that phenomenon with elected officials. They are often carried into office because of their charisma, but when their actions do not gain general approval, they may lose their charisma overnight. 'Charisma' has become such an overused and misused term that it is almost useless as a descriptor of leaders. Bernard Bass, professor of organizational behaviour at the State University of New York, has done extensive research on charisma (Bass, 1985).

Other people have investigated the expectations that followers have of leaders, to determine the extent to which their perceptions of leadership matched what leaders themselves said they did. One of these studies was sponsored by the American Management Association (Kouzes & Posner, 1987; Kanter, 1983).

As a result, more than 225 different values, traits and characteristics were identified, but reduced afterwards to 15 by classification. The most frequent responses, in order of mention, were (1) integrity, (2) competence and (3) leadership.

In a follow-up study, the four top characteristics of superior leaders were, by order of importance, honesty, competency, forward-looking and inspiring.

The above mentioned studies suggest the effective leadership traits which should be ideally found in leaders.

LEADERSHIP PRACTICES

Kouzes and Posner (1987) have discovered that the ordinary executives who convinced others to join them on pioneering journeys followed the path of a three-phase strategy. They refer to it as the VIP – vision–involvement–persistence – model of leadership.

Looking deeper into this dynamic VIP process, five fundamental practices were identified that enabled leaders to get extraordinary things done: (1) challenging the process, (2) inspiring a shared vision, (3) enabling others to act, (4) modelling the way and (5) encouraging the heart.

1 Challenging the process involves questioning what is done regularly in order to find new ideas and innovate. Leaders may challenge the process by searching for opportunities, experimenting and taking risks.
2 Leaders should constantly look for the future, imagining what it will be like when they have arrived at their final destinations. This activity should be shared with their people. They should envisage the future and commit others in the process.
3 Enabling others to act means leading activities to get the collaboration of the people, by building teams and empowering. They regularly foster cooperation, delegate and empower their people.
4 Modelling the way involves directing the course of action and practising what you preach. Setting the example and planning small wins are ways to model the way.
5 Encouraging the heart means recognizing and celebrating what is done successfully by the employees.

The above mentioned commitments of leadership are very deeply analysed by Kouzes and Posner (1987).

MODELLING ORGANIZATIONAL LEADERSHIP ASSESSMENT

Many models for organizational assessment have been developed. For detailed information see the entry on 'Total Quality Management' in this Encyclopedia, where several are mentioned and the EFQM (European Foundation for Quality Management) Model is analysed in detail.

A number of behavioural commitments support leadership practices. Adoption of the process of self-assessment is the EFQM's recommended strategy for improving performance (EFQM, 2000).

Self-assessment is a comprehensive, systematic and regular review of an organization's activities and results referenced against the EFQM Model. Today, many organizations are using the Model for this purpose, determining their strengths and areas subject to improvement (Peters & Austin, 1985).

Organizations carry out this cycle of evaluating and taking action repeatedly, so that they can achieve a sustained improvement. The most advanced have integrated self-assessment in the regular organization's planning cycle.

The evaluation is valid for the different criteria (enablers and results) implied in the Model. The first criterion is specifically leadership. The contribution of leadership to the business is measured by the overall results of the organization, but leadership is evaluated in terms of the specific attributes of its leaders (Kanter, 1983).

The criterion on leadership responds to the definition previously written and includes the different practices which have been covered in this entry.

The assessment reviews how the leaders demonstrate their commitment and how actively they drive improvement activities, implicating people, customers, suppliers and external organizations (Watson, 1963).

Examples of these areas are: the way they develop values and expectations and act as role models of these values; how they prioritize, fund, organize and support improvement activities within the organization; how they manage relationships with customers, suppliers and other external organizations; how they demonstrate business knowledge and get involved in education activities; how they communicate with their subordinates, listening, informing and reviewing the effectiveness of their leadership. On the other hand, how they recognize and celebrate people successes.

Being an 'enabler' criterion of the Model, leadership is assessed as a combination of the following two items.

On one hand, the approach used by the leaders in meeting their responsibilities is assessed looking at a number of attributes: has the approach a good base? Is the approach systematic? Has it preventive mechanisms? Is it reviewed against its effectiveness and changed accordingly for permanent improvement? Is it integrated in the normal business operations?

Trained assessors judge on a percentage scale how much each of those criteria are met. In this way an average percentage of performance is obtained for the leaders in the organization.

On the other hand, deployment of those attributes has to be assessed by answering the following questions: to what extent are the preceding activities extended within the organization? Do they relate with only the top of the institution or are they spread overall? Are they extended to all functions and areas of the business, or do they concentrate only in a single part of the organization?

Deployment is then assessed with another percentage, which in fact is an average of the perception the assessor has on the number of managers practising leadership at the level of the approach assessed, as opposed to the total number of executives, managers and supervisors existing in the organization.

The mean of the 'approach' and the 'deployment' is the end result of the organizational leadership assessment.

ASSESSMENT INSTRUMENTS AND TOOLS

Traditionally, interviewing techniques, group sessions and role play have been used in several ways to assess leadership capacities and potentials. Some corporations have developed direct assessment methods by asking employees by means of questionnaires what they think about their leaders.

IBM, for example, developed in the 1980s an instrument which was made available to all management levels, to assess leadership styles and behaviours by means of opinions of their employees; it was called MAP (Management Activity Profile). It helped managers to put in place improvement techniques for achieving a better leadership profile.

Assessment centre techniques, which were pioneered by Douglas Bray and his associates at the American Telephone and Telegraph Company in the mid-1950s, became very popular as evaluation techniques, in general terms, but could be used for leadership assessment purposes as well. The foundation of this technique is a series of situational exercises in which candidates for several managerial programmes take part over a certain period of time (two to three days) while being observed and rated; role playing and case analysis are part of the exercise.

However, one of the potential problems of the assessment centre evaluation procedure is that it is so pressure-packed. Outstanding employees who have contributed to the organization may simply not perform well in the centre. Another problem involves the feelings of individuals who

receive mediocre or poor evaluations. Basing promotion decisions or identification of individuals with high potential on the results of a single assessment centre experience is questionable. It may have potential benefits and potential problems.

Kouzes and Posner (1987: 309) developed a 'Leadership Practices Inventory', based on a survey. It consists of thirty-eight open-ended questions which were tested with several populations. The outcome of these procedures resulted in thirty statements (six statements for measuring each of the five leadership practices); there are two forms – self and other – which differ only in whether the behaviour described is the respondent's (self) or that of another specific person (other).

Quite a number of instruments have been developed for assessing leadership: for example, Ohio State University initiated studies in 1945, attempting to identify various dimensions of leader behaviour (Stogdill & Coons, 1957). To gather data about the behaviour of leaders, they developed the Leader Behaviour Description Questionnaire, an instrument designed to describe how leaders carry out their activities; although the major emphasis in the Ohio State leadership studies was on observed behaviour, the staff did develop the Leader Opinion Questionnaire, to gather data about the self-perceptions that leaders have about their own leadership style.

FUTURE PERSPECTIVES AND CONCLUSIONS

Organizations are using several procedures for assessing their leaders, as well as other management activities, looking at results as a consequence of 'enablers'.

The domain of the leaders is the future. Their unique legacy is creating valued institutions that survive over time.

The most significant contributions leaders may make is not to today's operational bottom-line activities but to long-term development of people and organizations who prosper and grow.

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Francisco Fernández Ballesteros

RELATED ENTRIES

Applied Fields: Organizations, Applied Fields: Work and Industry, Leadership Personality, Total Quality Management

LEADERSHIP PERSONALITY

INTRODUCTION

Common sense suggests that leadership is the most important topic in the social, behavioural, and organizational sciences. A trip through the business section of any bookstore will also reveal that it is the most popular – based on the number of books written on the topic (well over 7000). The literature on leadership falls into two discrete categories. The first, and by far the largest, contains books designed for the popular or mass market. This vast literature contains nuggets of wisdom and flashes of insights from entrepreneurs, military officers, historians, business school professors, and consultants; however, it is not systematic, empirical, or verifiable, and it lacks an assessment base. In short, it is not a foundation on which to build a reliable understanding of leadership; it is entertaining rather than deeply informative.

The second literature, and by far the smaller of the two, comes from the empirical tradition of Academia. This tradition has the critically important characteristic of adhering to the standards of intellectual accountability that normally prevail in empirical research – publicly available data, standardized analytical methods, peer review, etc. By definition, then, the empirical tradition is more informative about leadership, at least in principle, than the vast collection of opinions contained in the literature designed for mass markets. But the empirical tradition suffers from four problems that limit its utility. First, it typically defines leadership in terms of the persons who happen to be in charge of the organizational unit being studied. But many, if not most, people who are in charge of organizational units attain their status for political reasons rather than because they have demonstrated significant leadership. In addition, by defining leadership operationally, the empirical tradition avoids the question of what leadership really is. Second, by defining leadership operationally, the empirical literature doesn't converge – because the characteristics of persons in charge of one organizational unit are typically different from the characteristics of persons in charge of a different unit, and it is nearly impossible to compare leadership (defined in this way) across organizations. Third, the empirical tradition has been strongly influenced by behaviourism, and as a result largely ignores the relationship between personality and leadership – from a behaviourist perspective, circumstances are more important than personality as an influence on leadership. And fourth, the empirical tradition has largely ignored the links between leadership and organizational effectiveness – arguing that effectiveness is too hard to define.

We believe that some attention to these definitional and conceptual issues will substantially clarify the assessment of leadership.

Leadership Defined

Data and common sense indicate that people are naturally selfish; nonetheless, all significant human achievement is the result of collective effort. Consequently, leadership should be defined in terms of the ability to persuade people to set aside their personal concerns and support a larger agenda – at least for a while. Leadership differs from management – subordinates respond to leaders because they want to, they respond to managers because they are paid to. Good managers, nonetheless, are often able leaders and vice versa.

Leadership and Organizational Effectiveness

All real world groups compete with other groups for desired resources – money, land, energy, food, loyal supporters, official patronage, league championships. Because leadership is a resource for a group, affecting its ability to attain its goals, leadership should be evaluated in terms of the effectiveness of the leader's team: Did it win the prize, the goal, the race, or the war?

Sometimes a good leader's team loses because it is overmatched, and sometimes a bad leader's team wins because it has superior resources; nonetheless, leadership and organizational effectiveness are co-dependent.

Leadership and Personality

To clarify the links between leadership and personality, we need first to define personality. Personality has two definitions, they are quite distinct, and they concern personality from the inside and from the outside. Personality from the inside, which we call identity, is composed of a person's values, goals, aspirations, and self-image; identity can be assessed by asking a person about his/her goals, aspirations, and self-image. Leadership assessment from the inside consists of assessing the identities of leaders and comparing them with the identities of non-leaders.

Leadership from the outside, which we call reputation, is composed of the images and evaluations of a person, as held by those people with whom that person interacts. Leadership reputation is assessed using observer ratings from whatever source a researcher might prefer. This would include assessment centre ratings and 360 feedback evaluations. Relevant research questions here include whom to ask to provide ratings, what rating dimensions should be used, and how leaders differ from non-leaders in terms of these ratings. The bottom line of this discussion is that leadership needs to be assessed from the inside and from the outside.

ASSESSING LEADERSHIP FROM THE INSIDE

As noted above, personality from the inside concerns a person's values, motives, and self-image – identity. Various methods and instruments are available to assess leadership from the inside and many of them yield valid results. For example, Sparks (1990) reports on research conducted at EXXON in the 1950s, designed to identify managerial talent. Using a combination of measures of cognitive ability, personality, biodata, and interviews, in a sample of 443 managers, and a composite success criterion (salary, level, and rated effectiveness), Sparks reports a cross-validated multiple R of 0.70. Howard and Bray (1990) report roughly comparable results using multiple methods in a longitudinal study at AT&T. Thus, it is possible to predict leadership performance using measures of identity, and in many cases with an admirable degree of validity.

The most robust procedures for assessing leadership from the inside fall into four categories: (A) projective measures of personality; (B) objective measures of personality; (C) specialized measures of personality; and (D) mixed measures of personality.

Projective Measures

McClelland (1975) and his associates have used the Thematic Apperception Test (TAT) to study leadership in a wide variety of organizations and countries. They report reasonable validity coefficients with scores for 'socialized power' (desiring power in order to bring about organizational change, not self-aggrandizement) and leadership performance.

Objective Measures

Objective measures of personality with demonstrated validity for predicting leadership fall naturally into four sub-groups. The best-known exemplars of the first group are the 16 PF (Cattell & Eber, 1961), and the Guilford–Zimmerman Temperament Survey (Guilford & Zimmerman, 1956). These inventories were constructed using internal consistency indices and factor analysis; the goal was to define reproducible factors, and predictive validity was a side issue. The second group contains objective measures of personality developed in an empirical manner and designed to maximize validity. The best-known example of this approach is the California Psychological Inventory (CPI; Gough, 1987); the well-respected CPI is widely used in management consulting around the world. The third group of measures concerns values and occupational interests. The best known of these is the Myers–Briggs Type Indicator (MBTI; McCaulley, 1990); the MBTI is not well regarded by many psychometricians, but McCaulley provides clear data that a

pattern of MBTI scores typifies executives world wide. A second important measure in this category is the Campbell Work Orientations Surveys (Campbell, 1990); Campbell shows that his inventory of values, interests, and preferences predicts a wide variety of leadership outcomes. The final category of objective personality measures contains inventories based on the Five-Factor Model (FFM; Wiggins, 1996). A substantial body of research shows that: (a) most existing measures of personality can be reconfigured in terms of the FFM, and (b) measures of normal personality based on the FFM are also robust predictors of leadership (*cf*. Hogan & Hogan, 1995). The FFM is the new paradigm for measures of normal personality, although there is strong resistance to this notion among some personality researchers (e.g. Block, 1995).

Specialized Measures of Personality

There are far too many specialized measures of personality, used to predict leadership, to cover responsibly here. There are thousands of individual scales, the best known of which concern authoritarianism, machiavellianism, self-monitoring, and dogmatism; these measures predict specific aspects of leader performance. Recent developments in theory and research suggest that these specific scales can be placed in the larger context of the FFM. Two recent special measures are important here – Emotional Intelligence (EQ) and Transformational leadership. The measurement base for the EQ movement (Goleman, 1995) is ad hoc and not well regarded by measurement experts. Nonetheless, a mounting body of evidence indicates that the ad hoc dimensions of EQ (self-awareness, self-management, social awareness, and social skill, as identified by Goleman) can be reliably measured and predict leadership performance fairly well.

The transformational leadership movement begins with Sigmund Freud and Max Weber, who argued that successful leaders have charisma, the ability to attract and develop a following. Robert House (1977) turned Weber's list of charismatic traits into a rating scale, and showed that the scale predicted leadership performance. House's results, combined with Burns' (1978) book, created a surge of interest in charismatic leadership, now termed neo-charismatic or transformational leadership, around which a substantial body of empiricism has developed, much of it based on a measure called the Multifactor Leadership Questionnaire (MLQ; Bass & Avolio, 1991). The results of this movement can be summarized in terms of six points. First, there is considerable consensus regarding the components of transformational leadership – the key components include integrity, conviction, commitment, vision, optimism, openness to new ideas, and consideration of and concern for subordinates. Transformational leadership is contrasted with transactional leadership, which emphasizes goals, accountability, performance management, and compensation. Second, these characteristics – which are desired by subordinates regardless of cultural context – resemble the components of EQ. Third, transformational leadership as a gestalt suggests that: (a) there is a moral component to leadership; (b) leadership depends on the ability to develop a relationship with subordinates; and (c) there is one best way to behave as a leader. Fourth, considerable data support these claims. Fifth, transformational leadership (and EQ) is clearly related to personality. Consequently, sixth, transformational leadership seems to be a syndrome of normal personality and should be captured by components of the FFM.

Mixed Measures of Personality

Several leadership assessment procedures combine measures of leadership from the inside with measures of leadership from the outside, and form a bridge to the next section of this entry. The two best known and thoroughly validated of these mixed measures are the Managerial Practices Survey (MPQ; Yukl, Wall & Lepsinger, 1990), and the Leadership Practices Inventory (Posner & Kouzes, 1990). The MPQ is better regarded by academic researchers; it asks a manager to evaluate him/herself in terms of 11 categories of managerial behaviour; then subordinates evaluate the manager using the same categories. The Leadership Practices Inventory is based on a critical incidents survey of experienced managers ('What did you do when you were at your best?'); the dimensions of this

assessment line up with the model of transformational leadership discussed in the preceding subsection.

ASSESSING LEADERSHIP FROM THE OUTSIDE

Subjective ratings of others' reputation as leaders began the 1950s using: (a) on-the-job behavioural description; and (b) assessment centres. Researchers at Ohio State University analysed 1800 behavioural descriptors and developed the Leader Behaviour Description Questionnaire (LBDQ; Stogdill & Coons, 1957) and the Supervisory Behaviour Description Questionnaire (SBDQ; Fleishman, 1957) which contained two broad dimensions: Consideration and Initiating Structure. Researchers at the University of Michigan created scales of leader Support, Goal Emphasis, Work Facilitation, and Interaction Facilitation (Bowers & Seashore, 1966). More recent on-the-job leadership rating scales are psychometrically improved, broader in scope, and use multiple rating sources. For example, *The Profilor* (Hezlett, Ronnkvist, Holt & Hazucha, 1997) assesses 38 managerial and leadership competencies using multisource ratings. A growing number of 360-degree measures of leader and managerial behaviour are available for use in developmental feedback (London & Smither, 1995).

The second major source of leadership ratings from the outside is the assessment centre. Originally developed in World War II to select officers and spies (Murray & Mackinnon, 1946), modern assessment centres use job simulations (e.g. in-basket exercise, leaderless group discussion) to evaluate leadership potential. The advantage of assessment centres over on-the-job ratings include control of situational factors and better assessor training and accountability. Assessment centres are valid predictors of leadership (Gaugler, Rosenthal, Thornton & Bentson, 1987), but there are many questions about what they measure (e.g. Bycio, Alvares & Hahn, 1987; Sackett & Dreher, 1982). Specifically, measures of such themes as planning and organizing, and interpersonal skills, correlate higher within exercises than individually between exercises. Nonetheless, assessment centres are a major source of data on leader and managerial behaviour.

FUTURE PERSPECTIVES AND CONCLUSIONS

Leadership assessment is intimately linked to leadership research. Key findings include the following.

Leadership is multidimensional. Leadership has often been conceptualized in terms of dichotomies; for example, Consideration and Initiating Structure, participative and autocratic styles, and person- and task-orientation. But leadership is a more nuanced concept, composed of an array of narrower facets. More specific leadership assessment allows (a) greater precision in developmental feedback and matching people to jobs; (b) richer conceptual frameworks for comparing alternative leadership perspectives; and (c) stronger tests of nomological networks guiding validation efforts (Tett, Guterman, Bleier & Murphy, 2000). A multidimensional approach also requires lengthy testing time for high fidelity data, and poses logistic problems in multisource feedback systems (Graddick & Lane, 1998).

Leadership is an evolving construct. Leadership assessment tools may need to be updated or replaced to reflect changes in the meaning of leadership as research progresses over time.

Leadership means different things to different people. Agreement among peer, subordinate, and supervisor ratings in multisource systems is moderate at best on most dimensions (Conway & Huffcutt, 1997; Dalessio, 1998; Harris & Schaubroeck, 1988). Validation efforts need to be sensitive to the diverse and sometimes competing values others hold about a given leader's role (Butterfield & Bartol, 1977), and to differences between raters in opportunity to observe leader performance.

Leadership assessment is a cognitive process and needs to be treated as such (Brown & Lord, 2001). Person perception holds promise as a framework for studying leadership reputation (Lord, De Vader & Alliger, 1986; Mount & Scullen, 2001; Sessa, 2001). Greater attention needs to be given to the mental processes by which individuals form judgements of themselves and others as leaders (Church, 1997).

Leadership effectiveness depends on the context. Skills required in higher level leadership roles typically are different from those required

at lower levels (Silzer, 1998). Leadership succession planning requires identifying the demands expected in future leadership roles.

Leader promotion can entail an assessment paradox. Despite the greater importance of leadership at higher levels, assessing senior leaders poses unique challenges due to greater ambiguity of the leader's role, increased political use of appraisal results, and reduced accountability for not undergoing appraisal (Gioia & Longenecker, 1994; Graddick & Lane, 1998; Longenecker & Gioia, 1992).

Responsible leadership assessment requires commitment from upper management that results will be used for stated purposes. Using developmental feedback data for promotion decisions can undermine assessment goals. Special efforts are needed to ensure adherence to stated purposes and confidentiality of results (Silzer, 1998).

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Robert Hogan and Robert Tett

RELATED ENTRIES

Personality Assessment (General), Leadership in Organizational Settings

LEARNING DISABILITIES

INTRODUCTION

The number of individuals classified with learning disabilities (LD) has increased dramatically over the last twenty years. This is because the classification of LD is based on the context of school learning. Consequently, considerable latitude exists among psychologists in defining LD. This latitude is reflected in social/political issues as well as non-operational definitions of LD (see Swanson, 1989, for a review).

The purpose of this entry is to bring some commonality to the assessment of LD. We address this problem by providing an operational definition of LD that will be useful in diagnostic assessment. Directions for future diagnostic research are also provided.

DEFINITION

Several definitions refer to LD as reflecting a heterogeneous group of individuals with 'intrinsic' disorders that are manifested by specific difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, or mathematical abilities (see Hammill, 1990, for a review). Most definitions assume that learning difficulties in such individuals are (a) *not* due to inadequate opportunity to learn, general intelligence, or to significant physical or emotional disorders, but to *basic* disorders in specific psychological processes, (b) these specific psychological processing deficits are a reflection of neurological, constitutional, and/or biological factors, and (c) there is a psychological

processing deficit that depresses only a limited aspect of academic or contextually appropriate behaviour.

Thus, to assess individuals with potential LD, efforts are made to determine: (a) normal intelligence, (b) below normal achievement in isolated academic skills, (c) below normal performance in specific psychological processes (i.e. phonological awareness, working memory) and (d) adequate opportunity to learn (documentation that optimal instruction has been presented but deficits in isolated processes remain).

ASSESSMENT ISSUES

Traditionally, the assessment of individuals with LD has been directed towards (1) isolating *specific* learning problems, (2) establishing a significant *discrepancy* between IQ and achievement, and (3) demonstrating that *responsiveness* to instruction varies from those of other handicapping conditions. The literature notes problems in each of these areas (e.g. Aaron, 1997; Fletcher et al., 1994).

Specificity

Current efforts have been made to define individuals with LD as having problems in specific *primary* academic areas (word recognition, word reading fluency, arithmetic calculation) rather than problems in high-order or more complex academic domains (e.g. reading comprehension, problem solving). Although conceptually the notion of specificity is critical to the assessment of LD (Stanovich, 1986), it has not been established that the specific psychological processes that separate individuals with potential LD are different from other individuals who suffer similar academic problems. For example, Siegel (1992) found few differences in performance between dyslexics (individuals with LD in word recognition) and low achievers on language, spelling, and memory measures.

Discrepancy

Poor performance in individuals with LD in specific academic areas is unexpected based on their average intelligence. Identification of this unexpected outcome has relied primarily on uncovering a discrepancy between achievement and intellectual ability. These discrepancies are quantified using: (a) mathematical formulas that emphasize current achievement, IQ, or mental age; (b) standard score discrepancies; and/or (c) regression formulas that account for the effects of scores regressing toward the mean (e.g. Kavale & Forness, 1994). A discrepancy of at least 1 standard deviation in one academic domain when compared to IQ is considered by some to reflect LD.

Unfortunately, several statistical flaws are inherent in many discrepancy formulas (e.g. Reynolds, 1981). For example, the regression formulas, in many cases, are dependent on the types of tests used. In other words, it is plausible that a student could be given a different battery of tests resulting in a different classification decision using the same formula but with different tests.

Responsiveness

Efforts are made by psychologists to distinguish individuals with LD from other general handicapping conditions, such as mental retardation, visual, and hearing impairments. Further specification is made that bilingual, socioeconomic status, and conventional instructional opportunity do not adequately account for depressed achievement scores. Such specification allows one to infer that the learning problems are intrinsic to the individual. Unfortunately, traditional assessment procedures seldom provide information that assesses the stability and/or durability of these intrinsic psychological processing deficits under instructional conditions. If an individual with LD has an inability to remember specific aspects of language (phonological information), then documentation must be provided when they have been systematically exposed to such instruction.

Some literature suggests that LD individuals are less responsive to intervention than individuals with similar primary academic levels but without LD (Swanson & Hoskyn, 1998, 1999) and these academic problems persist into adulthood (e.g. Bruck, 1992). However, differential responsiveness to instruction has not been directly tested under well-controlled experimental conditions.

CLASSIFICATION RESEARCH

The implicit assumption for using discrepancy scores in the classification of LD is that individuals who experience reading, writing and/or maths difficulties, unaccompanied by a low IQ, are distinct in cognitive processing from slow or low achievers. This assumption is equivocal.

A plethora of studies have compared children with discrepancies between IQ and reading with non-discrepancy defined poor achievers (i.e. children whose IQ scores are in the same low range as their reading scores) and found that these groups are more similar in processing difficulties than different (e.g. Shaywitz et al., 1992; Stanovich & Siegel, 1994). As a result, some researchers have advocated abandoning the concept of discrepancy between IQ and achievement measures. In the area of reading deficits, some have even suggested dropping the requirement of average intelligence, in favour of a view where children with reading problems are best conceptualized as existing at the extreme end of a continuum from poor to good readers (e.g. Stanovich & Siegel, 1994). In addition, some researchers have argued that IQ is irrelevant to the definition of reading disabilities and that poor readers share similar cognitive deficits, irrespective of general cognitive abilities (Siegel, 1992).

In a major synthesis of the literature, Hoskyn and Swanson (2000) calculated effect sizes across studies to determine if LD readers and low achievers (LA) share common cognitive deficits. The characteristics of the sample are shown in Table 1. The most common standardized measures of intelligence were from the Wechsler Intelligence Tests (75% of the studies) and the most common measures of word recognition were from the Wide Range Achievement Test or the Woodcock Reading Mastery Test (57% of the studies). Table 2 shows the comparisons between the groups. Positive effect sizes favour children with LD in reading (reading disabled – RD). Effect sizes around 0.80 are considered substantial, those around 0.60 are moderate, and those below 0.20 are marginal.

Table 1. Age and psychometric characteristics of children with RD and low achievers (LA)

Variable	RD group mean	RD group SD	LA group mean	LA group SD
Age	111.05	33.34	110.92	33.48
Word recognition	79.82	5.75	84.09	5.72
Verbal intelligence	99.46	4.79	83.64	4.91

SD = standard deviation.

Table 2. Magnitude of effect size by category of dependent measure

Category of dependent measure	K	Mean effect size	SD
Phonological processing			
Speech-related phonological processing	34	0.27	0.5
Pseudo-word reading	18	0.29	0.39
Real-word phonetic analysis	26	−0.02	0.52
Automaticity (Naming speed)	55	0.05	0.45
Spelling	8	0.19	0.43
Memory	59	0.12	0.89
Syntactical knowledge	11	0.87	0.24
Lexical knowledge	17	0.55	0.63
Visual spatial reasoning			
Visual-motor skills	9	0.15	0.8
Spatial ability	37	0.36	0.67

K = number of studies.

The important results were that although the RD and LA groups share deficits in phonological processing and automaticity (naming speed), the RD group's performance was superior to the LA group on measures of syntactical knowledge, lexical knowledge, and spatial ability. Another important finding was that cognitive difference between the two ability groups becomes less ostensible after age 12.

BEST OPERATIONAL DEFINITION TO DATE

The majority of classification research in the last 10 years has focused on primary deficits in reading or mathematics. This research defines LD as those individuals with IQ scores equal to or above a Full Scale IQ score of 85 and reading subtest scores equal to or below the 16th percentile and/or arithmetic subtest score equal to or below the 16th percentile. The most commonly used intelligence tests are the Wechsler measures, and achievement tests include measures of word recognition or identification (i.e. Wide Range Achievement Test, Woodcock Reading Mastery Test, Kaufman Test of Educational Achievement, Peabody Individual Test) and arithmetic calculation (all the aforementioned tests that include arithmetic measures and the Key Math Test). This definition captures two high incidence disorders within LD: reading (word recognition), and arithmetic (computation, written work).

DIRECTIONS FOR FUTURE RESEARCH

Because the validity of defining LD is undermined by the use of discrepancy classification procedures, further research is necessary to classify such individuals. Several means of advancing the classification literature are as follows:

Choose Measures of Construct Integrity

Although current assessments use the WISC III (or WISC-R) and standardized achievement (e.g. reading) tests to determine discrepancy scores, this is not an argument for conceptual integrity (also see Kavale & Forness, 1994: 41, for a discussion of this issue). Neither a theoretical rationale nor empirical evidence is available to substantiate the claim that IQ tests, e.g. WISC III, capture the construct of 'potential'. Quite simply, it is not the case that individuals with comparable IQ scores on the WISC III have the same potential. In addition, a difference between an intelligence score on the Wechsler test and a serious performance deficit on the Wide Range Achievement Test (or any other achievement test) in the area of reading is not a valid test of a discrepancy model. Neither test fits into a theoretical framework of intelligence nor reading. Advances in testing LD are better served if classification is grounded in theory.

Ensure Independence among Measures

Discrepancy scores (or discrepancy defined groups) are correlated with their component parts, and therefore the discrepancy measure will relate significantly to other variables correlated with the component parts (Cronbach & Furby, 1970). When discrepancy scores are correlated with their component parts, there is a greater than chance tendency for them to be correlated with other variables which are associated with those component parts.

An example of the above rule is as follows. When (a) reading recognition is part of the discrepancy score, and (b) when low reading ability groups are comparable on reading recognition performance, then performance is comparable between discrepancy and non-discrepancy groups on processes (phonological awareness) related to reading. Thus, the discrepancy group is little more than a surrogate of the poor reading group. This circularity in findings has been recognized in the literature for some time (Cronbach & Gleser, 1953).

Direction of Outcomes must be Consequential in Performance

For example, *Child A* who has a high reading score, but low intelligence score, should reflect a different 'set of' or 'level of' processes when compared to *Child B* who has a high IQ score but low reading score. If individuals are

identified by use of a discrepancy, assessment must address or determine if direction is consequential on cognitive performance. If the direction is unimportant, those measures used to determine a discrepancy should be removed from the discrepancy formula.

Measures Related to Discrepancy Scores are Only Valid if Assessed on Something above and beyond their Components and Correlates

Most researchers recognize the reliability problems with discrepancy scores, but few recognize that the use of discrepancy scores implies that it accomplishes something beyond their component parts. Responsiveness to instruction seems to be a missing test in the majority studies comparing discrepancy and non-discrepancy groups. There is some suggestive research based on meta-analysis that groups with discrepancies are less responsive to general interventions than those whose IQ and reading scores are at the same low level (Swanson & Hoskyn, 1999).

FUTURE PERSPECTIVES AND CONCLUSIONS

This entry has reviewed some of the common assumptions related to definitions of LD. We also review evidence on the validity of classifications based on a discrepancy between IQ and achievement. Future approaches to defining LD will rely on cut-off scores on standardized measures above a certain criterion of general intelligence measures (e.g. standard score > 85) and cut-off scores below a certain criterion (standard score < 85) on primary academic domains (e.g. reading and mathematics). Table 3 provides a list of some common standardized measures used to assess learning disabilities.

Table 3. Some standardized measures used to diagnose learning disabilities

I	*Intelligence*
	A Wechsler tests (e.g. WISC-III)
	B Raven progressive matrices test
II	*Achievement*
	A Woodcock reading mastery test
	B Wide range achievement test
	C Woodcock psychoeducational inventory (Achievement Clusters)
	D Test of written language
III	*Cognitive processes*
	A Comprehensive test of phonological processing
	B Test of word reading efficiency
	C Swanson–cognitive processing test

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RELATED ENTRIES

Applied Fields: Clinical, Applied Fields: Education, Mental Retardation, Dynamic Assessment, Learning Strategies, Children with Disabilities

LEARNING STRATEGIES

INTRODUCTION

Students differ in the approach they take to learning and in the cognitive processes they engage in when performing academic tasks, and these differences are of interest because they correlate with differences in the quality of academic outcome. The basic idea is to identify the features of more successful learning as well as the best ways to develop them. There has been much confusion and different meanings associated with the term learning strategies (LS) as well as different terms to describe similar processes.This discussion will take as a starting point the arguments of van Dijk and Kintsch (1983) regarding strategies of discourse comprehension. According to them, a strategy is 'the idea of an agent about the way to act in order to reach a goal (in the most effective way)' (p. 64), or, in other words, '... a global representation of the means of reaching (a) goal. This overall means will dominate a number of lower level, more detailed decisions and actions' (p. 65). It is not a detailed planning, since sequences of actions, complex informations and circumstances interact to produce a given result, but 'merely a global instruction for such necessary choice to be made along the path of the course of action' (p. 65). Related to strategies, and contrasted to mere actions, they describe a *move* as 'any action that is accomplished with the intention of bringing about a state of affairs that ... will (probably) lead to a desired goal' (p. 66). Thus, 'a strategy is defined as a cognitive unit dominating only the moves of an action sequence and not each action' (p. 66). It is also interesting to keep in mind that in 'complex problems part of these strategies may be consciously intended and, yet, part of them will also be more or less automatized' (p. 70). Finally, they describe a tactic as a system of strategies.

In the field of LS, two sources of differences among students can be distinguished which might be understood in the light of these concepts. A*pproaches to learning* dominate, give meaning and a style to most of the activities a student carries out; in terms of the above discussion, they might be taken as tactics students may adopt when learning. On the other hand,

strategies have to do with more discrete, yet complex activities such as the way they address an academic reading or set out to write an essay.

The goals students with opposing approaches pursue in learning differ in important ways; students with a *deep approach* try to learn and to change their perception of reality, while those with a *surface approach* try to comply with academic demands, pass exams or take learning as a means to get a better job. Approaches to learning have been documented to be related to teachers' practices (see entry on 'Instructional Strategies') and to correlate with different ways of performing academic tasks and with outcomes measured in various ways (Ramsden, 1992). They act at the intentional level and permeate lower level strategies. *Approaches to learning* have been summarized (Ramsden, 1992) as shown in Table 1.

LS have been defined as different ways of processing information (Weinstein & Mayer, 1986) and are often used coherently with the two main approaches (deep vs. surface). It is interesting to remember they are units complex enough to entail different moves and decisions and may comprise more or less automatized components but are by definition selected among other alternatives, thus flexibly and deliberately applied to reach specific goals. Weinstein and Mayer offer a taxonomy of LS which has become a classic and includes 6 categories of *cognitive strategies*, in fact 3 types of strategies carried out in basic (learning of isolated facts) or complex (learning of integrated bodies of knowledge) tasks. These strategies are: *Repetition*, *Elaboration* and *Organization*. These cognitive strategies are complemented by 2 categories of support strategies: *affective* (anxiety and motivational) and *metacognitive*, having to do with planning, monitoring and reviewing.

Thus LS embrace a wide range of moves and processes from the cognitive, affective, social and metacognitive levels which interact with each other. A student with good learning strategies will be able to formulate clear task objectives, select the right cognitive activities to reach a given learning goal, learn in a self-regulated way, look out for support when needed, be able to apply the acquired knowledge to solve problems and succesfully monitor and orchestrate the whole process, thus resulting in enhanced abilities to continue learning autonomously throughout life.

ASSESSMENT METHODS

Approaches to Learning

To assess them, a number of instruments have been developed. *Interviews* with students have been used from a phenomenographic ethnographic approach, with the purpose of understanding how learning is approached and experienced (Marton, Hounsel & Entwistle, 1984). Their main difficulty is the high costs of in-depth interviews, but they are fundamental in a qualitative approach to students' experience which might then lead to more structured devices.

Various *self-report measures* have also been developed. Among the best known is the *Approaches to Study Inventory* (ASI, Entwistle & Ramsden, 1983). Its 64 items basically cover three orientations to learning (meaning, reproducing and achieving) with their corresponding

Table 1. Summary of approaches to learning

Deep approach	Surface approach
Intention to understand.	*Intention only to complete task requirements.*
Student maintains structure of task.	*Student distorts task structure.*
Focus on 'what is signified'	Focus on 'the signs'
Relate previous knowledge to new knowledge	Memorize information for assessment
Relate knowledge from different courses	Associate facts and concepts unreflectively
Relate theoretical ideas to everyday experience	Knowledge cut off from everyday reality
Relate and distinguish evidence and argument	Fail to distinguish principles from examples
Organize and structure content into a coherent whole Internal emphasis	Focus on unrelated parts of the task
	Treat the task as an external imposition
	External emphasis: demands of assessment

approaches (deep, surface, strategic) and two styles of learning (comprehension and operation) with their corresponding pathologies (globetrotting and improvidence). The *Module Experience Questionnaire* (MEQ, Ramsden, 1992) combines with scales related to teaching, deep vs. surface approaches to learning.

Learning Strategies

Self-Report: General

These self-reports consist of a list of characteristic activities students do or do not usually engage in when performing academic activities. So, they refer to what they do *generally*, not in a specific task; but it is easy to see that they can significantly change from one task or knowledge domain to another. In spite of these limitations, these procedures are an economic and quick way of assessment which can be used for screening in a first phase of work. However, they should be supplemented with more specific devices such as specific reports or observations (or both) in order to fully understand the functioning of a student.

Many of these questionnaires do not derive from an explicit theoretical framework: items have generally been selected through rational or empirical approaches, but often the overall theoretical framework is not made explicit. Thus the number of scales and items widely differ and it is often difficult to compare them. Among those with best foundations we shall mention (Zimmerman & Palmer, 1988).

The *Learning and Study Strategies Inventory* (LASSI, Weinstein et al., 1988) includes 77 items distributed in 10 scales: Attitude, Motivation, Time Management, Anxiety, Concentration, Information Processing, Selecting Main Ideas, Study Aids, Self Testing and Test Strategies.

The *Motivated Strategies for Learning Questionaire* (MSLQ, Pintrich, Smith, García & McKeachie, 1991) is comprised of 81 items distributed in 15 scales: 6 related to aspects of motivation (Value, Expectancy and Affect) and 9 to Learning Strategies: Cognitive (Rehearsal, Elaboration, Organization and Critical Thinking), Metacognitive and Resource Management (Time and Study Environment, Effort, Peer Learning and Help-seeking).

The *Inventario De Estrategias de Aprendizaje* (IDEA, Vizcarro, Bermejo, del Castillo & Aragonés, 1996) has 153 items distributed in 14 scales (plus Sincerity): Attention, Establishing Connections, Knowledge Representation, Oral & Written Expression, Assertivity with Teacher, Motivation-Effort, Perception of Control, Non-Repetitive Learning, Taking Examinations, Work Management, Metacognition, Physical & Environmental Conditions and Reflective Learning.

Self-Report: Specific

These devices ask for the subject's report through interviews or think aloud protocols while or immediately after performing a given task (reading, problem solving, written composition, etc.). Typical *interview* questions include: 'How does a good reader go about reading?' Or 'Did you look back while reading?'

Think aloud protocols may take two forms: asking the subject to report the operations he/she is performing along a task or at specific moments (for instance, in reading, after each paragraph or at given marks in the text). These reports may also take place after completing the task, supported by audio or video recordings to stimulate recall.

Observation

This method of data collection may be used to register some open features of strategic behaviour, traces or results of behaviour. An example of the first kind is observing task centred behaviour or search for information of external sources. As traces of behaviour, underlining book or note taking are typical in situational tests of study or reading behaviour. Finally, a synthesis elaborated after reading or number of correct answers to open or closed questions are frequently used as a measure of quality of outcome of reading or studying, that is, as a criterion.

Recently, some simulations and electronic environments allow a continuous registration of the work done by a student and the paths followed when performing a task, thus making possible a detailed follow-up and analysis of the strategies used in task completion.

More informal data may take place in classroom observations of the process of academic performance. These informal observations are usually complemented by the dialogue between teacher and student whereby the goals and

reasons of a given strategy may be thoroughly explored. In fact, observation methods should be complemented by in-depth questioning regarding the reasons behind a given strategy or the extent of its use to gather a more precise picture.

FUTURE PERSPECTIVES AND CONCLUSIONS

One limitation of focusing on learning approaches or strategies is that we might forget about contextual demands, with which they are necessarily related. While there is not much discussion on the existence of different approaches and strategies which correlate with different levels of achievement, a crucial question is how to help students develop more effective ways of learning. Independent study skills programmes have been developed trying to teach broad LS which can be applied to any subject matter. However, other findings show strategies acquired in this way are difficult to generalize to new situations and effective LS can only be acquired along with specific content knowledge, that is through quality teaching in specific domains. The challenge, then, is to train teachers so that they are able to help students develop the appropriate strategies within their subject framework. A mid-way solution might be to help students acquire general LS which teachers will then develop in their own classrooms and subjects. A good definition and assessment of LS are required as well as the ability of teachers to observe and model the best strategies.

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Carmen Vizcarro Guarch

RELATED ENTRIES

Applied Fields: Education, Theoretical Perspective: Cognitive, Instructional Strategies

LIFE EVENTS

INTRODUCTION

Although it is long established that stress is related to ill health and psychological distress, there remains ambiguity about the dimensions of stress involved in this process, specifically the types of stressors that have more deleterious effects on health. To study the naturalistic stress process, the field requires valid and reliable measures of *life events*, to use in conjunction

with measures of vulnerability to stress. A *life events scale* is a comprehensive list of external events and situations (stressors) that are hypothesized to place demands that exceed the capacity of the average individual to adapt. Sample items in life events scales include recent divorce or separation, the death of a close family member, a job loss, moving, and the onset of a health problem.

Two types of life events assessment dominate the literature; exposure to out-of-the-ordinary events that have the capacity to change the patterns of life or arouse very unpleasant feelings (*life events*) and exposure to relatively minor, less emotionally arousing events whose effects disperse in a day or two (*hassles*). These measures often, but not always, take the *environmental* perspective on stress (e.g. Cohen, Kessler & Gordon, 1995), which tends to view events as triggers for disease. Life events measures differ to the extent to which they include self-reports of perceived stressfulness and threat posed by events (*appraisals*) and enduring or recurrent difficulties in an area of life (*chronic stressors*). The dimension of appraisal incorporates more fully the *psychological* perspective on stress (e.g. Lazarus, 1999). These variations in life event assessment have developed in response to different types of research questions, the outcome of interest in the investigation, and the period of time over which a particular event is thought to have impact, whether a few hours, or many years.

LIFE EVENTS

There are two general methods of life events assessment, checklist measures (Turner & Wheaton, 1995) and personal interview measures (Wethington, Brown & Kessler, 1995). Interview measures incorporate qualitative probes that specify the characteristics of life events theorized to produce physical or psychological stress, the severity of the occurrence (the threat), and the timing of life events in relationship to the outcome. Some checklist measures use standardized probes to assess perceived severity, appraised threat, and timing of the event. Both checklist and interview measures can assess chronic stressors as well as acute or discrete life events.

A typical checklist measure consists of a series of yes/no questions, asking participants to report if any situation like the one described has occurred over a past period of time (e.g. one month, a year). Checklist measures may rely on respondent self-report to rate event severity and threat, or may assign average ('normative') severity ratings developed by investigators. Either method results in a summary score of the estimated stressfulness of events experienced over a period of time.

Checklist measures are popular, inexpensive, and easy to administer. They also yield consistent relationships with physical health outcomes, which is a property that makes them useful for exploratory studies (Turner & Wheaton, 1995). The Social Readjustment Rating Scale (SRSS: Holmes & Rahe, 1967) is the ancestor of many checklist measures in current use. The SRSS included both positive and negative events because its developers believed that change *per se* was associated with changes in health status. Over time, checklists have moved toward including only negative or undesirable events, based on repeated findings that undesirable events are more predictive of severe health problems than positive events. Special measures have been developed for other populations, including adolescents and ageing adults (Turner & Wheaton, 1995).

Despite their popularity, checklist measures have been criticized on the grounds of reliability and validity. These criticisms include inadequate or generalized severity ratings, lack of comprehensiveness across different life domains and the experiences of special populations, and fall-off in reporting more distant rather than more recent events (Herbert & Cohen, 1996).

The early development of personal interview methods that use qualitative probes was driven by a perspective that assumes social and environmental changes (and anticipations of those changes) threatening the most strongly held *emotional commitments* are the basis of severe stress. This perspective also asserts that severe stress threatens health, rather than minor stress, distinguishing it from measures of hassles, or daily events (e.g. Lazarus & Folkman, 1984).

Interview measures are more often used if research requires one or more of the following: (1) more precise severity ratings, that are less contaminated by respondent appraisal; (2) the

relative timing of exposure and disease onset; and (3) establishing that stressors are 'independent' of respondent illness or behaviour. Promoters of interview methods also claim that they are more reliable and valid than checklist measures, although it is probably more accurate to assert that they measure different phenomena. Their expense rules them out for exploratory, low budget studies.

The purpose of the interview probing is to gather enough information to rate the objective *long-term contextual threat* or severity of situations. The rating of event severity is the major aim of personal interview methods, as the experience of a very severely threatening situation is hypothesized to pose a risk for illness. Rating the degree of severity and threat for objective situations has been documented over several decades in dictionaries available for researchers. Events may also occur because of the pre-existence of a physical or mental disorder. If that pre-existing disorder is as well the major outcome of the research study, interpretive difficulties arise. Rating routines for most personal interview measures of stressor exposure include an assessment of whether a situation is (1) known to be related to an actual disorder the respondent reports (e.g. getting fired because of drinking), or (2) hypothetically related to symptomatology (e.g. events involving interpersonal conflict). The Life Events and Difficulty Schedule (LEDS: Brown & Harris, 1978) is the best-known and best-documented interview method. Many interview measures use LEDS or LEDS-like rating schemes.

The LEDS has experienced criticism for its rating and interview methods. Wethington, Brown, and Kessler (1995) discuss these criticisms extensively. The most persistent criticism is that ratings of 'threat' include contexts many researchers would like to measure separately as modifiers of the impact of stressors on health. Specifically, there is a long-standing controversy over whether LEDS ratings of contextual threat cloud the distinction between event severity and the individual's vulnerability to a stressor (Tennant, Bebbington & Hurry, 1981).

All interview and checklist measures aim to be comprehensive across types of stressors. They vary, however, in whether they include comprehensive assessment of chronic stressors as well as discrete events. This distinction is important for investigators, because chronic stress assessment is apt to be more important for some health outcomes (e.g. physical precursors to heart disease) in comparison to others (e.g. onset of depression).

Measures of life events also differ in whether they include or exclude appraisal. Many checklist and interview measures of life events for the most part aim to exclude appraisal from stressor exposure assessment. Those that exclude appraisal do so because of concerns that stressor appraisal may be confounded with the health and psychological outcomes that stressor exposure is hypothesized to predict (Monroe & Kelly, 1995). Indeed, researchers have speculated that some stressor appraisals are 'caused' by underlying, persistent mood disturbance, rather than vice-versa (Stone, Kessler & Haythornthwaite, 1991).

HASSLES

Early hassles assessment relied on diary methods of collection, where respondents were asked to keep records of small events occurring over a given period of time, usually a 24-hour or 1-week period. Researchers have taken two approaches to measurement: open-ended questions which asked respondents to describe bothersome events of the day; and structured questions, simple yes or no response questions modelled on life events checklists (Eckenrode & Bolger, 1995).

Current hassle scales share the strengths and weaknesses of related approaches to the assessment of major life events and chronic stressors. One of the most persistent has been that diary methods of data collection, relying on written self-report, confound objective events with psychological appraisal processes (Eckenrode & Bolger, 1995). Hassle measures assume participants respond to the questions in a relatively neutral and uniform way (Schwartz & Stone, 1993). A second persistent criticism is that the self-report of hassles is confounded with coping. The argument here is that when a respondent copes successfully with small hassles, such as overloads or interruptions, he or she is less likely to either (1) remember the occurrence, or (2) interpret the situation as a stressor (Aspinwall & Taylor, 1997).

A third criticism is that methods of data collection for hassles are too time-consuming and expensive to use in large-scale surveys of the population, particularly on a daily basis. Most

research on daily events has been conducted in small, discrete, relatively homogeneous samples (Stone et al., 1991; Eckenrode & Bolger, 1995). Such samples limit the generalizability of findings. Almeida and colleagues (Almeida, Wethington & Kessler, 2002) have recently completed a national study of hassles, developing a telephone interview measure of hassles. Future work on life events and hassles assessment will lead to more refinements in assessment.

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Elaine Wethington

RELATED ENTRIES

Applied Fields: Clinical, Applied Fields: Health, Stress, Job Stress, Health

LOCUS OF CONTROL

INTRODUCTION

Locus of control (LOC) is an individual's expectancy about the typical source (locus) of reinforcement. Does reinforcement originate within an individual ('When something good happens to me, it is because I worked for it') or from outside ('I have no influence on what the

government does')? In the former case, we have an *internal* LOC, whereas in the latter case, we have an *external* LOC.

I provide a brief overview of the LOC construct and how it has been measured with self-report questionnaires. This task is daunting. LOC has been one of the most frequently investigated individual differences, and LOC measures have been used in thousands of empirical investigations. I have relied here on several earlier and more extensive reviews (Lefcourt, 1991; MacDonald, 1973).

In addition to its own popularity, the LOC construct has inspired related lines of research into generalized expectancies about the sources of good and bad events – notions like explanatory style, helplessness, hope, illusory control, John Henryism, secondary control, self-efficacy, and so on (Peterson, 1999). Those who work within these other traditions may not always cite LOC as the intellectual parent of their constructs, or they may insist that their own approaches are distinct. Regardless, there is considerable overlap – theoretically and empirically – between LOC and its offspring.

SOCIAL LEARNING THEORY AND LOCUS OF CONTROL RESEARCH

Rotter (1954) introduced locus of control in his social learning theory to make sense of people's varying reactions to success and failure. A radical learning theory, one that does not look within an individual to explain behaviour, would predict that success (reinforcement) should always result in continued responses, whereas failure (punishment or extinction) should never do so. This prediction proves to be wrong. In some cases, success does not produce perseverance, and in other cases, failure does not produce passivity.

Rotter therefore proposed that people's behaviour is influenced not just by reinforcement or punishment but also by their expectancies about the link between responses and outcomes. It is only when expectancies are congruent with what happens that success and failure have effects. People who do not expect that efforts and actions produce reinforcement will not have their response tendencies changed by occasional reward. And those who do expect that efforts and actions produce reinforcement will not be dissuaded from future responding by occasional lack of reward.

According to Rotter (1966), expectancies about a given situation are shaped by the features of that situation and by experiences in similar situations. These experiences accumulate and produce generalized expectancies. So, LOC is abstracted from past experiences, but it also determines future learning and thus can have a life of its own. LOC is psychologically interesting because it is *not* always redundant with reality.

Lefcourt (1991: 415) summarized what early researchers learned about the correlates of LOC:

> An internal locus of control was associated with a more active pursuit of valued goals, as would be manifested in social action ... information seeking ... alertness ... autonomous decision making ... and a sense of well-being. Those who were assumed to have a more external locus of control were often found to be depressed ... anxious ... and less able to cope with stressful life experiences.

These findings are consistent with the role assigned to LOC in social learning theory. However, other findings seemed contrary. Either LOC was not associated with the active pursuit of goals, or the magnitudes of correlations were surprisingly low.

In response, Rotter (1975) wrote a cautionary article about 'misconceptions and misuses' of the LOC construct. First, he urged researchers to take into account the reinforcement value of goals. Those with an internal locus of control may not participate in a political protest, for example, if they do not agree with the cause.

Second, he reminded researchers that LOC refers to *generalized* expectancies, and it should not be surprising that LOC plays a small role in explaining behaviour in situations in which specific expectancies are well-established. For instance, an internal LOC predicts good grades early in a student's academic career but less so as the student learns what is involved in doing well.

A third point made by Rotter (1975) is that researchers may inadvertently fall into a 'good guy–bad guy' way of thinking about LOC, assuming that internals only do good things and that externals only do bad things. So, 'internals should be more liberal, more socially skilled, better adjusted, more efficient' (p. 60). There is no reason to make these assumptions, and if they are used as hypotheses, they will not yield consistently confirming data. To have

'good' consequences, an individual's LOC must be congruent with the causal texture of given situations, and there are settings in which a realistic external LOC is more useful than an unrealistic internal LOC.

Rotter (1975) also touched upon two methodological issues that have guided subsequent researchers as they developed additional LOC measures. The first issue concerns domain-specific LOC measures. Consistent with social learning theory, expectancies about a given sphere of activity – such as academics – should better predict behaviour in that domain than expectancies about other spheres. Accordingly, recent years have seen the development of dozens of domain-specific LOC measures.

The second issue is the dimensionality of LOC. Rotter's (1966) original LOC measure, described in the next section, conceptualized the construct as unidimensional, an assumption apparently supported by factor analyses. However, Rotter (1975) pointed out that such findings are not incompatible with the possibility that there are subtypes of internality or externality and that there may be good reasons to identify these. Subsequent researchers have thus unpacked LOC.

Table 1. Representative LOC measures

IE Locus of Control Scale (Rotter, 1966)
Purpose: to measure general LOC Format: 23 forced-choice items Internal consistency: $\alpha = 0.70$ Test–retest reliability: $r = 0.50$–0.70 Validity evidence: see text
IAR Questionnaire (Crandall et al., 1965)
Purpose: to measure LOC of children in academic domains, separately for success and failure format: 34 forced-choice items, half for success and half for failure Internal consistencies: $\alpha = 0.55$ for subscales, 0.70 overall Test–retest reliability: $r = 0.70$ Validity evidence: internality scores predict grades, achievement test scores, and amount of time spent pursuing 'intellectual' activities
IPC Scales (Levenson, 1981)
Purpose: to measure internal, powerful others, and chance LOC Format: 24 Likert 6-point scale items, 8 items per subscale Internal consistencies: $\alpha = 0.60$–0.90 for subscales Test–retest reliability: $r = 0.60$–0.80 Validity evidence: subscales show differential correlates with types of political activism, types of psychopathology, length of internment among prisoners, and retrospective reports of parental behaviour

REPRESENTATIVE MEASURES OF LOCUS OF CONTROL

Space does not permit discussion of all extant LOC measures, or even a listing of them by name. My strategy is to focus on three representative measures (see Table 1).

Rotter's (1966) own *IE* (Internal–External) *Locus of Control Scale* was one of the first measures of LOC and is still widely used. It presents respondents with pairs of statements, one exemplifying internal LOC and the other external LOC. Respondents choose one statement in each pair, and the number of external choices is ascertained. The content of the items ranges widely. In the process of scale development, candidate items were discarded if they were linked to social desirability. Factor analyses implied that the resulting scale was unidimensional. Subsequent studies, however, cast doubt on both the independence of the measure from social desirability and its unidimensionality. Indices of internal consistency and test–retest reliability are nonetheless satisfactory. Validity has been established in a variety of ways, including known-groups' strategies. Individuals who arguably have an external LOC because of the circumstances of their lives – such as prisoners – score toward the external end of the scale.

Crandall, Katkovsky, and Crandall's (1965) *IAR* (Intellectual Achievement Responsibility) *Questionnaire* was one of the first domain-specific measures. The IAR Questionnaire measures LOC with respect to academic outcomes and is suitable for grade school and high school students. Like Rotter's measure, the IAR Questionnaire uses a forced-choice format. However, it distinguishes between success experiences and failure experiences. Another feature of the IAR Questionnaire is that it renders externality in terms of 'other people' as opposed to chance or fate. The IAR Questionnaire is consistent and reliable, and it has accrued good validity evidence.

Among a number of multidimensional LOC measures, Levenson's (1981) *IPC* (Internality, Powerful Others, and Chance) *Scales* have become particularly well-known. This measure distinguishes two types of externality: the belief that powerful others control reinforcement and the belief that chance is the locus of control. Three subscales therefore comprise the measure. Each is measured with statements presented in a Likert format. Levenson (1981) reported factor analyses supporting the independence of these three factors, although appreciate that these subscales are not orthogonal. Internality is negatively correlated with both externality subscales, which in turn are positively correlated with one another. Again, this measure is consistent, reliable, and valid.

FUTURE PERSPECTIVES

Several lines of current research seem fruitful. The first are studies of domain-specific LOC that investigate generalized expectancies with respect to health (e.g. Wallston, Wallston, Kaplan & Maides, 1976) and religiosity (e.g. Jackson & Coursey, 1988). Next are studies that investigate LOC cross-culturally. In light of arguments that personal control is a culture-bound construct, such investigations are important because they suggest boundary conditions to LOC as typically construed as well as discover additional expectancies that influence behaviour (Weisz, Rothbaum & Blackburn, 1984). A third line of work attempts to discern the developmental precursors of LOC and may lead to interventions that cultivate appropriate expectancies. Finally, the links between LOC and its numerous cognates deserve not only theoretical speculation but also earnest empirical inquiry.

CONCLUSIONS

LOC has long been a central topic of investigation by psychologists and will continue to be. LOC researchers have not always followed the good advice offered by Rotter (1975) about the meaning and measurement of LOC, and contemporary investigators who study cognates of LOC have certainly not heeded the analogous advice vis-à-vis their own constructs. The most important conclusion that I can offer is to echo Rotter's admonition that researchers should keep theory in mind as they design and interpret studies.

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Christopher Peterson

RELATED ENTRIES

Personality Assessment (General), Cognitive Styles, Attributional Styles, Theoretical Perspective: Cognitive

Encyclopedia of Psychological Assessment

Volume 2
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List of Entries

Volume 1

Volume 2

Reader's Guide

This list is provided to assist readers in locating entries on related topics. It classifies entries into nine general categories: (1) Theory and Methodology; (2) Methods, Tests and Equipment; (3) Personality; (4) Intelligence; (5) Clinical and Health; (6) Educational and Child Assessment; (7) Work and Organizations; (8) Neurophysiopsychological Assessment; and (9) Environmental Assessment. Some entry titles appear in more than one category.

1. Theory and Methodology

Ambulatory Assessment
Assessment Process
Assessor's Bias
Automated Test Assembly Systems
Classical and Modern Item Analysis
Classical Test Theory
Classification (General, including Diagnosis)
Criterion-Referenced Testing: Methods and Procedures
Cross-Cultural Assessment
Decision (including Decision Theory)
Diagnosis of Mental and Behavioural Disorders
Diagnostic Testing in Educational Settings
Dynamic Assessment (Learning Potential Testing, Testing the Limits)
Ethics
Evaluability Assessment
Evaluation: Programme Evaluation (General)
Explanation
Factor Analysis: Confirmatory
Factor Analysis: Exploratory
Formats for Assessment
Generalizability Theory
History of Psychological Assessment
Intelligence Assessment through Cohort and Time
Item Banking
Item Bias
Item Response Theory: Models and Features
Latent Class Analysis
Multidimensional Item Response Theory
Multidimensional Scaling Methods
Multimodal Assessment (including Triangulation)
Multitrait–Multimethod Matrices
Needs Assessment
Norm-Referenced Testing: Methods and Procedures
Objectivity
Outcome Assessment/Treatment Assessment
Person/Situation (Environment) Assessment
Personality Assessment through Longitudinal Designs
Prediction (General)
Prediction: Clinical vs. Statistical
Qualitative Methods
Reliability
Report (General)
Reporting Test Results in Education
Self-Presentation Measurement
Self-Report Distortions (including Faking, Lying, Malingering, Social Desirability)
Test Adaptation/Translation Methods
Test User Competence/Responsible Test Use
Theoretical Perspective: Cognitive
Theoretical Perspective: Cognitive-Behavioural
Theoretical Perspective: Constructivism
Theoretical Perspective: Psychoanalytic

MEMORY (GENERAL)

INTRODUCTION

By a simple definition, memory is the capability of animals to acquire, retain, and make use of knowledge and skills. Since the early 1980s, the way that cognitive scientists think about memory has dramatically changed. Today, memory is more often viewed not as a unitary entity but as comprising different components or systems. Neurocognitive research has indicated that it is more appropriate to consider the human memory as a collection of multiple but closely interacting systems than as a single and indivisible complex entity (e.g. Tulving, 1985a; Squire, 1992; see also Schacter & Tulving, 1994a, for current perspectives). Different memory systems differ from one another in terms of the nature of representations they handle, the rules of their operations, and their neural substrates (e.g. Tulving, 1984; Weiskrantz, 1990; Tulving & Schacter, 1992; Schacter & Tulving, 1994b; Willingham, 1997).

Various classificatory schemes of human memory have been proposed so far. Undoubtedly, the two most influential and extended classifications are those postulated by Squire (1992) and Schacter and Tulving (1994a). Squire distinguishes two long-term memory systems: declarative and non-declarative (or procedural) memory; whereas Schacter and Tulving identify five major systems: procedural memory, perceptual representation system, semantic memory, short-term working memory and episodic memory. Related distinctions include explicit versus implicit memory, direct versus indirect memory, and memory with awareness versus memory without awareness. However, these latter dichotomies may not be memory systems, but rather forms of expression of memory. According to the Schacter and Tulving classification, retrieval operations in the procedural, perceptual representation and semantic systems are implicit, whereas in the working memory and episodic memory they are explicit. On the other hand, Squire considers declarative memory as an explicit system, whereas non-declarative memory is viewed as a heterogeneous collection of implicit abilities (Squire & Knowlton, 2000).

EXPLICIT AND IMPLICIT MEMORY

Compelling evidence for the existence of multiple memory systems is provided by experimental findings of numerous convergent dissociations (functional, developmental, pharmacological, neuropsychological, neuroanatomical) between tasks of *explicit and implicit* memory (for reviews, see Schacter, 1987; Ruiz-Vargas, 1993; Nyberg & Tulving, 1996; Schacter, Wagner & Buckner, 2000). The original distinction between explicit and implicit memory was made by Graf and Schacter (1985). *Explicit memory* is revealed by intentional or conscious recollection of specific previous information, as expressed on traditional tests of free recall, cued recall and recognition. *Implicit memory* is revealed by a facilitation or change of performance on tests that do not require

intentional or conscious recollection, such as perceptual identification, word stem completion, lexical decision, identification of fragmented pictures, mirror drawing, and so on.

Consider these two experimental situations: (1) A list of 20 familiar words is presented to subjects who are instructed to pay attention to each word because, after the presentation, they will be asked to reproduce as many of the presented words as possible. (2) A list of 20 familiar words is also presented to subjects who are instructed to perform an orienting task (e.g. pleasantness ratings). After this study phase, the subjects will be asked to say the first word that comes to mind in response to a series of three-letter word stems. Obviously, some word stems can be completed with presented words, and some cannot. The first experimental situation reflects one of the ways in which psychologists have traditionally measured human memory: by assessing deliberate or *explicit memory* of subjects for items studied in a specific learning episode with a recall test. In the second situation, it is often observed that subjects show an enhanced tendency to complete word stems corresponding to studied words in comparison to 'new' word stems. This phenomenon is known as *repetition priming* or *perceptual priming*.[1] Priming does not involve intentional or explicit recollection of the study episode, and thus it is assumed to reflect *implicit memory* for previously acquired information.

Distinction between explicit and implicit memory has had a profound impact on contemporary research and theorizing of human memory. The finding that some products of memory are expressed with conscious awareness of the previous experience, and other ones without conscious awareness of the source of the information, has constituted 'a revolution in the way that we measure and interpret the influence of past events on current experience and behaviour' (Richardson-Klavehn & Bjork, 1988: 475–476). Therefore, both experimenters and clinicians should take into account this distinction whenever they assess human memory.

MEMORY ASSESSMENT

The German philosopher Hermann Ebbinghaus (1850–1909) was the first to demonstrate that memory can be measured. His main contribution was methodological in nature. Among his most important contributions were the *study/test paradigm* for the study of memory, the basic foundation of any memory experiment and test, and *the savings method*, currently considered as an implicit memory test, which were a couple of inventions of very large influence. Since then, memory assessment has undergone an extraordinary quantitative and qualitative advance. Both the evolution and the accumulation of new memory tasks have defined the progress throughout the last century. The Ebbinghausian measure of serial recall led to new forms of testing recall (free recall, cued recall), and these measures fuelled new theoretical developments in the 1980s. Today, two major classes of memory measures are distinguished: tests of explicit memory and tests of implicit memory.

Tests of Explicit Memory

Explicit memory tests are those in which the instructions in the test phase make explicit reference to an episode or experience in the subject's personal history. Thus, they require intentional or conscious recollection of previous information. Traditionally, these tests have been considered as *the only* memory tests. Table 1 provides a relatively extensive list of tests of explicit memory currently in use (see also entry on 'Memory Disorders' in this volume).

The tests of explicit memory include *free recall*, *cued recall* and *recognition* memory tasks. Prototypically, in tasks of free recall, subjects are shown a list of items (words, pictures, sentences) and are later asked to recall the items in any order that they choose. In cued recall, subjects are given explicit retrieval cues. The retrieval cues are prompts, reminders or any additional information that guides the search processes in memory (e.g. FRUITS for the to-be-recalled words 'apple', 'plum', 'grape', 'kiwi'). In free and cued recall, memory performance is assessed simply by counting the number of to-be-remembered items recalled.

An exception to the prototypical tasks outlined above is *serial recall*, in which the subject is asked to recall the items in the order of presentation, and performance is assessed by the number of items recalled in the correct sequential order. This procedure allows the assessment of memory for order or temporal memory, one kind of memory especially relevant, for instance, in language

Table 1. Standardized tests of explicit memory (in alphabetical order)*

Psychometric tests
The Adult Memory and Information Processing Battery (AMIPB)
The Benton Revised Visual Retention Test (BVRT)
The Buschke Selective Reminding (SR) Test
The California Verbal Learning Test (CVLT)
The Luria–Nebraska Memory Scale (LNMS)
The Memory Assessment Clinic (MAC) Battery
The Misplaced Objects Test
The Rey Auditory Verbal Learning Test (AVLT)
The Rey–Osterreith Complex Figure Test (CFT)
The Rivermead Behavioural Memory Test (RBMT)**
The Warrington Recognition Memory Test (RMT)
The Wechsler Memory Scale–Revised (WMS-R)
Memory and metamemory questionnaires
(*Memory questionnaires* (MQs) ask people to recall or recognize knowledge or events. *Metamemory questionnaires* (MMQs) ask people to indicate how well they recall or recognize knowledge or events.)
MQs
The Autobiographical Cueing Technique or The Crovitz–Schiffman Technique
The Autobiographical Memory Interview (AMI)
The Boston Remote Memory Battery (BRMB)
The 'Dead-or-Alive' test
The Famous Faces Test
The Famous Personalities Test
The Price Estimation Test
MMQs
The Cognitive Failures Questionnaire (CFQ)
The Everyday Memory Questionnaire (EMQ)
The Inventory of Memory Experiences (IME)
The Memory Assessment Clinic Self-Rating Scale (MAC-S)
The Self-Rating Scale of Memory Function (SRSMF)
The Short Inventory of Memory Experiences (SIME)
The Subjective Memory Questionnaire (SMQ)

*See, for references, Baddeley, Wilson and Watts (1995).
**The RBMT is one of the few memory tests to have a version for children. However, recently some memory tests for use with children have been presented [e.g. *The Children's test of Nonword Repetition* (CNRep) constructed by Gathercole, Baddeley, Willis and Emslie; *The Story Recall Test* developed by Beardsworth and Bishop (see, for details, *Memory*, Volume 2, Issue 2, June 1994: special issue on 'Memory Tests and Techniques')].

perception and comprehension (see entry on 'Language (General)' in this volume). Serial recall is also used in the well-known short-term memory task called *digit span*, that has been traditionally included in tests of general intelligence such as Wechsler-batteries.

A typical *recognition* task involves presenting a list containing the to-be-remembered or *old* items (e.g. words) just as in the presentation phase of recall tasks. However, in the subsequent test phase, subjects are shown a series of words – old items mixed with *new* items or *distractors* – and they are required to decide which are the old ones.

In the last few years, much research has also been devoted to the study of the subjective states of awareness associated with recognition memory. Tulving (1985b) introduced a new methodology to distinguish 'remember' (R) and 'know' (K) responses in recognition memory tests. An R response represents recognition with conscious recollection of the item's prior occurrence; a K response represents recognition associated with feelings of familiarity in the absence of conscious recollection. Tulving proposed that these two states of awareness reflect two kinds of consciousness, autonoetic and noetic, which are respectively properties of episodic and semantic memory. The *remember/know paradigm* merits its consideration because a number of studies have demonstrated that the recollective experience of remembering is affected in different ways by many independent variables. For our purposes, its results are especially relevant to focus on different subject variables. There is now considerable evidence that age, Alzheimer's disease, amnesia, epilepsy, schizophrenia and autistic disorders have dissociative effects on R and K responding. The general finding has been that, in the conditions mentioned, 'remember' responses are selectively impaired and 'know' responses are relatively spared (see, for review, Gardiner & Richardson-Klavehn, 2000).

Finally, and with illustrative rather than exhaustive purposes, it cannot be ignored that an unlimited number of memory-judgement tasks are also explicit memory tasks. For example, judgements of presentation frequency, judgements of temporal order or recency, judgements of input modality, judgements of source/reality monitoring, feeling-of-knowing judgements, and so on.

Tests of Implicit Memory

Implicit memory tests are those in which subjects are asked to respond to test stimuli (e.g. generate a word, classify an object, perform a motor task) without making reference to prior events. The impressive experimental evidence available about

dissociations between implicit and explicit memory tasks warrants the assumption that there are fundamental differences between mnemonic information assessed by implicit and explicit memory tests. For example, numerous studies have documented across diverse tasks that amnesic patients (and other special populations) exhibit preserved mnemonic functioning when they are assessed with tests of implicit memory, and a memory severely impaired when tests of explicit memory are given. Studies with normal subjects have also shown that under some conditions (e.g. effects of alcohol, psychoactive drugs, general anaesthesia, or certain experimental manipulations) normals exhibit implicit memory for information that they cannot explicitly remember. The most important and theoretically relevant conclusion from these findings is that implicit memories are explicitly inaccessible and vice versa, because (a) different aspects of events are encoded by distinct but interacting neurocognitive systems, and (b) diverse tasks tap different memory systems. Therefore, an adequate memory assessment requires of experimenters and clinicians to make use of explicit memory tests as well as implicit memory tests.

There are many implicit memory tests currently in use, and new tests are created every year. A general classification scheme that includes most of them has been recently proposed by Toth (2000). Implicit memory tests could be roughly organized in two major categories: *verbal* and *non-verbal* tests, and each one of them in its turn into three subclasses: (1) *perceptual* tests (e.g. perceptual identification, word stem completion, degraded word naming, object/non-object decision), (2) *conceptual* tests (e.g. word association, category instance generation, object categorization, person/trait attributions), and (3) *procedural* tests (e.g. reading mirror inverted text, probability judgements, mirror drawing, motor tracking). Generally speaking, the perceptual tests challenge the perceptual representation system, the conceptual tests involve the semantic memory system, and the procedural tests tap the procedural memory system.

Assessment of Different Memory Systems

From the multiple memory systems view, memory assessment must evolve to assess every single memory system. According to the five-fold classification system proposed by Schacter and Tulving, such systems are defined and could be assessed as follows:

1. The *procedural memory system* is a behavioural action system concerned with the acquisition, retention and retrieval of motor, perceptual and cognitive skills, simple conditioning, and non-associative forms of learning. These kinds of memory are measured by tests of implicit memory, such as the pursuit rotor task, maze learning, mirror reading, artificial grammar learning, tower of Hanoi, and so on.
2. The *perceptual representation system* (PRS) encompasses various domain-specific subsystems that process and represent information about the form and structure of words and objects. The PRS is assessed with implicit memory tests, such as perceptual identification, word stem completion, homophone spelling, picture-fragment completion, object/non-object decision, possible/impossible object decision, and many others.
3. The *semantic memory system* is the system involved in the acquisition, retention and retrieval of general knowledge of the world. Therefore, the task of assessing the status of this complex and multi-faceted system seems an impressive one. This challenge could be overcome by using a multiplicity of types of tests, such as word fluency, vocabulary, word association, naming tasks (animals, objects, etc.), recognition of famous faces, category instance generation, fact generation, category verification, semantic anomaly detection, K responses in recognition tests, and so on.
4. The *working memory system* (WM) is a short-term system that makes possible the temporary maintenance and processing of information, and to manipulate that information. The WM is measured by explicit memory tests such as the Brown–Peterson task, various memory span tests (e.g. forward and backward digit span, word span, alpha span), the size of the recency effect, the release from proactive inhibition task, the Dobbs and Rule task, mental arithmetic, and others. As Craik et al. (1995) emphasize, because WM tests do not all measure the same component processes it is advisable

to assess WM by using several tests rather than one global test.

5 The *episodic memory system* is the system for personally experienced episodes. Episodic memories are assessed with tests of explicit memory for verbal and non-verbal materials, such as free recall (immediate and delayed), cued recall, recognition, R responses in recognition tests, generation task, and others. Different tasks may be used to assess autobiographical memory, considered as a subtype of episodic memory, such as recall and recognition of famous events, the Crovitz–Schiffman technique or the cueing method, etc. In clinical contexts, the Autobiographical Memory Interview (AMI) provides relevant information about the deterioration of this kind of memory in patients.

At this point, it is worth considering that remembering and the different memory systems summarized above all refer to the past. However, as everybody knows, people are also capable of remembering what they must do in the future. The former is called *retrospective memory*, and the latter, *prospective memory*. Prospective memory is defined as the timely remembering of a planned action; everyday tasks such as remembering to phone one's sister at eleven o'clock, remembering to take medication after lunching, or remembering to reply to an e-mail this evening are all significant memory acts common to everyday living. Because both observations in the real world as well as laboratory studies show that prospective memory declines with age, brain damages and progressive brain diseases, prospective memory tasks should be given whenever memory is assessed.

FUTURE PERSPECTIVES AND CONCLUSIONS

During the last decade, students of memory have witnessed a colossal progress in scientific understanding of this capacity. However, scientists have also discovered that 'the complexity of memory far exceeds anyone's imagination' (Tulving, 2000: 727). Thus, it is not unusual for the very term 'memory' to mean many things to many people and, consequently, for the concept of 'memory impairment' to be utilized in many different ways by researchers, clinicians and patients and their families. This idea has been masterly captured by Tulving (2000: 728) when he said: 'Any claim about "memory" or "memory impairment" immediately requires clarification: About which kind of memory, memory task, memory process, or memory system are we talking?'

One fundamental reason for this lack of agreement is that memory is not a monolithic entity but a collection of different systems with multiple processes which are expressed in different ways. This idea should be assumed not only by researchers but also by clinicians and neuropsychologists in order to reduce the undesirably great distance existing between experimental research and clinical assessment. Currently, most neurosychological batteries are still focused on traditional memory tests; that is, free recall, cued recall and recognition tasks. However, implicit memory tests must be included without delay into explorations of special populations such as brain-damaged individuals, patients with Alzheimer's disease and other degenerative brain diseases, the elderly, etc., who have already showed sharp dissociations between explicit and implicit memory task performances.

Fortunately, the incipient convergence between psychologists and neuropsychologists favoured by the new Cognitive Neuroscience framework (Kosslyn & Koenig, 1992; Gazzaniga, 1995) undoubtedly will result in an impressive change in the ways human memory will be assessed in the years to come.

Note

1 Perceptual priming refers to facilitation in the identification of a stimulus (word or object) as a function of a prior exposure to the same stimulus.

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RELATED ENTRIES

Applied Fields: Neuropsychology, Theoretical Perspective: Cognitive, Memory Disorders, Dementia, Language (General), Neuropsychological Test Batteries

MEMORY DISORDERS

INTRODUCTION

Memory enters into nearly all cognition and memory dysfunction is one of the most common sequelae of neurological disorders. It seems therefore highly implausible to consider a unitary research or assessment on memory. Thirty years ago, Tulving's (1972) contribution to the organization of memory consisted of dividing long-term memory in terms of content, i.e. episodic and semantic memory. Episodic memory refers to memory for specific events within a spatial and

temporal context. Semantic memory, on the contrary, holds information that is independent of the context in which that information was learned. More recently, Tulving's view of memory as multiple systems (1995) comprises five types of memory: procedural memory, perceptual representation system, semantic memory, primary memory and episodic memory. A great deal of research indicates that even severely amnesic patients show preservation in the procedural system (conditioning, motor-skill acquisition, perceptual learning, verbal facilitation and rule learning).

A further memory construct, which had an important impact on memory research, concerns declarative/non-declarative memory (Squire, 1993). Declarative memory is defined in terms of facts and events acquired through learning and retrieved intentionally. Non-declarative memory refers (mainly but not only) to priming and skills learning. Declarative/non-declarative memory is parallel to Schacter's (1992) concept of explicit/implicit memory.

Characteristics of memory loss depend on the locus of lesion. Very broadly speaking, damage to parts of the limbic circuit (hippocampus, fornix, mamillary bodies, anterior thalamus and cingulated gyrus) affects memory performance in different ways (Mishkin, 1982). Moreover, memory deficits arising from temporal or frontal lesions have been reported, 25 years ago, as showing qualitative differences.

NEUROPSYCHOLOGICAL ASSESSMENT

The aim of the neuropsychological assessment of memory is threefold: (i) Characterization of the brain damaged patient's memory for both clinical and research purposes. (ii) Rehabilitation, whenever possible, on the bases of the results obtained in (i). (iii) Measurement of change by comparing, for instance, the patient's performance on two occasions, pre- and post-rehabilitation programme or pre- and post-neurosurgery. The present entry develops the first goal, which comprises the assessment of both memory loss and memory preservation. Moreover, within the frame of memory viewed as an ensemble of subsystems, this entry deals with the explicit contents of memory only.

Memory deficits can be *triggered by* impaired intellectual, attentional and/or motivational functioning. However, loss of memory cannot be *accounted for* diffuse deficits of cognitive capacities since patients presenting memory loss are well able to perform normally on tests of general intellectual abilities. Memory assessment is best achieved by obtaining a comprehensive cognitive profile and by interpreting the memory performance on the basis of the patient's general cognitive capacities. The neuropsychological examination should include the patient's verbal and non-verbal IQs and an estimation of the premorbid cognitive level of functioning in order to find if there is a significant difference between pre- and post-illness mental status. Besides general abilities, it is important to assess language functions, visuoperceptual and visuospatial capacities, executive functions and, particularly, attentional functions. Indeed, attentional impairments preclude any conclusions on memory deficits since explicit memory depends on the integrity of the attentional processes. To get round this difficulty in the examination of memory, the clinician may try to minimize the influence of attentional factors by selecting the tests, when feasible. A further way to circumvent this is by controlling the patient's attention. Thus, for instance, on Warrington's (1984) verbal and non-verbal Recognition Memory Tests, the patient is asked if the items shown by the examiner (words or faces) are pleasant or unpleasant. On the contrary, some other memory tests may both rely openly on intact attention, particularly during the encoding part of the task, or they may be designed to assess attention during a learning task. Finally, an adequate understanding of memory deficits would also require assessment of current levels of motivation.

MEMORY AND ATTENTION

Patients with memory deficits, even if they are severe, may perform adequately on tests of *simple attention* span, i.e. tasks that require the repetition of information, usually digit repetition, immediately after its presentation. The Digit Span subtest of the verbal scale of the WAIS-III assesses simple attention through repetition of digits forward. Visual pointing span can be assessed by the Corsi Blocks (Kaplan et al., 1991) or by spatially organized patterns as in the visual span subtest of the Wechsler Memory Scale – Revised (WMS-R; Wechsler, 1987). Patients presenting

with generalized cognitive deficits as in dementia may fail the simple attention test. Other patients showing a relatively preserved performance on verbal and/or visual span might be unable to carry out similar tests either when information becomes more complex including, for instance, increasingly longer sentences or when an interfering task is introduced as in Brown–Peterson's technique. Immediate repetition of items requires not only preserved attention but also preserved short-term memory (STM). It has been observed, albeit much less frequently than the attentional deficit, a *genuine* STM disorder, which dissociates from long-term memory performance (Warrington & Shallice, 1969). Besides the examination of simple attention and STM, evaluation of higher levels of attention and their influence on memory functions are necessary in routine assessment. Thus, a sensitive test to disorders of *directed attention* is the Stroop Test (Stroop, 1935), which measures the capacity of the individual to inhibit a response to an overriding trait by means of directing his/her attention to a minor feature. The Mental Control Tests of the WMS-R are designed to evaluate *sustained attention*. Finally, *divided attention* is measured by means of Part B of the Trail Making Test since the patient is requested to keep both the letter sequence and the number sequence in mind and to perform the task within a set time limit.

MEMORY IMPAIRMENTS

To attempt an accurate diagnostic of memory impairments and (ideally) suggest their characteristics, clinicians need valid, reliable and sensitive memory tests. The validity of tests is essential in the prediction of everyday life difficulties that the patient might encounter. Reliability with memory tests is a delicate point due to learning effects; however, for some tests at least, reliability can be achieved by means of the use of parallel versions of the test. The more sensitive the test is to memory disorders the higher the probability to detect comparatively small changes. However, sensitive memory tests are yet to be conceived.

There are two non-exclusive models of memory assessment. (i) The global performance approach yields an overall single score and seems useful when the goal of the examination is to detect memory loss with no further specifications. This model of assessment uses the same battery or batteries of tests regardless of the individual patient's memory complaints. (ii) The flexible or cognitive approach allows detecting *and* characterizing the nature of memory deficits by means of a variety of tests chosen from a pool of standardized tasks, and/or tests conceived and constructed to detect selective dissociations of memory functions within an individual patient's neuropsychological profile. In the latter case, the newly constructed tests are also given to normal controls matched to patients for age, sex, education and handedness. The cognitive approach also provides plausible ways to reflect the complexity of anatomical data. Indeed, lesions affecting different brain areas cause diverse memory deficits, which can be identified by a careful description of the patient's performance across a wide range of selected memory tests. Selection of the memory tests described in the remaining of the entry (see Table 1) was made taking into account memory processes, performance before and after the onset of the illness and the sensory modality elicited by the tests.

A recent and fruitful approach in the assessment of memory disorders consists of determining which memory process has been most affected by the lesion. Tests are carried out to find out whether a patient is impaired in learning new material,

Table 1. Examples of tests within different memory constructs

Memory process	*Test/task*
Encoding	Immediate cued recall from the G-B test
Retrieving	Free and cued recall from the G-B test
	Free and cued recall from the CVLT
System/type	*Task/question*
Anterograde/retrograde memory	
Personal semantics	Names of three people you met after/before BI (see Kopelman et al., 1990)
Autobiographical episodes	The first/last incident recalled after/before BI (see Kopelman et al., 1990)
Public events	Current famous faces/Famous faces from the past
Modality	*Test*
Verbal	Recognition memory test for words
Non-verbal	Recognition memory test for faces

that is encoding process, or in retrieving information successfully encoded. It is also necessary, in everyday clinical practice, when dealing with *acute* insult to brain structures underlying memory, to establish whether the brain accident or illness provoked disruption of information acquired prior to the injury, i.e. retrograde amnesia, as well as information to be learned after the injury, i.e. anterograde memory. Finally, it is equally important to specify whether a dissociation is observed in the patient's performance in terms of the verbal versus non-verbal modality of the stimulus presentation. Data on sensory modality selective impairments can be pivotal in the conception of rehabilitation programmes.

Anterograde Memory

The clinician may seek to assess the patient's *verbal* memory performance according to the *encoding* condition, i.e. presenting a control-encoding task such as Grober and Buschke's (1987) Test. This test consists of 16 words belonging to 16 different categories and presented on cards containing four words at a time. The patient is asked to read aloud and to point to each item (e.g. harp) following the examiner's indication of a category (musical instrument). When the four items are thus learned, the card is removed and the patient is given the four categories as a cued immediate recall. If the patient is unable to respond, the item is shown again and the same steps as above are carried out until every item is encoded. The learning phase is achieved when all or nearly all the items have been encoded (otherwise the test should be discontinued). Three recall trials follow the encoding of the 16 items and each of them consist of free recall immediately followed by cued recall of the words the patient was unable to retrieve spontaneously. The three recall trials show the patient's learning capacity. Results on the Grober and Buschke Test are often compared with learning tests with no control-encoding conditions such as the Auditory Verbal Learning Test (AVLT; Rey, 1964). This very frequently used task consists of five presentations of a list of 15 unrelated words and a second list that is presented once. Whenever the learning curve is reliably better on the Grober and Buschke Test than in the AVLT, the remaining of the memory examination is carried out at a slow pace to aid acquisition of new material. This should help to characterize accurately the patient's memory function. If the encoding process appears to be impaired independently of the test, the clinician might seek to address the encoding deficit itself: is it due to the patient's difficulty in engaging in deeper levels of information processing? This difficulty was reported in diencephalic lesions as, for instance, Korsakoff amnesia by Butters and Cermak (1980), who demonstrated that patients failed to encode new information because they could analyse only the features representing the 'shallow' levels of verbal information.

Deficits in the *storage* stage of the newly acquired information have also been reported in cases of faster than normal rates of forgetting. Such deficits are interpreted within the consolidation of information theory (see Squire & Alvarez, 1995). Storage or maintenance deficit is not developed in the present entry since consolidation theory is both better viewed taking into account some single case studies of temporally graded retrograde amnesia (e.g. Manning, 2002) and more readily developed in relation to neuropsychological research topics than in connection to neuropsychological assessment.

Differences in *retrieving* information in anterograde memory is documented by recall versus recognition tests. However, no ready comparisons can be drawn between them since recall and recognition elicit different brain areas and memory mechanisms. Some verbal learning tests include a recognition section (e.g. the Grober and Buschke Test or the California Verbal Learning Test, CVLT; Delis et al., 1987), providing the possibility to illustrate the two retrieval conditions within the same test. However, it may be useful to obtain data on the patient's recognition memory with no previous learning of verbal information. Warrington (1984) developed the Recognition Memory Tests for Words and for Faces, with the aim to detect minor deficits of memory. The test consists of 50 words that are shown to the patient, one at a time during three seconds. The patient's attention is controlled (see Table 1) during the encoding phase of the task. Immediately after the presentation of the items, the patient performs a forced-choice recognition task with distractors. This test is more resistant to the effects of anxiety and depression (Coughlan & Hollows, 1985); however, the main interest of the test is to allow the clinician to detect selective verbal or non-verbal memory disorders.

Within the *non-verbal* modality, visual reproduction and visual recognition tests are routinely

used in neuropsychological assessment of memory. The most widely known line drawing, abstract design, visual memory reproduction test is probably the Rey Complex Figure (Osterreith, 1944; Rey, 1964). Scoring procedures for this (Lezak, 1995) and some other reproduction tasks (e.g. the Visual Retention Test by Benton, 1962) have norms for different groups of brain-damaged patients and normal individuals. Apart from the recognition memory test for faces, Warrington (1996) also developed the Topographical Memory Test, which allows identification of dissociations between the ability to recognize places as compared with routes.

Retrograde Memory

Besides the difficulty of learning new material, patients presenting memory loss may also show a defective performance when asked to retrieve events, both autobiographical and public, which occurred prior to the brain pathology. When retrograde amnesia is present, the clinician needs to know how far back it extends. Therefore, retrograde memory tests should include the possibility to show the patient's performance on material drawn from different periods.

There are several methodological problems related to retrograde memory tests. Thus, for instance, retrograde memory tests for public events have items related to events that range from recent to remote periods. This implies that the tests must be constantly updated, which being impracticable, restrains considerably the possibility of obtaining a standardization based on wide range population samples (see Lezak, 1995).

Past memories of *personal events* are often tested by means of the Autobiographical Memory Interview (AMI; Kopelman et al., 1990). The test is divided into two sections in order to cover factual knowledge about personal semantic information and recollection of autobiographical incidents. It is designed to elicit data across the whole life span: childhood, early adult life and recent life.

A further complementary task is the Galton–Crovitz Test (see Graham & Hodges, 1997). The patient is asked to produce a recollection based on each word from a pool of 20 items (e.g. party, friend, book, prize, film, etc.). Each word is given the number of times necessary to cover different periods of life (e.g. 0–18 years; 19–33 years; 34–49 years). The patient is encouraged to say as much as possible and to give as many details as possible. It is suggested to score responses using a 0–5-point scale (from 'don't know' to detailed, specific single events).

Past memories of *public events* are tested using the Famous Faces Test. A number of celebrities from the past are presented to the patient, who is asked to name the person or to provide as much information as possible concerning his/her occupation, political party, etc. The test includes personalities who were famous throughout different decades.

Kapur et al. (1989) developed the Dead/Alive Test, which consists of 30 personalities who have died and 10 living celebrities. This task assesses memory for people who were famous over the past 30 years. The patient is requested to indicate if the celebrity shown to him/her is dead or alive, whether he/she has been killed or has died of natural causes. Finally, the patient is asked to date the personality's death in five-year bands.

FUTURE PERSPECTIVES AND CONCLUSIONS

Over the past two decades, the detailed analysis of patients presenting memory loss has revealed important theoretical and clinical implications, which show both the necessity to separate assessment of memory from other cognitive functions and to conceptualize memory as a predominantly heterogeneous system. The aims of the neuropsychological assessment of memory have consequently moved from achieving a global result to that of obtaining a set of scores. The latter approach would show the patient's deficits and preservations in a wide range of specific aspects of memory as, for instance, in relation to the onset of the illness or in terms of long-term memory contents or input modalities. Finally, the memory process, encoding, storage and retrieval should be viewed as contributing to the formation of memory traces, each in a specific, different and complex way. Future perspectives are related to the integration of knowledge and applied techniques from different scientific domains. The contribution of functional brain imagery seems crucial in the attempts of improving our understanding on memory processes and the consequent development of sophisticated and sensitive memory tests.

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RELATED ENTRIES

Applied Fields: Neuropsychology, Memory (General), Dementia, Neuropsychological Test Batteries

MENTAL RETARDATION

INTRODUCTION

Intellectual disability comprises a heterogeneous group of people, who in their school years are singled out as having general difficulty in learning, and in adult life as having limitations in their independent community functioning. The present entry describes how to assess

intelligence and cognitive processes, adaptive skills and social functioning and behavioural problems in persons with intellectual disability. We use intellectual disability in addition to mental retardation because it is currently the broadly accepted scientific definition for identifying the population group diagnosed with adaptive and intellectual limitations. The term 'mental deficiency' was widely used during the 1970s and beginning of the 1980s, but by the second half of the 1980s it had been replaced by 'mental retardation'. Nowadays, the preferred term for professionals and scholars worldwide is 'intellectual disability'.

Intellectual disability cannot be understood as a characteristic of the individual, despite the fact that it has traditionally been classified as a medical or psychiatric disorder. Since 1992, with the significant paradigm shift in the concept of mental retardation proposed by the American Association on Mental Retardation (AAMR) (Luckasson et al., 1992), it has been considered that mental retardation refers to substantial limitations in present functioning. This means that we are now emphasizing individuals' functioning instead of their characteristics. Individuals' functioning is understood as the result of the adjustment between personal abilities and characteristics, and environmental expectations. Consequently assessment should not focus as much on the individual as on the environment around him.

PRESENT CONCEPT OF INTELLECTUAL DISABILITIES

The present conceptual approach to the definition of intellectual disability is not a medical model, although the medical model can describe the aetiology, nor is it a psychometric or psychopathological model, although the former is fundamental for determining competence in intelligence and the latter can describe the thoughts or behaviours experienced by a person with mental retardation. The AAMR proposes a functional model based on the integration of multidisciplinary and multidimensional perspectives addressed at specifying the needs of the individual in order to determine the type and intensity of the supports needed. Mental retardation is not considered an absolute feature of the individual but the expression of the interaction between the person with limited intellectual functioning and the environment. To talk about mental retardation does not mean to talk about people with certain characteristics, but about the restricted functioning of people with specific personal limitations.

We should not suppose that mental retardation is pervasive throughout the lifespan of the individual. In fact, the prevalence of mental retardation in adult life decreases because the requirements of social and cultural environments are not as high as the demands of school regarding educational performance and disciplined group behaviour. The existence of mental retardation is defined by the evaluation of the need to provide supports for the normal functioning of the individual.

Although a multidisciplinary approach is proposed, psychology is the discipline which tends to focus more on the individual and their interaction with the environment, and therefore psychologists should organize and define key decisions in the assessment process (Jacobson & Mulick, 1996). Mental retardation assessment consists of a formal diagnosis and the functional description of strengths and weaknesses of the individual, together with his needs. A competent person will carry out the diagnosis through psychological tests, but in order to have an appropriately developed functional description of the individual it will need to be devised by a multidisciplinary team. The team should be made up of people who spend greater time with the person, both within a family context and through supporting services and programmes.

DIAGNOSTIC CRITERIA FOR INTELLECTUAL DISABILITIES

Despite some significant discrepancies, the American Association of Psychology (APA) and the American Association of Mental Retardation (AAMR) coincide in the essential features that the evaluator has to bear in mind in order to identify and diagnose a person with intellectual disability. The three criteria are (Editorial Board, 1996; Luckasson et al., 1992) as follows.

Significant Limitation in General Intellectual Functioning

The significance criterion refers to an IQ that is two or more standard deviations below the mean. The assessment of IQ has to be carried out by a qualified psychologist applying one or more individual tests with the appropriate psychometric guarantees. Moreover, it is advisable to confirm the assessment with data from the application of other tests in the assessment process.

Significant Limitations in Adaptive Functioning which Exist Concurrently with Intellectual Limitations

For this criterion, the APA proposes to use an individual, comprehensive measure of adaptive behaviour. In this case, the significance criterion would be similar to those above: a global score of two or more standard deviations below the mean of the population in that measure. However, the AAMR substantially changes this criterion and defines it as limitations in two or more of the following adaptive skill areas: communication, self-care, home living, social skills, community use, self-direction, health and safety, functional academics, leisure, and work. Such areas lead to a categorization of the individual's general behaviour in order to facilitate the identification of needs and favour the specification of support strategies, bearing in mind the comparative age of the person under assessment. Hence, we obtain more operative criteria than those of the APA in order to promote the interface between assessment and intervention.

Intellectual Disability Should Manifest Itself before Age 18

This criterion results from the fact that in Western cultures an individual assumes the function of an adult at 18, since it is considered to represent the completion of a person's development. In other cultures, due to different features regarding the individual's developmental process, different age criteria may be appropriate. The APA has proposed the extension of such a limit up to 22 years, since the present situation allows for general longer educational stages and family dependence.

PROCESS OF EVALUATION OF MENTAL RETARDATION

Basic Assumptions in the Process of Evaluation

In order to avoid serious mistakes in the diagnosis of intellectual disabilities, we should begin with a series of assumptions based on the experience of previous decades in the evaluation of people with intellectual disability. According to the system proposed by the AAMR in 1992, we might differentiate four different assumptions, which are inseparable from the definition. The evaluation has to take into account these assumptions in order to take the appropriate decisions about the evaluation process.

First, an evaluation is considered to be valid when it takes into account cultural and linguistic diversity of the individual, together with possible differences in communicative and behavioural facets. Applicable tests and procedures must be based on this assumption. If not, we would be discriminating against all those who form part of cultural minorities or have special communication characteristics.

Secondly, the determination of limitations in adaptive skills must be made in relation to a typical community environment of similar age peers. The evaluation of adaptive skills becomes significant and useful when it is carried out within the natural context where the person studies, works or spends their leisure time. And, of course, we are always talking about similar environments to those of people of a certain age.

Analyses and assessments should not be exclusively focused on the individual deficiencies. On the contrary, they should recognize that together with adaptive limitations there are strengths in other areas, and we have to take them into account when treatment is established. Supports to any person must be based not only on the analysis of limitations but also on an improved knowledge of their own possibilities in different aspects of behaviour.

Finally, it is accepted that the functioning of persons with intellectual disability will improve if they are provided with appropriate supports for a continued period of time. Consequently, every person can improve no matter the extent and severity of the deficiencies. Such a statement is broadly the result of innovative input from the

behavioural approach to education and treatment of people with intellectual disabilities. Towards the end of the 1970s, behaviour modification analysis and techniques proved to be efficient and allowed us to undertake professional work with children and adults that were traditionally segregated from educational and therapeutic programmes on the grounds that they were ineducable. Success in the treatment of disruptive behaviours (self-lesion, stereotyped behaviours, aggressions, etc.) and the development of support programmes for populations with greater deficiencies showed that every person can have, and has, the right to improve and enhance his quality of life.

Evaluation of Intelligence Limitation

The criterion to determine the existence of a significant intellectual limitation is a score in conceptual intelligence performance of about two or more standard deviations below the mean. This implies a standard score of approximately 75–70 or below, based on scales with a mean of 100 and a standard deviation of 15. Such a score range recognizes the importance of a possible measurement error in assessment instruments. If standardized measures are not appropriate for the actual case (because of cultural diversity, for example), clinical opinion should be used. In such a case, a significant limitation means a performance below that of approximately 97% of the people in the reference group (in terms of age and cultural environment).

The most used instruments to assess intellectual functioning are: Stanford–Binet Intelligence Scale (Thorndike, Hagen & Sattler, 1985), Wechsler scales (Wechsler Intelligence Scale for Children – III [Wechsler, 1991]; Wechsler Adult Intelligence Scale – Revised [Wechsler, 1981]; Wechsler Preschool and Primary Scale of Intelligence [Wechsler, 1967]), and the Kaufman Assessment Battery for Children (K-ABC, Kaufman & Kaufman, 1983).

The results of the intelligence test are only one part of the whole process of intelligence assessment. Since as individual's functioning in situations of daily life must be consistent with scores in standardized measurements, if there is no such consistency we should put into doubt the validity of the measurements obtained in those tests. Thus, it is also indispensable to use other assessment measures with more flexibility and ecological validity (direct observation of behaviour, clinical interviews and analysis of the individual's history or data) and clinical judgement to determine whether the IQ score is valid or not for a specific person.

Evaluation of Limitation in Adaptive Functioning

The evaluation of adaptive skills is essential for assessing actual limitations of the individual and to know how to help or provide an efficient support. Traditionally, procedures have been designed to find a general measure of adaptive behaviour, but there has been a great deal of confusion over what aspects should be included in the measure, since the concept has not been clearly formulated. The 1992 proposal by the AAMR meant an important advancement and provided new orientation in the diagnosis and assessment of adaptive functioning.

Instead of looking for a general measure of adaptive behaviour, we refer to ten adaptive skill areas (cited in the second diagnostic criterion), with specific and differentiated content which allows for habilitation and rehabilitation programme planning. The purpose is not, therefore, limited to diagnosis, but assessment is directly linked to intervention. And the higher or lower importance of those areas is related to the relative age of the person and developmental level. On the other hand, pathological, disruptive, or maladjusted behaviours are included in another area, referred to as psycho-emotional, and they are not included in the adaptation area.

Existing tests to measure general adaptive behaviour are different in nature and some help is required in the general diagnosis of mental retardation and others for the in-depth analysis of an individual's competencies, with the final aim of intervention. The most used instruments are: Adaptive Behaviour Scales (ABS) (Nihira, Foster, Shellhaas & Leland, 1974), School Edition of the ABS (Lambert & Windmiller, 1981), Vineland Adaptive Behaviour Scales (Sparrow, Balla & Cicchetti, 1984), Scales of Independent Behaviour (Bruininks, Woodcock, Weatherman & Hill, 1984) and the Comprehensive Test of Adaptive Behaviour (Adaptive Behaviour Global Test) (Adams, 1984).

Adaptive skill evaluation should be undertaken from a clinical standpoint, more than a psychometric one. Together with the information from the above-mentioned scales, it is advisable to gather information about the individual's closer environment (the more the better, and always on the most reliable information). Sometimes, direct behaviour observation is required. In this way, we may obtain a clinical judgement based on the convergent validity of consistency of the data obtained through different sources and situations. With such changes, we are aiming at developing more efficient and accurate decisions for diagnosis and programme planning.

Evaluation of Psycho-Emotional Problems

People with mental retardation do not always exhibit altered behaviours in the psycho-emotional domain. On the contrary, most of them present similar characteristics to the non-disabled population. However, the prevalence of psychological disorders or psycho-emotional alterations is quite a lot higher than it is in populations without mental retardation. Consequently, we need a specific approach to the evaluation of this area in all persons with intellectual disability, even though we often find people who exhibit good psychological well-being and, therefore, do not require intervention.

Problems in the psycho-emotional domain can be maladaptive or challenging behaviour, or psychopathological disorders related to formal psychiatric designations (Olley, 1999; Olley & Baroff, 1999; Verdugo & Gutiérrez, 1998). Among maladaptive behaviours we find stereotypical behaviour, self-injury and problematic sexual behaviour. Among psychopathological disorders: anxiety, mood, depression and schizophrenia.

If we refer to behavioural problems in populations with intellectual disability, very often it is the contexts they are in that fails to promote the development of appropriate behaviours. The existing environments involuntarily promote and foster maladaptive repertoires, which require professional intervention in order to be minimized or eliminated. Consequently, evaluation should undertake an accurate analysis of the environment surrounding the individual. The evaluation of behavioural problems should be based on a functional analysis. Functional analysis aims at discovering the role behaviour is playing. We analyse the possible functional relationship between a feature of the environment and the behaviour exhibited by the person. The essential presupposition to bear in mind is that every problem exhibited by the individual serves a specific purpose, they are strategies to achieve something. And changing the behaviour will require the identification of that purpose behind the individual's behaviour.

FUTURE PERSPECTIVES AND CONCLUSIONS

Nowadays we are still witnessing significant changes in our understanding of people with intellectual disabilities and, in light of this, in how to evaluate them. A long time ago we shifted from biological approaches to psychometric and psychopathological models, and currently there is a consensus being formed about a functional model addressed at efficiently designing the best possible supports for the individual. Such a model, multidimensional and interdisciplinary in nature, does not consider people with problems from a psychopathological perspective, but as persons who are different in their manifestations and behaviours. People with intellectual disabilities require both evaluation and intervention based on present scientific principles, but should not always be identified as individuals with psychological disorders. It is true that they experience these disorders more often than other people and, consequently, they have to be evaluated in this domain or via these dimensions, but most of them will not require help in this field.

The changes in the near future will take place in the field of support definition, intelligence evaluation, adaptive behaviour assessment and the very understanding of psychological disorders in the population. The criterion of significant limitation of intelligence has always been associated with the definition of mental retardation or intellectual disability. And its measurement, although approached from comprehensive perspectives and using different procedures, is essentially psychometric, based on individual tests. The next few years will witness an in-depth analysis of these approaches, but not a significant shift in the long-standing criteria.

The criterion of limitations in adaptive skills is more prone to immediate change. In fact, among professionals, it has always been the most discussed and polemical criterion (Langone, 1996). In the 21st century, due to limitations as a general measure of adaptive behaviour and as suggested by the APA (Editorial Board, 1996), we may not refer any more to the list of the ten adaptive areas previously proposed by the AAMR (Luckasson et al., 1992). Instead, we are witnessing the emergence of an understanding based on a theoretical framework or tripartite intelligence, which emphasizes the analysis of limitations in practical, conceptual, and/or social adaptive skills (Luckasson, 2000). The implications of such an approach will guide the organization of the analysis of individuals' competencies and support needs. And this should bring about substantial changes to the ten adaptive areas proposed by the AAMR in 1992.

Finally, the psycho-emotional area will produce the most innovative research and improved evaluation. On the one hand, the criteria will be broadened to analyse this area from a psychological well-being related perspective (Verdugo, in press), and the aim of evaluation will be to obtain useful information for the enhancement of the personal satisfaction of the individuals. On the other hand, research will suggest new keys to improve our understanding of individuals' psychopathology and special characteristics of this population. So far we have only taken a few modest steps towards our final goal.

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RELATED ENTRIES

Applied Fields: Education, Intelligence Assessment (General), Development: Psychomotor, Development: Socio-Emotional, Development: Language, Development: Intelligence/Cognitive, Dynamic Assessment, Children with Disabilities, Learning Disabilities

MOOD DISORDERS

INTRODUCTION

Mood disorders are generally defined according to criteria listed in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV; APA, 1994). While the DSM-IV lists 10 mood disorders, only major depressive disorder (MDD) and bipolar disorder (BD) will be addressed in this entry. MDD is defined as exhibiting either depressed mood or loss of interests or pleasure most of the day nearly every day for at least 2 weeks and accompanied by at least five of the following symptoms: (1) change in weight or appetite; (2) insomnia or hypersomnia; (3) psychomotor agitation or retardation; (4) fatigue or loss of energy; (5) feelings of worthlessness or excessive guilt; (6) poor concentration or indecisiveness; and (7) suicidal ideation or attempt. BD involves a manic episode for at least 1 week and may or may not involve the symptoms of MDD. Symptoms of a manic episode include either euphoria or irritability and at least three of the following symptoms: (1) inflated self-esteem or grandiosity; (2) decreased need for sleep; (3) talkativeness or pressured speech; (4) flight of ideas; (5) distractibility; (6) increase in activity level; and (7) excessive involvement in pleasurable yet risky activities.

This entry will first address difficulties in assessing MDD and BD. Second, several assessment devices will be described. Third, the need for additional devices will be noted. Finally, it will be concluded that assessment devices for MDD and BD should be multivariate and include not only symptoms of disordered mood but also causal and maintenance factors that can guide prevention and treatment strategies.

DEFINITIONAL CHALLENGES TO ASSESSMENT OF MOOD DISORDERS

DSM-IV criteria for MDD and BD are quite heterogeneous and some are ill-defined. For MDD, either depressed mood or anhedonia must be present most of the time, but what constitutes 'most' is not specified. Furthermore, it is unclear how these two criteria are measured separately. Is it possible to exhibit dysphoria but still exhibit pleasure? Another measurement challenge is that the DSM-IV weighs all seven symptoms of MDD equally. If a person is very sad and suicidal but has normal appetite, sleep pattern, and energy level, is this person not disordered? In clinical settings, suicidal people are given emergency treatment but, as discussed below, assessment devices for MDD would not alert the clinician of a serious problem. Therefore, another measurement challenge is how to weigh the significance of each of the seven symptoms that accompany dysphoria or anhedonia.

For BD, the defining symptom to assess is either euphoria or irritability. Excessive happiness and excessive anger are different emotional states that involve different cognitions and behaviours. It is unclear why they are not recognized as separate mood disorders. There are few assessment devices for BD and this definitional confusion may be one reason this disorder has been difficult to measure.

Another challenge to the measurement of MDD and BD is the temporal criteria for diagnosis. Identification of symptoms lasting 2 weeks for MDD and 1 week for BD requires accurate retrospective reporting which is subject to not only memory bias but also the very symptoms of the disorders (e.g. difficulty concentrating and distractibility). While continuous observation or self-monitoring may obviate this issue, most techniques for assessment of mood disorders are based on a single administration of the device.

ASSESSMENT DEVICES

There are at least 50 instruments designed to assess mood disorders (Nezu, Ronan, Meadows & McClure, 2000). Most of the instruments assess MDD symptoms and very few measure manic symptoms relevant to BD. The instruments include structured interviews, observational and

clinician-rated protocols, and self-report inventories. A sampling of instruments with strong psychometric support and cost-effectiveness for both screening and diagnosis will be summarized. Instruments designed for special populations (e.g. mentally retarded, schizophrenics, older persons, etc.) will also be described.

Structured Interviews

The Diagnostic Interview Schedule (DIS; Robins, Helzer, Croughan & Ratcliff, 1981) is available in several languages and in adult and child versions. It is highly structured, takes 90 to 120 minutes to administer, and yields diagnoses for MDD, BD, and other DSM-IV disorders. Its advantages include being conducive to administration by a layperson while disadvantages include lack of norms. The Structured Clinical Interview for DSM-IV Axis I Disorders (SCID; First, Spitzer, Gibbon & Williams, 1997) is designed for adults and adolescents. It is semi-structured, takes 45–90 minutes to administer, and measures both MDD and BD. Advantages include being briefer than the DIS-IV while disadvantages include lack of norms. The Kiddie-Schedule for Affective Disorders and Schizophrenia for School-Age Children – Present and Lifetime version (K-SADS-PL; Kaufman et al., 1997) is semi-structured, takes 35–75 minutes to administer, and yields diagnoses for MDD, BD, and other DSM-IV disorders. Advantages include obtaining data from both the child and a caregiver while disadvantages include lack of norms.

The Clinician-Administered Rating Scale for Mania (CARS-M; Altman, Hedeker, Janicak, Peterson & Davis, 1994) was developed to improve existing mania rating scales, using 15 items that correspond to DSM-IV criteria for manic and psychotic symptoms. The CARS-M is semi-structured, takes 15–30 minutes to administer, and yields a total score and two subscale scores. Advantages include standardization of administration, delineation of mania from psychotic symptoms, and evidence demonstrating the measure's specificity to mania. Also, an initial study on its Spanish version reported acceptable psychometric properties (Livianos et al., 2000). Disadvantages include its inappropriateness for assessing depression in mixed and schizoaffective states, and for use among adolescents and the elderly.

Clinician-Rated Protocols

Few observational devices have been designed to assess either MDD or BD, and most devices are designed for special populations. The Calgary Depression Scale for Schizophrenia (CDSS; Addington, Addington & Maticka-Tyndale, 1993) is designed to discriminate mood disorder and schizophrenia symptoms among all ages. The CDSS includes both semi-structured interview questions and observer Likert-type ratings of MDD symptoms, takes at least 30 minutes to administer, and yields a total score. Advantages include rapid administration and availability of norms to guide score interpretation. Disadvantages include restriction to clinical settings with raters familiar with both mood disorders and the range of schizophrenic symptoms that overlap and affect both self-report and observational ratings. The Psychopathology Inventory for Mentally Retarded Adults (PIMRA; Matson, 1988) consists of clinician and observer (e.g. caregiver, work supervisor) ratings of symptoms of eight disorders and an affective disorder scale representing mostly MDD behaviours. The PIMRA takes 30–45 minutes to administer (10 minutes for the affective scale) and yields a total score and eight subscale scores. Advantages include multi-method assessment while disadvantages include lack of norms. The Cornell Scale for Depression in Dementia (Alexopoulos, Abrams, Young & Shamoian, 1988) is also multi-modal, involving Likert-type clinician ratings of MDD symptoms based on both client and caregiver responses to 19 items. It is designed for individuals of all ages exhibiting symptoms of dementia while maintaining the ability to communicate, takes about 30 minutes to administer, and yields a total score interpreted against the mean of a small normative sample. Advantages include standardized procedures for reconciling the score when there are differences between clinician ratings of client and caregiver responses. Disadvantages include the need for raters to be highly trained in both mood disorders and organic brain disorders.

The Brief Psychiatric Rating Scale (BPRC; Overall & Gorham, 1962) and its expanded version, BPRS-E (Van der Does, Linszen, Dingemans, Nutger & Scholte, 1993), assess general psychopathology including mood disorders. The standard version has 18 items, takes up to 45 minutes to administer, and yields a total score and five subscale scores. Advantages include

its comprehensiveness, while disadvantages include lack of specificity for any disorder, extensive training required to ensure reliability and validity of ratings, and reported higher interrater reliabilities for diagnoses within the psychotic than non-psychotic range (Hafkenscheid, 1993). Of the few existing mania scales, the commonly used Mania Rating Scale (Young, Biggs, Ziegler & Meyer, 1978) has 11 items, takes 15–30 minutes to administer, and yields a total score. Advantages include its comprehensiveness and acceptable interrater reliabilities. Disadvantages include lack of standardized administration, unequal weight assigned across item scores, and lack of evidence for its specificity for BD.

Unlike symptoms rating scales, the recently developed National Institute of Mental Health prospective Life Chart Methodology (NIMH-LCM-p or LCM; Denicoff et al., 1997) and its patient-rated version (Leverich & Post, 1998) assess degree of functional impairment due to the course of BD. The LCM has five daily monitoring items, including a significant events rating and an overall rating of functional impairment due to mania or depression. Advantages include standardized administration, facilitation of individualized short- and long-term course and treatment monitoring, delineation of impairments due to mania and depression, and ease of analyses when using the computerized version. Disadvantages include partial reliance on the patient's recall of information and lack of symptom monitoring relevant to illness and DSM-IV criteria.

Self-Report Inventories

The most common type of assessment device for mood disorders is the self-report questionnaire, and most of these are designed to assess MDD. The most widely used measure for adults is the Beck Depression Inventory (BDI-II; Beck, Steer & Brown, 1996). The BDI is designed for adolescents and adults, contains 21 items, takes 5–10 minutes to complete, and yields a total score. Advantages include extensive psychometric support, provision of cutoff scores, and a version in Spanish. Disadvantages include failure to associate cutoff scores with MDD diagnosis and equal weighting of items. The Zung Self-Rating Depression Scale (Zung, 1965), designed for adults, is another 'gold standard' of self-report measures with strong psychometric support. It contains 20 items, takes about 5 minutes to complete, and yields a total score. Advantages include rapid administration and free availability on the Web (www.welbutrin-sr.com/eval/zung.htm). Disadvantages are similar to those of the BDI. The Children's Depression Inventory (CDI; Kovacs, 1992) is designed for ages 7–17 years, contains 27 items, and takes 10–15 minutes to administer. Advantages include standardized scores, a 10-item short form, and translated versions in 10 European languages. Disadvantages include poor discrimination from other childhood disorders. The Geriatric Depression Scale (GDS; Yesavage et al., 1983) is designed for adults aged 65 and older. It contains 30 items, can be administered orally or in written form, and takes about 30 minutes to complete. Advantages include flexibility in administration to accommodate physical or cognitive impairment, free availability on the Web at www.stnford.edu/~yesavage/GDS.html, and translated versions in various Asian and European languages. Disadvantages include lack of norms and cutoff scores.

One of the few instruments designed to measure both MDD and BD symptoms is the Multiple Affect Adjective Checklist – Revised (MAACL-R; Zuckerman & Lubin, 1985). The MAACL-R assesses anxiety, depression, hostility, positive affect, and sensation seeking among adolescents and adults. It contains 132 items, has two forms for state and trait affect, and takes 5–10 minutes to complete each form. Advantages include standardized scores and assessment of a range of moods. Disadvantages include omission of related symptoms of mood disorders. The most useful instrument for assessing BD is the General Behaviour Inventory (GBI; Depue et al., 1981) designed for adolescents and adults. It contains 73 items and provides cutoff scores for subtypes of BD, such as cyclothymia. Advantages include the strongest psychometric support for any self-report measure of BD, making it more cost-effective than clinical interviews. Disadvantages include failure to detect BD when symptoms are infrequent or rapid cycling (Klein, Dickstein, Taylor & Harding, 1989).

The patient self-report version of the previously mentioned LCM (Leverich & Post, 1998) contains four items that assess daily functional impairment severity due to mania or depression. Along with the above reported advantages, one disadvantage is the possible non-compliance by

BD patients in completing daily assessments, particularly in non-inpatient settings.

FUTURE PERSPECTIVES

While there has been good progress in developing assessment devices for MDD, there is a need for instruments designed to assess BD and other mood disorders. Because most instruments are available in English only, translated versions are needed. Also, few instruments are available for people who cannot verbally communicate symptoms of mood disorders, indicating a need for multi-modal instrumentation so that assessment can be conducted with information from observation in natural and analogue settings, self-report, observer's report, and psychophysiological indices.

There is also a need for instruments that assess not only the symptoms of mood disorders, but also the theoretical causal and maintenance factors that would guide prevention and treatment planning. One such instrument is the Elder Life Adjustment Interview Schedule (ELAIS; Dubanoski, Heiby, Kameoka & Wong, 1996). The ELAIS is a structured interview and contains scales that assess depression along with situational conditions, health status, and behavioural competencies related to mood regulation. The ELAIS also contains scales that assess cognitive functioning and response sets to check for reliability of responses to interview questions. The ELAIS takes about an hour to administer and is available in English and Japanese languages. A self-report version for adolescents and adults is under development by the present authors.

CONCLUSIONS

The advancement of instruments to assess MDD has corresponded with the development of integrated theories (e.g. Eifert & Evans, 1990). The slow development of instruments to assess BD reflects the lack of clarity of the disordered moods involved (i.e. both euphoria and irritability) and little theoretical understanding of causal and maintenance factors. Most theories of BD focus on organic determinants for which there are no medical diagnostic procedures. A recent psychological theory of BD (Reidel, Heiby, & Kopetskie, 2001) suggests that assessment of this condition include measures of situational conditions (e.g. pleasant events and obstructions to goals), health factors (e.g. sleep deprivation), and behavioural competencies (e.g. skills to engage in risky activities and deficit predictions of long-term negative consequences). This theory could guide the development of a multi-scale assessment device for BD.

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Elaine M. Heiby, Velma A. Kameoka and Judy H. Lee

RELATED ENTRIES

Applied Fields: Clinical, Emotions, Diagnosis of Mental and Behavioural Disorders

MOTIVATION

INTRODUCTION

Why do some people spend their time thinking about accomplishing tasks whereas others tend to reflect on their relationships? What personal characteristics determine whether people will flourish versus flounder in particular domains? Why are some people successful at reaching their personal goals whereas others fail when faced with distractions and obstacles? Why do some individuals display enhanced well-being after reaching their goals whereas others do not? These are the types of questions that motivational researchers have sought to answer over the past 50 years. The classic approach to these questions involved the assessment of individual differences in the strength of psychological needs for achievement, affiliation, and power. Such needs were conceptualized as relatively stable dispositions that are learned early in life and that predispose individuals to strive for certain classes of goals. Whether such needs are best measured through content-analysis of verbal material or via self-report of goal preferences has been the topic of lively debate. More recently, an alternative conception of needs as necessary psychological

nutriments rather than collections of desires has been proposed. Three essential needs have been identified – for autonomy, competence, and relatedness – and the focus has shifted to examining the extent to which goal selection and subsequent self-regulatory efforts support versus hinder the satisfaction of these needs.

ASSESSING MOTIVES IN IMAGINATIVE STORY CONTENT

Fifty years have passed since McClelland, Atkinson, and their colleagues (1953) began a research tradition founded on the assumption that there is a pattern and organization to the flow of human behaviour which can partly be understood in terms of underlying psychological motive dispositions such as the need for achievement or the need for affiliation. These psychological motives were conceptualized as enduring features of personality that energized, directed, and selected wide varieties of behaviour and experience. Individual differences in the strength of various motives were thought to be most directly assessed by examining the content of people's imaginative thoughts. This belief was based on the assumption that expressive behaviours, such as fantasies, reflected internal motive dispositions more uniquely than did perception, action, or judgement which are strongly influenced by determinants in external reality (McClelland, 1988).

The most widely used motive scoring system was developed to assess the need for achievement. Respondents are asked to write brief stories in response to four to six ambiguous picture cues (e.g. a picture of an architect at his desk with a photo of his family in front of him). The written stories are coded according to a detailed and explicit scoring system. Scoring is based on the presence and level of elaboration of achievement themes. The scoring system was developed by comparing the thematic content of stories told by individuals whose achievement motive had been experimentally aroused versus participants in a neutral condition. The nAch scoring system is objective, quantitative, and yields high levels of agreement among trained coders. It has been validated with participants from cultures as diverse as Germany, Japan, and Brazil. Similar scoring systems were developed to assess the needs for power and affiliation. The most recent versions of the content-coding systems for social motives are available in the *Handbook of Thematic Content Analysis* (Smith, 1992). (Table 1 provides references for all instruments discussed in the present entry.)

Table 1. Motivational assessment instruments

Measure	Year	Authors
Need for Achievement Scoring System	1992	McClelland et al.
Need for Power Scoring System	1992	Winter
Need for Affiliation Scoring System	1992	Heyns et al.
Need for Intimacy Scoring System	1992	McAdams
Self-Report Motives	1974	Jackson
General Causality Orientation Scales	1985	Deci & Ryan
Academic Motivation Scales	1997	Vallerand et al.
Goal Motivation Scales	2001	Sheldon
Self-Efficacy	1997	Bandura
Achievement Attributions	1970	Weiner & Kukla

Achievement motivation is defined as a concern with doing things better or with surpassing standards of excellence (McClelland & Koestner, 1992). Early studies indicated that achievement motivation predisposed individuals toward moderate risk-taking in performance situations (Atkinson, 1957). Later studies showed that achievement motivation is related to superior performance when activities are moderately challenging, provide performance feedback, and encourage personal responsibility for outcomes (McClelland, 1988). Among adult men, achievement motivation promotes a positive orientation toward work, in general, and is particularly predictive of success at entrepreneurial activities. Among adult women, the relation of nAch to work outcomes is strongly affected by whether their values are family-centred or career-oriented. The relation of achievement motivation to school performance has been shown to depend on the presence of challenge and feedback. The dynamics of achievement-related actions were extensively discussed by Atkinson and Birch (1970).

Power motivation is defined as a concern with having an impact on others (Winter, 1992a,b). Men with strong power motivation exhibit the

following characteristics: (a) they strive to gain recognition by joining organizations and pursuing leadership positions; (b) they pursue occupations which offer opportunities for exerting influence; (c) they are drawn to competitive activities and perform well at them; (d) they experience difficulties in their intimate relationships with women; (e) they are likely to suffer from health problems such as high blood pressure, poor immune functioning, and drinking problems. Women who are high in power motivation have also been shown to strive to gain recognition and to pursue careers that offer the opportunity for exerting influence; however, among women, power motivation is not related to negative outcomes such as relationship difficulties and health problems. Self-control and experience with responsibility can moderate many of the negative outcomes associated with strong power motivation in men. The unique combination of high power motivation and high self-control has been shown to be strongly associated with managerial success.

Affiliative motivation is defined as a concern over establishing, maintaining, or restoring positive relations with others (Koestner & McClelland, 1992). Affiliative motivation has been related to the amount of time spent interacting with others and possessing a sympathetic and accommodating interpersonal style. However, because affiliative motivation has been associated with social anxiety and lack of popularity among peers, it was suggested that nAff is best conceived as a measure of affiliative anxiety or fear of rejection. Intimacy motivation captures the positive aspect of affiliative motivation and has been related to relationship quality and psychosocial adjustment (McAdams, 1992a,b).

Despite early criticism, fantasy-based measures of motives have been shown to display adequate test–retest reliability when they are assessed under relaxed conditions and with appropriate instructions (McClelland, 1988). Furthermore, fantasy motives have been shown to possess considerable predictive validity in areas such as task performance, occupational success, relationship patterns, and health outcomes. The relation of social motives to various criteria can be most clearly established when environmental factors (e.g. incentives and opportunities) and non-motivational person variables such as skills, self-schemata, and sex-roles are considered. For example, Winter et al. (1998) recently showed that impact of the need for power and affiliation on career choice and relationship outcomes depends importantly on whether or not individuals are introverted or extroverted. Many of the positive correlates of these motives were only evident for those who were relatively extroverted.

DISTINGUISHING MOTIVES ASSESSED IN FANTASY AND SELF-REPORT

Self-report scales were developed to replace the fantasy-based motive measures because they were thought to be more reliable, as well as more efficient to administer and score. Edwards designed a self-report inventory for motives in 1954, but a large number of other such inventories have since been introduced (e.g. Jackson, 1974). These inventories typically offer excellent psychometric credentials with scale internal consistencies and test–retest reliabilities ranging between 0.60 to 0.80. However, two problems with using self-report motive inventories are that respondents may (1) be unaware or unable to report on their motivational state; and (2) shade their responses in a socially desirable direction.

More importantly, self-report measures of motives rarely correlated significantly with similar measures derived from coding associative thought (Spangler, 1992). This fact was reported first in 1953 by McClelland et al., and has been confirmed many times since then. McClelland, Koestner, and Weinberger (1989) argued that this lack of correlation should be taken seriously, and that as a minimum, psychologists should not call by the same name two measures which do not correlate with one another. They proposed that attitudinal or self-reported motives be referred to as *self-attributed* and the fantasy-derived motives be called *implicit* since a person is not explicitly describing him or herself as having the motive. These authors also recommended that motivation theorists consider the possibility that there are two qualitatively different kinds of human motivation, both of which are important. Compared to self-attributed motives, implicit motives are expected to be less cognitively elaborated, more often unconscious, and tied more closely to natural incentives and emotions.

There are three central differences in the way self-attributed and implicit motives relate to behaviour (McClelland et al., 1989). First, measures of implicit motives are thought to be more effective in predicting behaviour in relatively unconstrained situations whereas self-attributed motives, as measured in self-report inventories, more accurately predict attitudes and choices. Second, several studies have shown that the implicit motives tend to predict action trends over time better than the questionnaire measures. Finally, self-attributed and implicit motives appear to be particularly responsive to different classes of environmental incentives. Self-attributed motives are most likely to affect performance when there are relevant social incentives present in the situation. Thus, a person who reports being high in achievement motivation (i.e. high in self-attributed achievement motivation) is most likely to outperform someone who describes themselves as low in achievement when they are in a performance setting in which an authority figure stresses the importance of working hard and doing well. On the other hand, implicit motives as assessed by the fantasy method are primarily responsive to variations in the nature of task-inherent or activity-based incentives (Spangler, 1992).

There is evidence that a more comprehensive understanding of social motivation can be achieved by including measures of both self-attributed and implicit motives in research designs. The greatest amount of variance in behaviours, cognition, and affect are accounted for when both implicit and self-attributed measures of motives are assessed (McClelland et al., 1989; Woike, 1995).

AN ORGANISMIC CONCEPTION OF NEEDS AND A FOCUS ON SELF-REGULATION

The needs concept has various definitions across psychology, ranging from what one *wants* to what is *necessary* for one's psychological health and thriving (Ryan, 1995). Used in this latter, more exclusive sense, a need is a 'psychological nutriment' required for optimal health and thriving. That is, just as a plant requires water, sunlight, and good soil in order to grow, people require certain nutriments in order to be psychologically healthy and adapted. Deci and Ryan (2000) assume that there are three primary needs that all people must satisfy if they are to function well in life: the need for autonomy (i.e. freedom and choicefulness), the need for competence (i.e. felt efficacy), and the need for relatedness (i.e. connection to others). Recent research suggests that these needs may be universally important to people.

From this organismic perspective, the critical motivational issues concern whether one's goal pursuits provide the opportunity for satisfaction of the three intrinsic needs. The content of goals and various goal-related regulatory processes can be assessed with methods developed to measure personal strivings (Emmons, 1999). There is evidence that when the content of personal goals is congruent with the needs for autonomy, competence, and relatedness, people make greater progress and experience enhanced well-being (Sheldon, 2001). By contrast, pursuit of goals that are incongruent with intrinsic needs (e.g. pursuit of fame or popularity) has been associated with dysfunction even when progress has been made.

The process by which individuals regulate their goal pursuits will also importantly impact upon their success and well-being. Sheldon and colleagues have completed a series of short-term, prospective, longitudinal studies in which participants are asked to list several goals that they plan to strive for during the semester and then rate the goals in terms of autonomy (Sheldon, 2001). Autonomy is defined as the extent to which a goal reflects personal interests and values versus something one feels compelled to do by external or internal pressures. Specifically, participants are asked to rate four different reasons that range from highly controlled to highly autonomous. The four reasons for pursuing goals are external (i.e. 'because somebody else wants you to'), introjected (i.e. 'because you would feel ashamed, guilty, or anxious if you didn't'), identified (i.e. 'because you really believe that it is an important goal to have'), and intrinsic (i.e. 'because of the fun and enjoyment which the goal will provide'). Goal autonomy is calculated by combining the intrinsic and identified ratings and subtracting the introjected and external ratings. Autonomy and goal progress scores are aggregated across the various goals that

participants had set. Several recent studies revealed that individuals were significantly more likely to make successful progress when they had selected goals that were autonomous and that goal progress was systematically related to improved affect. The benefits of having autonomous goals were maintained after controlling for neuroticism and self-regulatory factors such as self-regulatory skill, goal efficacy, and goal commitment. The impact of autonomous goals on progress was shown to be mediated by the capacity to maintain sustained effort. That is, they appear to be protected and maintained in the face of task-irrelevant temptations because they are continually energized.

Several domain-specific scales of autonomous self-regulation have also been developed and validated. All of these scales ask respondents to consider their reasons for pursuing activities within a given domain such as school, sports, religion, or politics. For example, the Academic Motivation Scale was developed to assess individual differences in self-regulation toward high school or college (Vallerand, Fortier & Guay, 1997). Students are asked to rate the extent to which they go to school because of autonomous reasons (e.g. interest and personal importance) or for controlled reasons (e.g. external and introjected reasons). The scale is highly reliable and has shown considerable predictive validity. Thus, more autonomous students are less likely to drop out of school over time and report significantly higher levels of personal adjustment after completing school (Koestner & Losier, 2001).

A global scale of autonomous self-regulation, the General Causality Orientations Scale (GCOS), has also been widely used. It was constructed to be a general scale, one that cuts across domains and includes a wide range of responses and reactions (Deci & Ryan, 1985). The scales have demonstrated good internal and test–retest reliability and considerable predictive validity. The original validation studies conducted by Deci and Ryan (1985) showed that people's scores on the Autonomy scale of the GCOS were significantly positively related to measures of ego-development, self-esteem, and self-actualization. Subsequent research showed that autonomous individuals report focusing on enjoyment and challenge at work, rarely experience boredom, and explore within themselves when making a career choice (e.g. carefully weighing their own interests and abilities). Recent research has revealed that the autonomy orientation is associated with a high degree of integration in personality, a persistent approach toward one's goals, and experiencing greater intimacy and more positive emotions during everyday social interactions. These studies suggest that the global autonomy promotes goal pursuit and adaptive functioning (Koestner & Losier, 1996).

The extent to which goal pursuits are supported by robust competence beliefs has also been extensively explored. Albert Bandura (2001) assigned a central role to efficacy beliefs in determining whether particular goals will be pursued and achieved. 'Perceived self-efficacy' refers to judgements of how well one can perform actions required to deal with a prospective situation. Self-efficacy should not be confused with self-esteem (i.e. global evaluations of personal worth), it refers instead to capability beliefs regarding very specific actions. The assessment of self-efficacy beliefs therefore typically involves designing questionnaire items that inquire specifically about how confident one is that one can perform particular actions. It has been shown that such capability judgements predict performance independently of actual skill levels. There is considerable evidence that self-efficacy beliefs are associated with setting optimally challenging goals and persisting vigorously toward the completion of such goals. Furthermore, meta-analyses have confirmed the association of self-efficacy with positive work outcomes.

How people interpret their success or failure at goal pursuits also represents an important issue in motivation assessment because there is considerable evidence that performance attributions will influence persistence and future performance (Dweck, 1999). Performance attributions are typically assessed by asking people to rate the extent to which an outcome was determined by ability, effort, luck, or task difficulty (Weiner & Kukla, 1970). Research evidence suggests that attributions for success to ability factors is predictive of robust goal striving, but that ability attributions for failure promote helplessness (Weiner & Kukla, 1970).

FUTURE PERSPECTIVES AND CONCLUSIONS

Motivation researchers have shifted their focus from measuring the strength of relatively global individual differences in social motives such as the need for achievement or the need for power to the consideration of the extent to which self-regulatory processes support intrinsic needs such as autonomy and competence. The assessment of the strength of psychological needs such as achievement or power is most helpful in answering questions concerning why certain individuals are drawn to particular activities. The assessment of self-regulatory qualities such as autonomy and self-efficacy is most helpful in answering questions concerning why certain individuals are successful at reaching their personal goals, and whether such success will translate into enhanced adjustment. A full understanding of the pattern and flow of human behaviour and experience thus will require attention to both social motives that are instrumental in selecting goals and to the self-regulatory processes that sustain goal striving.

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Richard Koestner

RELATED ENTRIES

Personality Assessment (General), Interest, Attitudes, Achievement Motivation

MOTOR SKILLS IN WORK SETTINGS

INTRODUCTION

Despite the fact that work is increasingly mechanized and automatized, motor skills are still the main vehicles by which tasks in industrial settings are performed. The literature in this area is vast, originating from psychology, engineering, biology, neuroscience, kinesiology, and physical education. Within the present limited framework, only a few topics can be dealt with to provide some understanding of the basic concepts and a flavour for the field.

First some classificatory schemas and definitions will be provided, and a brief overview is given of the major motor control theories. Then a short description of how movement speed and movement accuracy is formalized in Fitts' law is followed by some methods of observation applied in work settings.

MOTOR SKILLS

A motor skill is defined by Jensen, Schulz, and Bangerter (1983) as the ability to use the correct muscles with the exact force necessary to perform the desired response with proper sequence and timing. Some conceive motor skill also as the capacity to adapt to changing environmental conditions and the consistency of action across repetitions; this is called motor equivalence (Rosenbaum, 1991).

TYPES OF MOVEMENT CLASSIFICATIONS

Capturing the wide repertoire of physical activities requires some ordering principles. A frequently applied classification distinguishes discrete, serial, and continuous movements (e.g. Sanders & McCormick, 1993; Schmidt, 1988). *Discrete* movements involve a single aiming movement to a stationary target with a clearly defined start and end, such as reaching for a control knob or pointing to a command field on a computer display. *Serial* movements involve a series of discrete movements. When similar discrete movements are repeated, like tapping a cursor key on a keyboard or hammering on a nail, they are mostly called repetitive movements, while the term sequential movements applies to a series of discrete movements carried out to a number of stationary targets that are regularly or irregularly spaced, e.g. playing the piano, typewriting, or reaching for parts in various stock bins. *Continuous* movements refer to a class of movements of which the beginning and the end must be arbitrarily defined, as with swimming and steering a car. An additional distinguishing

feature is that these movements need muscular control adjustments during the movement, as in guiding a piece of fabric through a sewing machine. Though not strictly a movement, maintaining posture or a *static* positioning for a period of time might be considered as an additional movement class.

Assessment of motor skills in work settings can be approached also from a *process* perspective: the preparation and execution processes involved in motor skills. In that case one describes motor skills, respectively, in terms of the involved information processes and the cognitive load emerging from preparatory and controlling demands, as well as in terms of maintaining the spatio-temporal trajectory, speed or force of the movement. Another level of description concerns the *quality* of movement outcome, both in qualitative (jerky, good) and quantitative (numbers expressing spatial accuracy, produced force) measures. A last classification schema addresses the predictability of the environment: a movement might belong to the class of open skills (football, soccer) or closed skills (darting, most machine operating skills).

THEORIES ON MOVEMENT CONTROL

The two basic theories of movement control are closed-loop and open-loop models. Central to open-loop models is the concept of a central representation commonly called the motor program. A *motor program* may be viewed 'as a set of muscle commands that are structured before a movement sequence begins, and allows the entire sequence to be carried out uninfluenced by peripheral feedback' (Keele, 1968: 387). Programming demands of a movement skill might be indexed by reaction time or preparation time. Preparation time can be shortened by providing relevant movement information in advance or storing the required movement program as a whole, i.e. by locking prespecified parameter values into the program as a result of learning. It is generally assumed that a class of movements is controlled by a generalized motor programme containing a set of parameters (e.g. relative timing and sequencing of movements) that are provided with specific values for each individual movement of that class to tailor the response to the situation.

Closed-loop theories stress the sensory information signals as the main control agent for movements. Movement control is exerted by comparing the effect of the action to some representation of what the action should be. Any discrepancy is considered error and, as in a negative feedback system, the movement is adjusted to reduce the error. Closed-loop theories may be adequate to explain the control of slow movements, but have problems in explaining fast movements, because in that case time for processing the error-signal might be too short though response-adjustment times of less than 100 ms for an object slipping out of hand or of about 150–200 ms for visually based movement corrections are reported.

A hybrid or intermittent mode of control, where programmed sequences are coordinated and monitored allowing feedback-based adjustments during movement execution, is the usual type of control, for instance the arm-transport phase and a prehension phase which must be coordinated in reaching for a tool. The fine-tuning of open-loop and closed-loop controlled movement execution processes reflects the proficiency of the motor skill. Increasing the proficiency of a movement skill mostly involves also the piecing together of various programmed units into one integrated general structure making it more resistant to change.

SPEED–ACCURACY RELATION

The distance to be covered by the movement and the precision demanded by the size of the target to which one is moving affects the time to exert the movement. An important relation between movement accuracy and movement speed was found by Fitts (1954). He discovered that movement time was a logarithmic function of distance (target size) when target size (distance) was held constant, now called Fitts' law: $MT = a + b \log_2(2D/W)$, in which MT is movement time, a and b are empirically derived constants depending on the type of movement involved, D is the distance of movement from start to target centre and W is the width of the target.

An excellent overview on theories and research of motor skills, like motor learning, reaching and grasping, catching, writing and drawing, posture,

walking, etc., can be found in a comprehensive handbook (Heuer & Keele, 1996).

MEASUREMENT AND OBSERVATION METHODS

Movement skills can be measured on different levels (see previous paragraph) and from different disciplines, such as medicine, sport, kinesiology, vocational rehabilitation, psychology (experimental, developmental), ergonomics, and many more. Some instruments for recording [changes in] postures and basic motor skills in a work setting will be described.

Posture Description

In work settings postures in relation to their contribution to discomfort, strain, stability, or force exertions can be assessed by subjective scoring by workers themselves (e.g. Borg's scale; Nordic Questionnaire) and by observation with the help of standard forms and formulas (e.g. NIOSH-method, OWAS-method, RULA) or with computerized recording (e.g. TRAC-method, Workman-1 method, Owasco & Owasan-method). The instruments can be used for recording work posture and physical load during lifting situations, if a wider margin of error is acceptable. Application mostly requires training (e.g. see Wilson & Corlett, 1999, for an overview).

Indirect observation of body motions is possible through methods which use one, two, or more video cameras to track passive or active markers on a moving subject that can be analysed off-line. Some commercially available systems are CODA, Elite, Optotrak, Proreflex, Vicon, Watsmart, and MotionStar (based on magnetic-induction principle).

Body motions can also be recorded directly. Individual angles between adjacent body segments can be measured using a simple goniometer. By the use of flexible strain-gauges, which are strapped to the joint, recording of motion over a period of time is possible. Range of Movement (ROM) describes the amount of movement, expressed in degrees, through a particular plane that occurs in a joint. A rough measure of tolerable static effort can be derived from lifting and holding times for various loads, expressed as a proportion of maximum voluntary contraction. Electromyography is a good technique for assessing which muscles are used in a task but is of more limited use in accurately assessing the fatigue process.

Simple Motor Tests

A variety of motor skills diagnosis and training instruments is available based on simple movement tasks, like aiming, paced and unpaced tapping, tracing and pursuit tracking, performed unimanually or bimanually. The objective of these instruments is to assess fine motor skills, like speed of arm/hand movement, eye–hand coordination, finger–hand steadiness, bimanual coordination. They are mostly based on standard paradigms of experimental psychology, are objective, reliable and have a high content and logical validity, some of them even provide norm values. Temporal and spatial accuracy, coordination proficiency, and speed are the main dependent variables. Application domains are specific tasks in industry, traffic, and the military. Most of these tests are commercially available as (parts of) psychomotor testing systems (e.g. Vienna Testing System).

In the field of vocational rehabilitation various assessment systems for motor skills exist. A very comprehensive system is Ergos, for example. It consists of five units measuring different aspects of potential body movements: static and dynamic force, whole body range of motion, work endurance, standing and walking, and sitting and reaching. During a 5 hour session, 42 parameters are assessed and compared to more than 14,000 job descriptions.

FUTURE PERSPECTIVES AND CONCLUSIONS

Most measurement devices, tests, and instruments for assessing motor skills provide objective and reliable data which mainly are predictive for performance of a specific movement type or in a narrow set of tasks. Only a few provide norm tables. They emanated from paradigms with which in applied and experimental psychology motor control has been studied suggesting a high content validity. Generally the recording devices possess a high temporal and spatial accuracy.

Computer work increases the risks of Repetitive Strain Injury (RSI) or Cumulative Trauma Disorder (CTD), hence appropriate motor skill tests are required. Furthermore, there is still need for norm tables and prognostic validity of many current motor skill tests.

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Will A.C. Spijkers

RELATED ENTRIES

Applied Fields: Work and Industry, Physical Abilities in Work Settings, Personnel Selection, Assessment in

MULTIDIMENSIONAL ITEM RESPONSE THEORY

Item response theory (IRT) models are stochastic models for responses of persons to items, where the influences of items and persons on the responses are modelled by disjunctive sets of parameters. In the framework of educational and psychological measurement, the person parameter can usually be labelled ability or proficiency; in the sequel, the term ability will be used. The definition of separate parameters for persons and items supports a comprehensive framework for many important issues in educational and psychological measurement, such as test scoring, validity, local reliability, test equating, calibration of item banks using incomplete designs, differential item functioning, optimal test construction and computerized adaptive testing (see, for instance, Lord, 1980, or Hambleton & Swaminathan, 1985).

In many instances, it suffices to assume that ability is unidimensional. However, in other instances, it may be a priori clear that multiple abilities are involved in producing the manifest responses, or the dimensionality of the ability structure might not be clear at all. In such cases, multidimensional IRT (MIRT) models can serve confirmatory and explorative purposes, respectively. As this terminology suggests, many MIRT models are closely related to factor analytic models; in fact, Takane and de Leeuw (1987) have identified a class of MIRT models that is equivalent to a factor analysis model for categorical data. This class of models will be treated first. Then attention will be given to a second class of MIRT models, defined by the existence of minimal sufficient statistics and closely related to loglinear models for the analysis of discrete data. This entry will be concluded with some remarks about the choice between the two models.

In the first class of models, MIRT models for dichotomously scored items were first presented by McDonald (1967) and Lord and Novick

(1968). These authors use a normal ogive to describe the probability of a correct response. The idea of this approach is that the dichotomous response of person i to item j is determined by an unobservable continuous random variable. This random variable has a standard normal distribution and the probability of a correct response is equal to the probability mass below some cut-off point η_{ij}. That is, the probability of a correct response is given by

$$p_{ij} = \Phi(\eta_{ij}) = \Phi\left(\sum_{q=1}^{Q} \alpha_{jq}\theta_{iq} - \beta_j\right),$$

where $\Phi(.)$ is the cumulative standard normal distribution, θ_{iq}, $q = 1, \ldots, Q$, are the Q ability parameters (or factor scores) of person i, β_j is the difficulty of item j, and α_{jq}, $q = 1, \ldots, Q$, are Q factor loadings expressing the relative importance of the Q ability dimensions for giving a correct response to item j. Further, it is assumed that the ability parameters θ_{iq}, $q = 1, \ldots, Q$, have a Q-variate normal distribution with a mean-vector μ with the elements μ_q, $q = 1, \ldots, Q$, and a covariance matrix Σ. So it is assumed that Q ability dimensions play a role in test response behaviour, the relative importance of these ability dimensions in the responses to specific items is modelled by item-specific loadings α_{jq}, and the relation between the ability dimensions in some populations of respondents is modelled by the correlation between the ability dimensions.

For the analysis of responses to multiple-choice items, the model can be extended to

$$p_{ij} = \gamma_j + (1 - \gamma_j)\Phi(\eta_{ij})$$

by introducing a guessing parameter γj. A comparable model using a logistic rather than a normal-ogive representation has been proposed by Reckase (1985, 1997) and Ackerman (1996a & b).

Restrictions have to be imposed on the parameters to identify the model. One approach to identify the model is setting the mean and the covariance matrix equal to zero and the identity matrix, respectively, and introducing the constraints $\alpha_{jq} = 0$, $j = 1, \ldots, Q - 1$ and $q = j + 1, \ldots, Q$. So, here the latent ability dimensions are independent and it is assumed that the first item loads on the first dimension only, the second item loads on the first two dimensions only, and so on, until item $Q - 1$, which loads on the first $Q - 1$ dimensions. All other items load on all dimensions.

An alternative approach to identifying the model is setting the mean equal to zero, considering the covariance parameters of proficiency distribution as unknown estimands. The model is then further identified by imposing the restrictions, $\alpha_{jq} = 1$, if $j = q$, and $\alpha_{jq} = 0$, if $j \neq q$, for $j = 1, \ldots, Q$ and $q = 1, \ldots, Q$. So, here the first item defines the first dimension, the second item defines the second dimension, and so forth, until item Q which defines the Qth dimension. Further, the covariance matrix Σ describes the relation between the thus defined latent dimensions.

In general, however, these identification restrictions will be of little help to provide an interpretation of the ability dimensions. Therefore, as in an exploratory factor analysis, the factor solution is usually visually or analytically rotated. Often, the rotation scheme is devised to approximate Thurstone's simple-structure criterion (Thurstone, 1947), where the factor loadings are split into two groups, the elements of the one tending to zero and the elements of the other toward unity.

As an alternative, several authors (Glas, 1992; Adams & Wilson, 1996; Adams, Wilson & Wang, 1997; and Béguin & Glas, 2001) suggest identifying the dimensions with subscales of items loading on one dimension only. The idea is to either identify these $S < Q$ subscales a priori in a confirmatory mode, or to identify them using an iterative search. The search starts with fitting a unidimensional IRT model by discarding non-fitting items. Then, in the set of discarded items, items that form a second unidimensional IRT scale are identified, and this process is repeated until S subscales are formed. Finally, the covariance matrix Σ between the latent dimensions is estimated either by imputing the item parameters found in the search for subscales, or concurrently with the item parameters leaving the subscales intact.

Several methods have been proposed to estimate the model. The first approach is to use a two-step procedure where the first step consists of estimating the covariance matrix of the latent variables using tetrachoric correlations and the second step consists of factor analysing this

matrix using standard software (LISREL, Jöreskog & Sörbom, 1996; EQS, Bentler, 1992; LISCOMP, Muthén, 1987). A second approach, developed by McDonald (1967, 1982, 1997), is based on an expression for the association between pairs of items derived from a polynomial expansion of the normal ogive. The procedure is implemented in NOHARM (Normal-Ogive Harmonic Analysis Robust Method, Fraser, 1988). The third approach, using all information in the data, and therefore labelled 'Full Information Factor Analysis', was developed by Bock, Gibbons, and Muraki (1988). This approach is a generalization of the marginal maximum likelihood (MML) estimation procedure for unidimensional IRT models (see Bock & Aitkin, 1981), and has been implemented in TESTFACT (Wilson, Wood & Gibbons, 1991). MML estimates for MIRT models with subscales can be obtained using CONQUEST (Wu, Adams & Wilson, 1997). Finally, fully Bayesian approaches with computational methods based on the Gibbs sampler were proposed by Shi and Lee (1998) and Béguin and Glas (2001). For an overview of the relative merits of the various procedures refer to the latter two articles.

The MIRT model for dichotomous items is generalized to a model for polytomous items with m_j ordered response categories by assuming m_j standard normal random variables, and m_j cut-off points η_{ijk} for $k = 1, \ldots, m_j$. The probability that the response is in category k is given by

$$p_{ijk} = \Phi(\eta_{ij(k-1)}) - \Phi(\eta_{ijk}),$$

where $\eta_{ijk} = \sum_{q=1}^{Q} \alpha_{jq}\theta_{iq} - \beta_{jk}$, $\eta_{ij(k-1)} > \eta_{ijk}$, $\eta_{ij0} = \infty$, and $\eta_{ijm_j} = -\infty$. Takane and de Leeuw (1987) point out that also this model is both equivalent to an MIRT model for graded scores (Samejima, 1969) and a factor analysis model for ordered categorical data (Muthén, 1984). This model can be estimated using standard software for factor analysis (see previous paragraph) or using a fully Bayesian approach (Shi & Lee, 1998).

Attention will now be focused to a second class of MIRT models, which is defined by the existence of minimal sufficient statistics and closely related to loglinear models for the analysis of discrete data. The model was probably first proposed by Rasch (1961), and worked out in detail by Fischer (1974), Kelderman (1984, 1989, 1997), Kelderman and Rijkes (1994), and Agresti (1993). The general formulation of the model is given by

$$p_{ijk} = \exp\left[\sum_{q=1}^{Q} \alpha_{jkq}\theta_{iq} - \beta_{jk}\right] h_{ij},$$

where h_{ij} is a normalizing constant that depends on the parameters but is constant for all response categories. There are two important differences between the present model and the loglinear formulation of the factor-analytic MIRT model (Reckase, 1985). Firstly, the α_{jkq}-parameters are now known integers which play a role as minimal sufficient statistics for the ability parameters. For that reason they will be called scoring-weights. Secondly, no assumptions are made about the distribution of the ability parameters. In fact, the item parameters β_{jk} can be estimated by conditional maximum likelihood (CML), which is based on a likelihood where the person parameters θ_{iq} are removed by conditioning on their sufficient statistics. The estimates can be computed using LOGIMO (Kelderman & Steen, 1988). Special cases of the model can be derived by fixing specific scoring-weights; for an overview refer to Kelderman (1997). Further, Kelderman points out that special models for specific hypotheses about the response process can be modelled by choosing the scoring-weights. That is, the relative weight of an ability dimension for producing a response in some category can be reflected in the choice of the scoring-weights. A zero value is chosen when it is assumed that the specific ability dimension does not play a role for this specific category or item.

CONCLUSIONS

The final remark pertains to the choice of an MIRT model. Although this choice is not always clear-cut, the following observations can be made. Firstly, in the loglinear model the score weights are fixed. Therefore, it is a much more restrictive model than the factor-analysis model. Further, the tools for statistical testing are more sophisticated in the loglinear model. Therefore, one might argue that the loglinear approach can play an important role in test construction in situations where items pertaining to some psychological construct can be

selected from some pool of potential items. This situation is characterized by a focus on a theoretical framework and validity issues. The factor-analytic approach is more appropriate for exploring the structure of some item pool in the absence of an elaborate theoretical framework or in situations, such as in educational measurement, where the item pool is created following the specifications of content matter experts and an appropriate model must be found to describe the data as they come.

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RELATED ENTRIES

Item Response Theory: Models and Features, Factor Analysis: Confirmatory, Multidimensional Scaling Methods

MULTIDIMENSIONAL SCALING METHODS

INTRODUCTION

The verb *to scale* means 'to arrange in a graduated series' (Webster's, 1961). Multidimensional scaling means arranging people (or objects) in two or more graduated series. A personality inventory may measure adults on their extroversion and conventionalism, thus yielding two graduated series: extroversion and conventionalism. Each graduated series is a *dimension*. Hence the term multidimensional scaling.

A *scaling model* is a statistical function expressing the relationship between location on a psychological dimension, X, and a behavioural response $B : B = \mathrm{f}(X)$. The dimension might be psychological extroversion. The behaviour might involve reacting to the statement 'I like loud parties' by choosing one of two responses: 'True of me'; or 'Not true of me'. The scaling model would express the probability of choosing the response 'True of me' as a function of extroversion.

If a good scaling model can be found, dimension X can be measured by observing the behaviour and then computing $X : X = \mathrm{f}^{-1}(B)$. The score X then constitutes our measurement. When the behaviour is a response to a test item, then the scaling model is called an item response theory (see entry on 'Items Response Theory: Models and Features').

If the behaviour is a function of two or more dimensions, the scaling model is said to be multidimensional. $\mathbf{B}$ becomes a vector of behaviours and $\mathbf{X}$ becomes a vector of measurements along two or more dimensions. After observing the several behaviours in vector $\mathbf{B}$, the measurements along the dimensions can be taken by computing $\mathbf{X} = \mathrm{f}^{-1}(\mathbf{B})$.

Multidimensional assessment methods fall into two categories, semi- and fully multidimensional. Fully multidimensional assessments are multidimensional in three respects. First, they employ complex tasks, each of which is a function of more than one dimension. Second, they employ multidimensional scaling models. Third, they yield a description of people (or objects) along two or more dimensions. Semi-multidimensional methods are multidimensional only in the last of these three respects. In what follows, semi- and fully multidimensional methods are discussed. Within the semi- and fully multidimensional sections, methods designed primarily for measuring attributes of people and methods for measuring perceptions of stimuli are considered separately.

SEMI-MULTIDIMENSIONAL METHODS

Tests Measuring Individual Differences

A semi-multidimensional technique derives a multidimensional measurement of a person (or object) from multiple, unidimensional behaviours. Imagine a test battery containing reading and mathematics items. B_1 and B_2 are responses to reading items; B_3 and B_4 are responses to the

mathematics items. Let X_R and X_M be variables representing the reading and mathematics achievement dimensions. In a semi-multidimensional technique, it might be assumed that $B_1 = f_1(X_R)$, $B_2 = f_2(X_R)$, $B_3 = f_3(X_M)$, and $B_4 = f_4(X_M)$. The set of behaviours measuring reading and the set of responses measuring mathematics are mutually exclusive sets. Because the responses and the scaling model are unidimensional, the method is only semi-multidimensional even though it yields reading and mathematics scores.

Many cognitive and achievement test batteries called 'multidimensional' are, in fact, semi-multidimensional, because they employ several sets of unidimensional test items that, in combination, form a multidimensional description of the test taker.

Measuring Perceptions of Stimuli

Multiattribute scaling is a term sometimes used to describe semi-multidimensional methods for assessing perceptions of stimuli (Ward & Newman, 1982; Baird & Noma, 1978). In multiattribute scaling, the psychologist begins by delineating the stimulus dimensions to be measured. A marketing researcher studying pizzas might list three dimensions: taste, texture, and appearance. The researcher might ask pizza consumers to rate taste, texture, and appearance on 5-point scales where 1 = very unappealing and 5 = very appealing. Taken together, these three unidimensional ratings of taste, texture, and appearance would constitute a semi-multidimensional description of the pizzas.

Semi-multidimensional approaches make two assumptions, assumptions that are not always tenable. First, they assume the psychologist can list the relevant dimensions. In some cases, these are not known with certainty. In other instances, the salient dimensions vary across people. Secondly, they assume that the psychologist can devise suitable unidimensional response tasks. Such tasks may not be available, or dimensionally complex tasks may be more suitable.

FULLY MULTIDIMENSIONAL METHODS

Tests Measuring Individual Differences

Multidimensional scaling models for items have only begun to emerge even though multidimensional item responses have always existed. Story problems on mathematics tests require both reading and writing ability. Portfolio and work performance assessment (see entry on 'Performance') utilize complex tasks tapping multiple abilities.

Rudimentary fully multidimensional approaches have long existed in the assessment of interests and personality: e.g. the *Minnesota Multiphasic Personality Inventory*, the *California Personality Inventory*, and the *Strong Vocational Interest Blank* (Butcher et al., 1989; Gough, 1987; Hansen & Campbell, 1985). In any test or inventory on which items are keyed to more than one subscale, items are implicitly assumed to be multidimensional. An item asking about interest in reading computer manuals might reflect two interest dimensions, an interest in computers and an interest in technical writing. If so, the item would be keyed to a subscale entitled 'Interest in Computer Science' and one entitled 'Interest in Technical Writing'.

Fully multidimensional models for tests and questionnaires are covered in the entry on 'Multidimensional Item Response Theory'.

Measuring Perceptions of Stimuli

Semi-multidimensional approaches assume that, if the respondent is told to make a judgement based on only one attribute of an object, the respondent will ignore extraneous attributes. There is ample evidence to the contrary (Clark & Lawless, 1994). In personnel evaluation (see entry on 'Personel Selection, Assessment in'), one explanation for the 'halo effect' is that supervisors cannot separate their global impression of an employee from their evaluation on a specific dimension. In fully multidimensional approaches, the respondent makes an overall judgement about the stimulus from which measurements along each separate dimension are derived in a subsequent analysis.

In the approach using *preference judgements* (Bechtel, 1976), the respondent is shown a single object (e.g. a pizza) and asked to make an evaluation of the object, usually on a rating scale (single stimulus approach), or the respondent is shown a pair of objects and asked to indicate which object they prefer and by how much (paired comparison approach). In either approach, the respondents base their judgements on an overall evaluation of the object(s) and presumably consider

several attributes rather than one specific attribute (Green & Wind, 1973).

The major scaling models for preference data have been based on linear or distance assumptions. According to the linear model for a single stimulus judgement, either the behaviour or a monotone transformation of it, $_T(B_{sr})$, is assumed linearly related to scale values:

$$B_{sr} = \sum_d W_{rd} X_{sd} + a_r \tag{1a}$$

or

$$_T(B_{sr}) = \sum_d W_{rd} X_{sd} + a_r. \tag{1b}$$

The latter is called a non-metric model. Here B_{sr} is the response of respondent r to stimulus s, X_{sd} is the measurement of stimulus s on dimension d, W_{rd} is a weight reflecting the salience of dimension d to the behaviour of respondent r, and a_r is an additive constant unique to respondent r. The scaling algorithm uses the responses as input to solve for the parameters in the model, including the measurements X_{sd}. The weight estimates W_{rd} describe individual differences in the saliences of dimensions to respondents.

According to the distance model, a stimulus is highly evaluated to the extent that it matches an ideal, represented in the model by a set of coordinates Y_{rd}. That is, the behaviour is assumed inversely related to the squared difference between the location of the stimulus and the location of the ideal point for respondent r along each dimension:

$$B_{sr} = a - \sum_d (X_{sd} - Y_{rd})^2 \tag{2a}$$

or

$$_T(B_{sr}) = a - \sum_d (X_{sd} - Y_{rd})^2. \tag{2b}$$

Given the responses, the scaling algorithm will solve for estimates of the parameters in the model, including the stimulus measurements X_{sd}. The estimates of Y_{rd} constitute a description of the ideal point for respondent r.

In the approach using *similarity judgements*, the respondent is shown a pair of stimuli and asked to judge the (dis)similarity of the objects. The most well-known methods are based on distance assumptions. The greater the dissimilarity between two objects, the farther apart they are assumed to be in a Euclidean space:

$$B_{ss'} = \sum_d (X_{sd} - X_{s'd})^2 \tag{3a}$$

or

$$_T(B_{ss'}) = \sum_d (X_{sd} - X_{s'd})^2. \tag{3b}$$

Here $B_{ss'}$ is the judged dissimilarity between stimuli s and s' and X_{sd}, $X_{s'd}$ are the measurements of stimuli s and s' along dimension d. Given the responses, the scaling algorithm will solve for estimates of the parameters in the model, the measurements X_{sd}. If there are individual differences in the saliences of dimensions, subject weights can be incorporated into the model to reflect those individual differences.

Figure 1 shows a three dimensional representation from a person perception study by Jones and Young (1972). The stimuli were 17 members of an academic unit (professors and students). Respondents judged the similarity of all possible pairs of members. The authors concluded that there were three dimensions underlying the similarity judgements, political persuasion (liberal vs. conservative), status, and professional interest (statisticians vs. substantive researchers). The algorithm yielded a set of three measurements (scale values) for each member, one locating that member along the political persuasion dimension, one locating that member along the status dimension, and one locating that member along the professional interests dimension (Figure 1).

In fully multidimensional approaches, two problems arise. First, the researcher does not specify the number or nature of the attributes to be considered by respondents in making their judgements. The number of dimensions and the nature of the dimensions must be determined based on the scaling results. Second, with some exceptions, solutions are determined only up to a rotation, translation of axes, and uniform stretching or shrinking of all axes. Sources such as Davison, (1992); Davison and Sireci, (2000); and Borg and Groenen, (1997) discuss a number of dimensions, dimension interpretation, and solution uniqueness.

While multidimensional scaling methods based on distance models were designed for the analysis

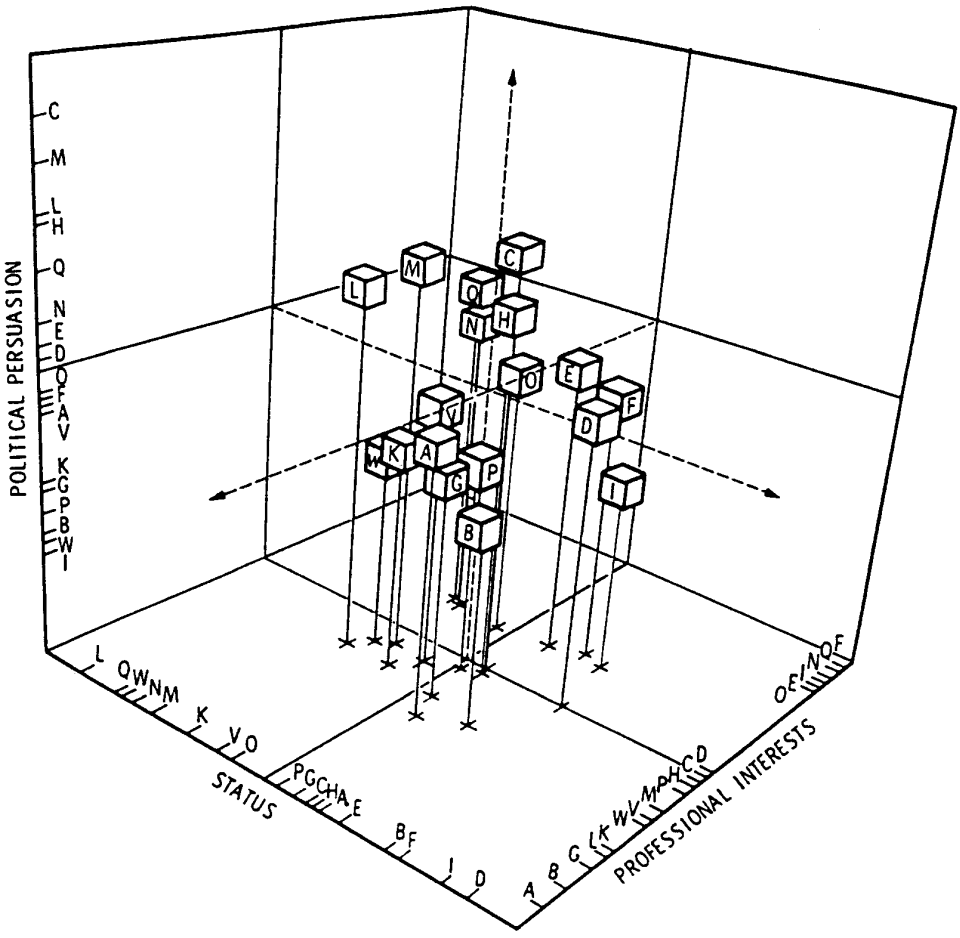

Figure 1. Stimuli coordinate space. The letters A–I denote faculty and a postdoctoral fellow. Letters K–Q, V and W denote graduate students. Copyright 1972 by the American Psychological Association.

of similarity judgements, they have also been used to study a number of issues in testing and assessment, including the dimensionality of a set of items, the most prominent profile patterns in batteries of test scores, and content validity (Davison & Sireci, 2000).

FUTURE PERSPECTIVES AND CONCLUSIONS

Currently, assessments labelled multidimensional often are not fully multidimensional. Fully multidimensional item response models will see wide application after a period of research and development. Fully multidimensional models for perceptual data have seen more application, particularly in marketing research. Ultimately, multidimensional models will make their greatest contribution by expanding the set of complex tasks that can be used for measurement purposes, and thereby open the way for a new generation of tests and assessments.

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Mark L. Davison

RELATED ENTRIES

Theoretical Perspective: Psychometrics, Item Response Theory: Models and Features, Multidimensional Item Response Theory

MULTIMODAL ASSESSMENT (INCLUDING TRIANGULATION)

INTRODUCTION

The aim of this entry is to give a short introduction to the basic concept of multimodal assessment. It deals with the definition of the concept and its differentiation from other concepts, points out the relevance of the strategy in research and practice, emphasizes the main aspects and gives some examples of application in the field of clinical psychology and psychotherapy. Finally, some proposals for future developments are given.

DEFINITIONS

It is generally agreed that human behaviour and experience have to be recorded in a *multimodal* way (other terms occasionally used: multimethod, multimethodically). Thus, distinctions are made between the following aspects (Baumann et al., 1985): databases, sources of data and functional ranges (see Table 1).

On occasions another aspect is added: the type of instruments which are used to assess the relevant aspects of interest (e.g. rating scales, achievement tests, technical procedures).

A term with a similar meaning is *multiaxial* classification, which is used in psychiatry and clinical psychology. This involves describing the patient on different axes or dimensions with the aim of structuring information (about the patient), in order to obtain a more adequate representation of the complexity of the clinical picture and to gather information about the

Table 1. Multimodal assessment

Databases	Basic units of consideration (perspectives: e.g. biochemical, physiological, psychological, social, ecological)
Sources of data	Data provider (e.g. patient, therapist, nursing staff, reference person, neutral observer)
Functional ranges	Partial aspect within a database (e.g. psychological databases: experiences, behaviour, feeling, working capacity)

patient which is relevant to treatment. In general, the following axes (not to be confused with axes or dimensions in factor analyses) are distinguished: clinical syndromes, disabilities/global assessment of functioning or environmental/circumstantial factors.

RELEVANCE

Multimodal assessment can be understood as a *general framework* which has to be specified for the concrete assessment of individual persons or groups of persons, making it necessary to select specific instruments. The choice should be made according to specific criteria. On the one hand, methodological aspects should play a central role (e.g. high psychometric quality, especially reliability and validity). At the same time conceptual considerations should be of equal relevance. This means instruments should be used which allow the characterization of the important aspects of the construct in question.

A multimodal approach is generally required for evaluation, e.g., of psychotherapy and psychotropic drugs research in order to cope with the complexity of the phenomena studied. Multimodal assessment in this area is increasingly gaining importance because of the range of competing psychotherapeutic methods, the development of disturbance-specific treatment approaches as well as manualized/standardized therapy approaches. It is necessary to choose a multimodal approach in order to do justice to the complexity of this area and to account for the variance as to the degree of exactness in databases and data providers as well as functional ranges.

Furthermore, the necessity of a multimodal approach arises from the need to reduce investigator-dependent rating bias and results in the inclusion of different perspectives. With regard to the self-rating scales, bias may include acquiescence, central tendency, or social desirability, on the level of observer-rating scales it may come from insufficient experience with the scale, response sets like generosity error or error of leniency. In planning a study, care has to be taken that it contains sufficient distinct measures to cover the domain of interest, but also that it does not include redundant measures (reduction of statistical power).

PARTICULAR ASPECTS OF MULTIMODAL ASSESSMENT

Relation between Self- and Observer-Rating Scales

In clinical psychology and psychotherapy, where there are usually different data providers for the psychological database (with the patient and the therapist as the most important sources), the relation of self-rating and rating by observers is of particular importance. Both are characterized in relation to other assessment methods in that they are applicable in a vast range of areas and that they are easy to administer (e.g. time-saving).

There are various ways of clarifying the relation between both assessment strategies (e.g. Baumann et al., 1985):

- Assessment of the same facts using the same method by patient and rater,
- Assessment of the same facts using different methods (e.g. self-rating by items and resulting scale values versus rating by others using a global rating scale),
- Structural comparisons of data obtained by observer- and self-rating scales (i.e. factors analysis) or other complex procedures like the multi-trait, multi-method analysis (*cf.* entry on 'Multitrait–Multimethod Matrices' in this volume),
- Comparison of the statements obtained from observer-rating and self-rating scales (e.g. determination of effect sizes).

There is extensive literature available which compares both strategies, especially in the area of psychotherapy and psychopharmacotherapy. Independent of the analysed groups of disorders the results of the studies converge. The following conclusions can be drawn in relation to both strategies:

- Both groups of instruments only correlate to a medium degree.
- Observer-rating scales provide a better differentiation between groups of patients than self-rating scales.
- Observer-rating scales are more sensitive in detecting differences between groups of patients than self-rating scales.
- Great discrepancies are often observed on the level of individual patients.

Various factors may account for these discrepancies:

- The instruments cover different aspects of the construct of interest (e.g. the different instruments used to assess the depressive syndrome),
- The perspective of the patient him- or herself and other data sources are different.

In summary, this does not mean that observer-rating scales are generally to be preferred to self-rating scales. Because not all phenomena of interest (e.g. mood, feelings, complaints) can be assessed with observer-rating scales, they therefore complement each other.

Concordance/Discordance and Synchronicity/Desynchronicity

The question of the degree to which the different databases and data providers correspond has aroused particular interest. If different parameters are identical at the same time, it is referred to as *concordance*, if they are not, this is referred to as *discordance*. If there is a correlation of two depression rating scales in the range of 0.80, convergence can be assumed. If the correlation is 0.50, this is no longer the case, i.e. both instruments cover different aspects of the syndrome (only 25% common variance). If the course of different parameters are parallel over time, there is *synchronicity* (e.g. parallel changes of cognitions and somatic symptoms during anxiety therapy), if not, there is *desynchronicity* (e.g. reduction of avoidance behaviour in the continuing presence of negative cognitions). Each case of discordance or desynchronicity requires an explanation, in clinical routine as well as in research.

In various studies, it was shown that convergence was rather low at the beginning of the therapy and then increased during the course of treatment, reaching its highest point at the end of the therapy (e.g. Möller, 1991).

Triangulation

A term often used in the context of multimodal assessment is triangulation. The concept was developed to find out if a hypothesis was correct when confronted with complementary assessment instruments (Flick, 1991; methodological strategy: multitrait–multimethod analyses).

The term triangulation is used in different ways. According to Green and McClintock (1985) it has a similar meaning as mentioned above (use of two or more different methods to measure the same phenomenon). The goal of triangulation is to strengthen the overall findings through congruence and/or complementarity of the results from different methods. Congruence here means similarity, consistency, or convergence of results, whereas complementarity refers to one set of results enriching, expending upon, clarifying, or illustrating the other. Therefore, triangulation is intended to serve two distinct purposes: confirmation and completeness. The aim of triangulation is not to achieve complete agreement, but to demonstrate the strength and weakness of the single analysis and to integrate the results into a picture.

In an extended meaning of the word, triangulation stands for the *integration of qualitative and quantitative strategies*. According to Kay et al. (1993), evaluation of a course of treatment needs to be approached at several levels. A quantitative level analysis aims to aggregate material, such as the measurement instruments. It may show whether the treatment has an effect on a group, and to what degree it is effective. The qualitative analysis of outsider and insider evaluations could be, for example, the perceived satisfaction of patients and their family members. By analysing individual-level qualitative data it is possible to learn in some ways how and why the treatment achieved the efficacy and satisfaction level reported.

EXAMPLE

For most psychiatric disorders, a multimodal approach is necessary for an adequate description because a gold standard is missing. An example is presented in Table 2. Anxiety disorders in particular are characterized as disorders with different components such as subjective experiences, specific behavioural reactions, and a broad spectrum of somatic/vegetative symptoms.

Table 2. Multimodal assessment of anxiety disorders (examples)

Databases	Psychological, physiological, social
Sources of data	patient, therapist, independent/trained rater, relevant others (e.g. family members)
Functional ranges	• Psychological database: cognitions, emotional reactions, behaviour • Physiological database: physiological reactions • Social database: impairments and handicaps, social support
Assessment instruments	Self- and observer-rating scales, structured or standardized interviews, diaries, behaviour observations, behavioural tests, self-monitoring, physiological assessment instruments

Depending on the specific aim of a study (e.g. the natural course, efficacy of a therapeutic intervention), a broad range of aspects have to be considered.

FUTURE PERSPECTIVES

Clinical assessment requires more than merely deciding whether a particular disorder is present or not. Since treatment decisions and evaluation are usually not only based on diagnoses, the demand arises for a multimodal assessment of the individual patient in practice as well as research. In general, different sources of data, databases and functional ranges/constructs are to be taken into consideration in describing the patients (see Table 1). In research, the concept should be used more to validate instruments as well as to investigate disorders or compare different kinds of therapy. From a conceptual point of view the outcome should not be unidimensional operationalized, although statistical considerations always focus on a single outcome criterion (smaller sample size necessary). For clinical practice Ogles et al. (1996) proposed an organizational and conceptual scheme incorporating the dimensions of content, social level, source, technology and time orientation, which all have to be considered in choosing the most appropriate outcome measures. Content refers to the psychological areas and aspects which should be measured. The social level concerns the differentiation regarding the degree to which an instrument measures intrapsychic (internal) attributes of the patient or more broadly defined characteristics of the patient's interpersonal (external) world. The dimension source includes the decision as to which data source should be considered. Technology refers to the kind of assessment procedure (e.g. global versus specific assessment of a variable). The time-orientation dimension reflects the degree to which the instrument attempts to measure a stable (trait) or an unstable (state) variable.

CONCLUSIONS

A multimodal assessment contributes to a more complete understanding of the complex phenomena of short- and long-term courses of psychiatric disorders and their treatment as well as constructs in other areas of psychology (e.g. occupational psychology). This methodological concept is a valuable but often under-utilized strategy for the investigation of complex and multifaceted phenomena.

None of the various available methods clearly emerges as better than the others, as each has different strengths with respect to the aspects of validity. Not all points are equally accessible to all methods, because circumstances will prevent the proper implementation of one method or another. Major differences are evident among the methods in their potential to be structurally valid (Moskowitz, 1988). It is therefore to be recommended that multimodal assessment becomes standard in research as well as (clinical) practice.

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RELATED ENTRIES

MULTITRAIT–MULTIMETHOD MATRICES, VALIDITY: CONSTRUCT

MULTITRAIT–MULTIMETHOD MATRICES

INTRODUCTION

A multitrait–multimethod matrix (MTMM) refers to a matrix of correlations among multiple theoretical/empirical constructs (traits), each of which is defined operationally by a common set of measurement procedures (methods). Convergence and divergence principle provide a framework underlying the use of MTMM matrices in construct validation research: different operationalizations of a particular construct are expected to measure that construct (convergence) whereas constructs with different labels are expected to refer to different theoretical entities when measured by the same method (divergence). Developed over the past four decades, a large number of analytic methods are now available to analyse MTMM matrices.

Perhaps the most provocative challenge to logical positivism and its core concept of operational definitions of scientific concepts came from the pioneering work of Campbell and Fiske (1959). Definitional operationalism equates a scientific concept to the method (i.e. operation) of obtaining it. Consider, for instance, an IQ score of 110 obtained by using the Wechsler Adult Intelligence Scale (WAIS). The scientific concept of intelligence is defined operationally by the WAIS in this example. Hence, the score of 120 is 'the intelligence'. Despite the fact that there is no ambiguity as to what the intelligence is in this example, Campbell and Fiske argued convincingly that the score of 120 should be more appropriately labelled as 'the intelligence measured by WAIS'. The difference between these two labels is profound because there are other ways (i.e. methods) to measure intelligence, e.g. many other intelligence tests in the form of ratings and behavioural observations, neuropsychological measures, and educational attainments that do not necessarily provide congruent information about one's intelligence. After all, most widely used intelligence tests have less than half of their variances in common. Therefore, the influences of methods on test scores, which is considered as imperfect measures of theoretical constructs, need to be investigated empirically.

Trait measurement is an integral part of psychological assessment. To investigate the trait validity of psychological test scores and the potential biasing effect of measurement methods, Campbell and Fiske proposed the multitrait–multimethod matrix (MTMM), which is a matrix of correlations between multiple traits measured by multiple methods. Traits are conceptualized as individual difference variables which can only be observed indirectly, e.g. intelligence, depression, and self-esteem. There are often multiple procedures of measuring traits. Standardized operations defining the processes of trait measurements are usually referred to as methods, e.g. self-report, direct observations, and supervisory ratings. A measure refers to a trait–method unit, e.g. aggression measured by teacher rating. The MTMM matrix, formed by correlating multiple

Table 1. Multitrait–multimethod matrix

	M_soc	M_att	M_rbb	M_agg	T_soc	T_att	T_rbb	T_agg	S_soc	S_att	S_rbb	S_agg
M_soc	1											
M_att	0.52	1										
M_rbb	0.39	0.52	1									
M_agg	0.59	0.61	0.67	1								
T_soc	0.24	0.15	0.10	0.20	1							
T_att	0.17	0.39	0.19	0.21	0.41	1						
T_rbb	0.09	0.17	0.37	0.25	0.38	0.46	1					
T_agg	0.19	0.21	0.26	0.32	0.56	0.51	0.71	1				
S_soc	0.34	0.21	0.17	0.24	0.19	0.07	0.00	0.05	1			
S_att	0.20	0.39	0.25	0.27	0.02	0.20	0.09	0.07	0.55	1		
S_rbb	0.03	0.16	0.44	0.22	−.05	0.04	0.26	0.08	0.34	0.43	1	
S_agg	0.20	0.22	0.35	0.38	0.02	0.09	0.17	0.16	0.57	0.58	0.62	1

measures, contains information on traits, as well as methods.

MTMM MATRICES

For illustration purposes, an MTMM matrix of four traits, i.e. social problems (soc), attention problems (att), rule-breaking behaviour (rbb), and aggressive behaviour (agg), measured by three methods, i.e. ratings from mother (M), teacher (T), and self (S), appears in Table 1. The MTMM matrix was obtained by the administration of Child Behaviour Checklist, Teacher's Report Form, and Youth Self-Report instruments to 1934 school-age individuals (Achenbach & Rescorla, 2001). The measure labels indicate the method followed by the trait, e.g. T_rbb for teacher's report of rule-breaking behaviour and S_att for self-reported measure of attention problems. Campbell and Fiske classified the MTMM correlations into three sets: (a) different-trait/different method, (b) different-trait/same-method, and (c) same-trait/different-method.

Psychological assessments often utilize test scores which are subject to systematic and random errors of measurement. An inference from a directly observable measure to an unobservable trait requires justification. The MTMM matrix is a powerful tool to make such a justification by investigating convergent validity, discriminant validity, and method-effect. A successful demonstration of convergent validity assures that multiple methods provide congruence information about a particular trait. Large correlation coefficients between multiple measures of each trait (i.e. same-trait/different-method correlations) are consistent with convergent validity requirements. Conversely, trait measurement is suspect if each method provides only a unique aspect of a trait. All measurement methods ideally provide the same rank ordering of individuals for a particular trait.

Discriminant validity requires that correlations between different traits (or traits labelled differently) be less than perfect when measured with the same method. Consider, for example, self-report measures of rule breaking behaviour and aggressive behaviour. When almost all individuals rate themselves high on one measure, also rate high on the other yielding a correlation very close to unity, it casts doubts about rule breaking behaviour and aggressive behaviour as two different traits. A less-than-unity correlation, in a strict sense, may be viewed as a necessary but not sufficient condition to establish discriminant validity. The two traits should not only be different, but also the difference between the two should be meaningful. Once the necessary condition is established through the MTMM matrix (a less-than-unity correlation), further studies may reinforce the discrimination by revealing, for example, that neuropsychological mechanisms underlying two traits are different, traits have different sets of predictors, and they predict different outcomes.

Method effect alters trait correlations by means of introducing systematic biases on trait measures. In turn, distorted trait correlations have ramifications on trait scores, as well as the interpretations of convergent and discriminant validity evidence. Ideally, a measure contains no method effect. In contrast, MTMM studies have shown overwhelmingly that psychological and educational test scores contain a substantial amount of method effect. Examples of method effect include observers

(e.g. mother, father, and teacher reports), response tendencies in rating forms, social desirability, and response format. Pervasiveness of method effect in psychological measures is yet to convince methodologists to study method effect rigorously over the last four decades (Cronbach et al., 1972).

STATISTICAL ANALYSIS

Over a dozen techniques have been proposed to analyse the MTMM matrix with various degrees of complexity ranging from visually inspecting correlation patterns to modelling trait and method effects in a multiplicative fashion. The method proposed by Campbell and Fiske (1959) involved averaging correlations and eyeballing correlation patterns in the MTMM matrix to determine discriminant validity, convergent validity, and method effect. Their method was viewed as intuitive with no reference to any statistical theory. The random ANOVA model, originally proposed to analyse the MTMM matrix, by Kavanagh, MacKinney, and Wolins (1971), gained popularity early on. As demonstrated by Dumenci (2000), these two methods essentially share the same strengths and limitations. Despite their simplicity, both methods require that different-trait/different-method correlations be zeroed up to sampling variability, an assumption often violated in practice. The MTMM matrix in Table 1, for example, is no exception in this regard as the different-trait/different-method correlations reach up to 0.35. Also, differences in scaling factors are obstacles to the validity of inferences drawn from these methods.

Commonly employed methods for analysing MTMM matrices are listed in Table 2. Exploratory factor analysis (Jackson, 1969), non-parametric ANOVA (Hubert & Baker, 1978), partial correlations (Schriesheim, 1981), smallest space analysis (Levin, Montag & Comrey, 1983), equal-level approach (Schweizer, 1991), and constrained component analysis (Kiers, Takane & ten Berge, 1995) are among the exploratory methods for analysing the MTMM matrix. Popularity of exploratory techniques are overshadowed by widespread use of yet another exploratory method of Campbell and Fiske criteria, as well as emerging confirmatory models for the analysis of the MTMM matrix.

Confirmatory models for the MTMM matrix includes a variety of factor analytic models, covariance component analysis, and composite direct product models. Ability to perform hypothesis testing is a distinguishing characteristic of confirmatory models. Those confirmatory models that generate a substantively different MTMM matrix than the observed MTMM matrix preclude making any construct validity claims. When the model-implied MTMM matrix is consistent with the observed MTMM matrix, as judged by statistical criteria, inferences on discriminant validity, convergent validity, and method effect have a stronger footing than those inferences

Table 2. Analytic methods for MTMM matrices

Exploratory	
1 Averaging correlations/correlation patterns	Campbell & Fiske (1959)
2 Random analysis of variance	Kavanagh, MacKinney & Wolins (1971)
3 Exploratory factor analysis	Jackson (1969)
4 Non-parametric analysis of variance	Hubert & Baker (1978)
5 Partial correlation methods	Schriesheim (1981)
6 Smallest space analysis	Levin, Montag & Comrey (1983)
7 Equal-level approach	Schweizer (1991)
8 Constrained component analysis	Kiers, Takane & ten Berge (1995)
Confirmatory	
1 Confirmatory factor analysis	
a CFA: *t*-trait & *m*-method factors	Werts & Linn (1970)
b CFA: *t*-trait & correlated-uniqueness	Marsh (1988)
c CFA: Second-order factor analysis	Marsh & Hocevar (1988)
d CFA: *t*-trait & $(m-1)$ method factors	Eid (2000)
e CFA: Random ANOVA specification	Kenny (1995)
2 Covariance component analysis	Wothke (1984)
3 Composite direct product models	Browne (1984)

originating from exploratory methods. It is perhaps this disconfirmability characteristic that has made the confirmatory models a preferred statistical approach in analysing the MTMM matrix.

Confirmatory factor analysis (CFA) has roots in true-score test theory (Lord & Novick, 1968) and was popularized by early contributions from Joreskog (1971). When applied to the MTMM matrix, the original CFA model of MTMM matrix involves t trait plus m method factors. Assumptions include orthogonal trait–method correlations and uncorrelated unique variables. Overparameterization of the MTMM matrix, convergence problems in obtaining an admissible solution, and out-of-range parameter estimates are commonly encountered problems in this classical CFA model for the MTMM matrix. Several remedies have been suggested to overcome these statistical problems leading to a new generation of CFA-MTMM models. Early modifications included the replacement of m method factors with correlated unique variables (Marsh, 1988) and respecification of each trait–method unit as a common factor by collecting data from multiple indicators for each trait–method unit (Marsh & Hocevar, 1988). These early modifications of the CFA-MTMM model have marginal benefits. The former modification has little value in understanding how the method effect operates on the measures whereas the latter attempted to find methodological solutions to statistical problems. Eid (2000) argued convincingly that the problem with the original CFA-MTMM model is that it has too many method factors. Thus, the resolution offered by Eid is to estimate m–1 method factors.

Covariance component analysis (CCA), a factorial random-ANOVA design, is founded in the generalizability theory of Cronbach, Gleser, Nanda, and Rajaratnam (1972). Applications of CCA principles specifically to MTMM matrices was developed by Wothke (1984, 1987). In addition to a general factor, which accounts for common elements in all measures, two sets of contrast factors, i.e. $t-1$ trait and $m-1$ method, are estimated from a CCA. Trait contrast factors reveal differences between all possible sets of traits, whereas method contrast factors elicit variability between all possible sets of methods. Scale unreliability and scaling differences between measures are taken into account in CCA. Unidirectional relations between scaling and contrast factors are fixed a priori. The matrix containing these fixed coefficients are called columnwise orthonormal in which the sum of squares is equal to unity for each column and the sum of cross-product terms is zero for all column pairs. CCA has several attractive features. CCA follows the multivariate statistical theory underlying MTMM matrices. Evaluations of method effect, convergent validity, and discriminant validity are made after taking into consideration a general factor, differences in scaling of measures, and measure unreliability, all of which are characteristics of commonly encountered psychological measures.

A common characteristic of MTMM models discussed so far is that the functional relations between trait and method factors are formulated in an additive fashion. Under additivity, it is expected that the magnitude of differences between different-trait/same-method correlations and different-trait/different-method correlations is zero up to the sampling variability for all trait pairs. The finding that the method effect varies as a function of the magnitude of different-trait/same-method correlations led to the development of the composite direct product (CDP; Browne, 1984) model in which multiplicative trait–method relations is explicitly modelled. Trait and method multiplicative correlation components, estimated from the CDP model, are then used to evaluate trait validity (i.e. convergent and discriminant) and method effect. Despite its statistical sophistication of handling multiplicative trait–method relations, applications of the CDP models are limited in psychological literature perhaps due to the unfamiliarity and apparent complexity of such models to a typical researcher in psychology. Even in its simplest form, i.e. the structural equation modelling specification of CDP models, a relatively high level of expertise is needed to implement CDP models.

CONCLUSIONS

Complete psychological assessment of individuals inevitably requires measures relatively free from systematic and random errors of measurement. The MTMM matrix is perhaps the most simplistic, yet effective, tool to evaluate trait validity of test scores utilized widely in psychological assessment. Despite the advances in trait measurement over the second half of the 20th century, the method effect remains a thorny issue by posing a serious challenge to the validity of

inferences drawn from test scores in psychological assessment. Trait validity is an ongoing process of improving our confidence in making inferences from test scores. The MTMM analysis is an effective tool in this process.

Design issues need to be taken into consideration in analysing MTMM matrices. A cross-sectional design is a rule in a typical MTMM study. Longitudinal designs also are vulnerable to the method effect even more than cross-sectional studies due to the repeated administrations of a set of measures. Most statistical models of change either totally ignore the issue of method effect or leave it unexplained by common factors (e.g. Kenny, 1995). There certainly are some exceptions. The $t-1$ method factor specification appears to be a sound strategy not only in cross-sectional designs (Eid, 2000) but also in longitudinal models of change as well.

Advances in the analysis of MTMM matrices parallel closely to the advances in structural equation modelling (SEM) over the last four decades. Recent developments in the SEM, particularly in the areas of nominal/ordinal data, missing data methodology, and non-linear/non-normal data, have considerable potential to expand the current scope of construct validity research. The SEM approaches are especially useful for exploring the method effect at item level while traits are evaluated within the latent variable framework.

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RELATED ENTRIES

THEORETICAL PERSPECTIVE: PSYCHOMETRICS, MULTIMODAL ASSESSMENT, VALIDITY: CONSTRUCT

NEEDS ASSESSMENT

INTRODUCTION

Needs assessment can be broadly defined as a systematic set of procedures to identify needs, prioritize them and make decisions concerning programme improvement based on these needs (Witkin & Altschuld, 2000). There are many different approaches to need definitions; for example, Bradshaw (1972) proposed a taxonomy of four types of social needs – normative, felt, expressed, or comparative needs – whereas McKillip (1987) suggested that need was a 'value judgement that some group has a problem that can be solved' (p. 10). A need is generally considered to be a discrepancy between a desired state of affairs and the present state of affairs in regard to a group and a situation of interest (Kaufman, 1988). Needs assessment seeks to determine and analyse such discrepancies and to set priorities for future action.

Sometimes it is difficult to see the distinction between needs assessment and other forms of programme planning. In general, needs assessment is done prior to programme planning and focuses on the ends to be achieved, rather than the means, although needs assessment data can form the basis for selecting the means (Anguera & Chacón, in press).

In this context, the first major problem is to conceptualize needs in order to be able to operationalize them. Social problems have to be translated into needs, which have both quantitative and qualitative domains. Determining the qualitative domain of a social problem involves labelling the situation in relation to theoretical constructs. To determine the quantitative domain, one must identify similarities between persons and groups that experience the same problems in order to categorize them and plan possible interventions to solve those problems (Kettner, Moroney & Martin, 1990). If standards of need are assumed to be relative, there must be a base group to serve as a standard against which to evaluate levels of needs. In needs assessment, the comparison group is most appropriately the community of which the target population is a part. So, we have to identify and study our real affected population, and not necessarily accept population statements about 'wants' as 'needs', as their wants can be different from our designed standards of need.

NEEDS ASSESSMENT PHASES

Needs assessment can be considered as applied social research. It entails a systematic process of conceptualizing a research design, and gathering and analysing data according to accepted standards of social science, and its results are used to inform policy and programme development. Following this logic, Witkin and Altschuld (2000) present a comprehensive process of needs assessment which considers three

sequential phases, each concluding with a written product:

> *Phase 1: Exploration*: The functions of the exploratory phase are to determine what is already known about needs; to identify major areas of concern; and to decide on system boundaries and potential sources of data. In addition, phase 2 is designed during phase 1, and criteria for evaluating the needs assessment as a whole are developed.
> *Phase 2: Data gathering*: Information is gathered and analysed based on (a) archival data; (b) communication processes; and (c) analytical processes.
> *Phase 3: Utilization*: Phase 3 is the bridge between (1) findings from the data and (2) plans for action. It implies setting priorities and criteria for solutions, weighing alternative solutions, and formulating action plans, while considering the allocation of resources.

METHODS FOR CONDUCTING NEEDS ASSESSMENT

Having considered needs assessment as applied social research, we can see that the range of methods used in needs assessment is potentially the same as that available to all applied social researchers. There is no standard method for conducting needs assessment; in fact, we strongly endorse using two or more methods of gathering data on which to base the assessment. At this point it is important to state that data-gathering methods by themselves are not a needs assessment. Needs assessment is a total decision-making process, in which data are but one component. Needs assessment is not a 'top-down' activity, in which a few people decide the needs to be addressed. On the contrary, it implies a democratic involvement of different stakeholders. Furthermore, the active involvement of different groups of stakeholders not only ensures that information takes into account different perspectives but also increases the likelihood that the results of the needs assessment will be used in appropriate programmes.

In order to verify the most frequent tools for gathering data for a needs assessment, we did a review of the literature using WebSPIRS software. We obtained 2075 articles where the term 'needs assessment' appeared in the title and/or in the abstract. We consulted the following databases from 1997 to the present: Current Contents, Sociological Abstracts, Humanities Index, ERIC and PsycINFO. In each type of data gathering method, we give the percentage of articles reviewed that used these methods.

Questionnaires

Surveys, especially in the form of written questionnaires, are the most frequently used tools for gathering data in needs assessment, either alone or in conjunction with other methods (42%). The main advantage of questionnaires is that they are relatively easy to administer. They can be administered to either large or small groups, and respondents can be anonymous and do not have to be physically present. In addition, the use of questionnaires may be less expensive than other types of data gathering. Standardized, structured questionnaires provide quantitative information. But the non-structured/semi-structured non-standardized ones can also provide qualitative information.

Interviews

We found that interviews are the most frequent alternative or complement to the written survey (21%). Their principal characteristic is that the interviewer asks the questions and records the answer. Structured or semi-structured interviews are the most frequent. Their main advantages are that they can give immediate feedback and that they are flexible tools (their structure, contents, protocol, and so forth can be changed through the interview process). Interviews mainly provide qualitative information.

Group Processes

After surveys, group processes are the most widely used method for gathering opinions and data for needs assessment (10.5%). Group processes are important because they constitute an optimal procedure for taking the views of different stakeholders into consideration. The community group forum, the nominal group technique, and the focus group interview have become the most frequent basic group processes in needs assessment.

Generally, group processes proceed through three major stages: (a) Planning (establishing purposes for the meeting; deciding on sampling, meeting site, structure, procedures, and leadership; inviting participants); (b) Implementation (different for each type of process that we will point out); and (c) Follow-up (use results, communicate results in a timely fashion to key decision makers and stakeholders).

Following these global phases, the first type of group process, the community forum, is mainly used to gather stakeholder concerns of need areas, opinions regarding quality, and exploration of community values. The forum is most effective with a group of about 50 participants. Usually the size is quite large. The second type, the nominal group technique, is most frequently used as a small group technique; the group is generally made up of 6 to 10 participants. The main objective of the nominal group technique is to produce a large number of ranked-ordered ideas in a relatively short period of time. One of the main characteristics of this technique is that the group members do not interact as they would in other group processes. Finally, the focus group interview is a structured process for interviewing a small group of, usually, between 8 and 12 individuals. Its purpose is to obtain in-depth views regarding the topics of concern. Obtaining a consensus is not the goal. This technique provides an opportunity for participants to hear the views of the other members as well. Interactions in the focus group interview flow in two ways: between group members and between participants and the leader or coordinator of the group.

Archival Research

When archival data are available and fits the focus of the needs assessment, they are valuable and should be used (6.5%). The use of existing records is generally cheaper and requires less time than creating new data sets. Such resources often have problems of quality and accuracy. They should be used only after seriously analysing their quality.

Literature Review

This method presents similar advantages and disadvantages to archival data and is used in the same proportion (6.5%). The major problem with this procedure is that such reviewed records are rarely designed expressly for the purpose of needs assessment and, consequently, they can present additional problems of interpretation and validity.

Other Kinds of Specialized Surveys and Group Techniques

In addition to the preceding group of methods, we found a less frequent mixture of different types of data-gathering procedures in our literature review (indicators, critical incidents, preference inventories, advisory councils, and so forth). Depending on the context in which NA is carried out, we can combine the previously described, more usual techniques with different and novel approaches. The key point is to clearly determine the purpose of the specific needs assessment in order to select the proper data-gathering method or combination of methods.

DATA ANALYSIS AND INTERVENTION CONTEXT IN NEEDS ASSESSMENT

Data analysis in needs assessment is theoretically oriented to causal analysis, examining needs in terms of their potential causes, particularly with regard to identifying those factors that can be changed with the available resources. Nonetheless, in our literature review we found that in actual practice during the last five years more than 60 per cent of reviewed records only used descriptive statistics, 8 per cent presented multivariate analysis, and the rest of the papers presented basic and classical inferential analysis (regression, Chi-squared, ANOVA, McNemar test, and so forth).

Given that it can be implemented in any organization or agency service, needs assessment presents a wide diversity of intervention areas. Our study of several hundred needs assessments that were conducted from 1997 showed that needs assessment is more frequent in social and health areas than in education. Specifically, some of the major areas in health programme applications are related to programmes for the elderly, physician and nurse training programmes, HIV/AIDS studies, neuropsychology, cancer, mental illness, sexuality, coronary heart diseases, and healthy eating (i.e.

Buhler, Oades, Leicester, Bensley & Fox, 2001). On the other hand, in the social intervention context we found the following main intervention areas: interventions with family or persons with illnesses, patients at risk, the unemployed, children with divorced parents, sexuality, and students with disabilities (i.e. Borgen, 1999). In the educational area we found some applications on school violence, training programmes for teachers, adult students, and continuing education (i.e. Coggeshall & Kingery, 2001).

FUTURE PERSPECTIVES

In the future, needs assessment will continue to be important, and may even grow in importance; however, those scholars and practitioners conducting needs assessment must pay attention to two important points.

First, new technologies will facilitate a rapid gathering and analysis of information from disparate groups of stakeholders. This is related to groups communicating electronically, new strategies for concept mapping, and analysis of Delphi responses (Scrimshaw & Hurtado, 1987). There has been very little empirical research on needs assessment. Because of this, more comparative studies of different methods of data gathering, as well as syntheses of different research efforts, will be needed in order to enhance other, more sophisticated techniques different from descriptive analysis.

Second, those interested in needs assessment must weigh the needs of individuals and partial groups with national or regional interests (Leviton, Finnegan, Zapka, Meischke, Estabrook, Gilliland, Linares, Weitzman, Raczynski & Stone, 1999). How can this be achieved? Macro-level needs assessment (usually using national statistics and indicators) must be combined with micro-level needs assessment (based on group processes and rigorous qualitative methods).

CONCLUSIONS

Needs assessment consists of determining, analysing, and prioritizing needs and, in turn, making decisions concerning strategies to resolve high-priority needs. After reviewing 2075 papers related to needs assessment published between 1997 to October 2001, it is clear that it is important to increase the use of more specific instruments for data gathering in addition to surveys and to use more precise analytical techniques in addition to descriptive statistics.

When carrying out a needs assessment process, we have to take into account four main factors that are basic to be successful: (a) proper consultation of the real affected population; (b) differentiating between population statements about 'wants' and 'needs'; (c) using needs assessment as a participatory process, not a 'top-down' process; and (d) understanding that different methods should be used for gathering information, but that the methods themselves are not a needs assessment.

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RELATED ENTRIES

Evaluation: Programme Evaluation (General), Evaluability Assessment

NEUROPSYCHOLOGICAL TEST BATTERIES

INTRODUCTION

Given the progress in neuroimaging methodology, it is not the primary task of neuropsychological test batteries to detect brain injury. Today, neuropsychological testing has to meet more specific tasks, especially the evaluation of rehabilitation programmes and neuropsychological trainings. The first part of this contribution refers to impairment, disability, and handicap as three different levels of neuropsychological assessment. Following an explication of tasks and problems of neuropsychological assessment in the second part, relevant aspects of neuropsychological functioning are differentiated and diagnostic tools for the assessment of attention, memory, dementia, coping with illness, emotional status, and specific executive functions are presented.

LEVELS OF NEUROPSYCHOLOGICAL ASSESSMENT

Proceeding from the terminology proposed by the WHO (see Matthesius et al., 1995), possible long-term consequences of brain damage and effects of neuropsychological rehabilitation can be conceptualized according to the three levels of impairment (i.e. amount of the damage itself, e.g. damages in basic processes of memory, concentration, and perception), disability (i.e. resulting functional losses, e.g. decreases in working performance attributable to memory, concentration, or perceptual disorder), and handicap (i.e. disadvantage in social functioning, e.g. job discrimination). Corresponding to this differentiation, three aims in the treatment of neuropsychological problems can be distinguished: restitution (i.e. full recovery of functional status), compensation (i.e. enabling the person to compensate successfully for every-day consequences of impairment), and adaptation (i.e. adjusting environmental conditions so that the person is able to lead an independent life).

According to Wilson (1997), simply focusing on drill and exercise, most cognitive training programmes in neuropsychological rehabilitation proceed from the impairment level. This kind of training programme has been said to be useless for brain-damaged persons, since a restitution of cognitive abilities is often impossible. Instead, Wilson (1997) proposed neuropsychological rehabilitation to focus on the disability-level. Proceeding from neuropsychological knowledge, educational programmes should enable patients to compensate for individual problems attributable to neuropsychological impairment. Consequently, behavioural therapy is seen as a basis for developing individual training programmes, aimed to optimize patients' performance in everyday activities. From a practical perspective, training programmes should not be restricted to the improvement of basic processes (i.e. hoping for a generalization of regained skills and abilities) but should also consider the importance of environmental conditions for the relationship between competencies and actual performance. Focusing on the respective relevance in patients' everyday life, it can be argued that exactly those activities, that are usually expected to benefit by means of generalization, should be trained in rehabilitation programmes.

Nevertheless, all the three levels differentiated in the WHO-classification are of high relevance for neuropsychological assessment. First, none of these levels can be ignored since the development of individual intervention measures as well as the evaluation of effectiveness and usefulness of rehabilitation programmes must rely on information about the kind and severity of impairment, disability, and handicap. To give an example, proceeding from the impairment-level it might be obvious that a training aimed to improve memory performance should be offered. However, it is not enough to claim that patients' memory performance in a specific psychometric test could be improved due to the participation in a cognitive training. Additionally, to establish the effectiveness and usefulness of the respective intervention measure, it must be shown that patients do suffer from less memory problems or are more effective in managing memory tasks after their participation in the respective programme than before.

Corresponding to the differentiation between impairment, disability, and handicap, three methodological approaches of neuropsychological assessment can be distinguished: (1) Diagnostics of impairment using psychometric instruments. Here, diagnosis of impairment is often identical with establishing the presence or absence of neuropsychological symptoms or syndromes. Examples are measuring intelligence or memory capacity with standardized tests or assessing neglect by means of perimetry. (2) Diagnostics of functional capacity establishing degrees of (in-)dependency in managing every-day tasks. Examples are lists of activities of daily living, including questionnaires developed especially for patients suffering from specific neuropsychological disorders, e.g. for assessing communicative effectiveness or cognitive failures. (3) Diagnostics of social consequences using scales to determine degrees of social integration (e.g. in contexts of job and family) and other psychosocial factors.

TASKS AND PROBLEMS OF NEUROPSYCHOLOGICAL ASSESSMENT

Just as psychological diagnostics in general, neuropsychological diagnostics was characterized from the beginning as status diagnostic: aimed to register the actual status of a person in different areas of psychological functioning, whenever possible in relation to a relevant comparison group. Results of neuropsychological diagnostics have long been used as decisive criteria for the assumption of brain damage. The extensive neuropsychological test batteries, developed to estimate the probability of brain damage, are only seldom applied in a complete version today, since the question whether the assumption of brain damage seems justified or not has become obsolete, given the development of neuroimaging methods (e.g. Deutsch & Mountz, 2000). Global measures of psychological functioning, e.g. intelligence scales, are still in use today, either as an indicator of personal competencies or as a means of validating new developed methods of neuropsychological screening. Today, compared with traditional methodological approaches, neuropsychological assessment must answer more specific questions; neuropsychological test batteries have to be evaluated against more specific criteria: first, rather than establish a global measure of decline in performance, neuropsychological test batteries should be able (a) to determine which specific aspects of performance are deficient, (b) to quantify the degree of deficiencies in the respective aspects of performance, and (c) to identify specific aspects of performance that might be improved by training or other intervention measures (Capitani, 1997). Second, neuropsychological test batteries should be suitable for documenting effects of neuropsychological training. The measurement of skills and abilities must be sensitive to the registration of even small changes in dependent variables, simultaneously being insensitive to artificial effects of repeated measurement (see Baddeley et al., 1980). Consequently, it has been argued that neuropsychological assessment should focus on basic processes (e.g. reaction times) underlying the observed complexity in psychological functioning (e.g. in the areas of perception, memory, intelligence, problem-solving, etc.). On the other hand, as already mentioned in the context of levels of neuropsychological assessment, the usefulness of rehabilitation efforts depends on significant effects on everyday performance; a detailed analysis of the impairment level must be complemented by an appropriate analysis of the disability level (Wilson, 1997).

The usefulness of neuropsychological screening tests like the Mini Mental State Examination, the Quick Cognitive Screening Test, or the Neurobehavioural Cognitive Status Examination in the evaluation of rehabilitation processes and outcomes depends on the initial level of cognitive capacity. Such screening tests only allow for an appropriate assessment of rehabilitation effects in the case of extreme deficits in patients' initial performance. Because of the limited value of screening tests for answering the questions sketched above as central topics of neuropsychological assessment, research on the effectiveness of rehabilitation programmes or more specific neuropsychological trainings generally depends on the use of neuropsychological test batteries allowing for a detailed assessment of deficiencies and competencies in the areas of attention, memory, coping with illness, visuo-perceptual information processing, executive functions, and neglect. Since the relevant information is often acquired by means of computer assisted diagnostics, i.e. tasks to be worked out by the subjects are presented on the PC-screen, solutions are encoded via keyboard and analysed by the respective software, it is reasonable to use the diagnostic tasks simultaneously as a basis for training programmes. However, it should be noted that training effects are of questionable validity if diagnostics simply repeat the content of the training (e.g. Knab, 2000).

Common problems of psychological diagnostics are of particular relevance in neuropsychological assessment. Many brain-damaged patients suffer from deficiencies in vigilance and emotional well-being, i.e. circumstances accounting for worse test performance in otherwise healthy subjects. Moreover, claims for indemnification, e.g. following an accident, might lead to an aggravation of symptoms of neuropsychological impairment (see Binder & Rohling, 1996; Nies & Sweet, 1994). As a consequence, a detailed analysis of potential biases in the test situation is a prerequisite for adequate neuropsychological assessment.

COMPONENTS OF NEUROPSYCHOLOGICAL TEST BATTERIES

Adequate assessment of neuropsychological status proceeds from detailed information about patients' personality, behaviour, mental abilities, learned skills, and rehabilitation potential. The necessary information is gained through a combination of different methodological strategies relying on different sources of information. As a rule, an exploration of premorbid history, including psychosocial information (see Sloan & Ponsford, 1995) and medical history (see Silver et al., 1997), can further the understanding of patients' problems and needs. However, observation is the foundation of all psychological assessment (Lezak, 2000). Neuropsychological assessment often relies on direct and indirect observations. Indirect observations include reports from caregivers, employers, family members, etc., who interact with patients in contexts, where the patient has no self-consciousness about being observed. Direct observations can be differentiated in informal observations, e.g. during an anamnestic interview, and psychological tests, i.e. 'a set of observations, made under standardised conditions for the purpose of measuring a characteristic or a set of characteristics with dimensional or multivariate features' (Lezak, 2000: 69). Psychological tests can be used in the assessment process to gain insight into behavioural phenomena, conditions, capacities, or states. Although typically conducted in artificial situations, psychological tests build an inevitable part of the assessment process, since formal testing – and only formal testing – allows for a comparison of patients' characteristics with relevant standards and norms and a documentation of behavioural changes in terms of their statistical significance.

Neuropsychological test batteries consist of a number of subtests which provide information about competencies and deficiencies in diverse areas of neuropsychological functioning. Since information about reliability and validity is available for each subtest of a given battery, subtests should be regarded as diagnostic tools that can be combined according to the information required for assessing the neuropsychological status of the individual patient. Consequently, in the following we do not focus on the portrayal of specific neuropsychological test batteries, e.g. the TAP (Zimmermann & Fimm, 1993), the ART-90 (Bukasa & Wenninger, 1986), or the Vienna Test System, as a whole. Instead, proceeding from the neuropsychological functions to be assessed, we will give a brief sketch of psychological tests that proved to be of sufficient reliability and

Table 1. Aspects of neuropsychological functioning and respective diagnostic tools

Aspects of neuropsychological functioning	Diagnostic tools
Attention	
(a) Alertness	Subtests of TAP, ART-90, and Vienna Test System
(b) Selectivity	Go/Nogo (TAP), Vienna Determination Test, d2, Stroop-Test
(c) Information processing capacity	Shared Attention (TAP), PVT (ART-90), Vienna Determination Test, Trail-Making-Test, ZVT (NAI), d2, PASAT
Memory	
(a) Short term memory	Subtests of WAIS-R, BAT, and ZVT (NAI)
(b) Working memory	Working Memory (TAP), PASAT
(c) Long term memory	Subtests of BAT and NAI, RBMT, LGT-3
(d) Orientation	Orientation Test for Rehabilitation Inpatients
(e) Dementia	MMSE, FAST, BCRS, NOSGER, ADAS, HIS, SIDAM, BAI
Coping with illness and Emotional status	
(a) Coping with illness	TSK, FKV
(b) Coping with pain sensations	SVS
(c) Emotional disorders	DSM-III-R/DSM-IV, ICD-10
(d) Depression	CDS
Executive functions	
(a) Mental flexibility	WCST, Trail-Making-Test, BCT, Means-Ends–Problem-Solving-Tasks
(b) Concept development	Subtests of LPS and IST-70

validity and therefore can be combined in individual neuropsychological test batteries. Since the assessment of visuo-perceptual impairment and neglect is described in detail in another contribution to this encyclopaedia, this entry concentrates on diagnostic tools for the assessment of four aspects of neuropsychological functioning: (1) attention, (2) memory, (3) coping with illness and emotional status, and (4) executive functions (see Table 1).

Attention

This aspect of neuropsychological functioning has long been regarded as a single, homogeneous concept (e.g. in the sense of concentration). Today, following the work of Posner and associates (e.g. Posner & McLeod, 1982), attention is differentiated in the three components alertness, selectivity, and information processing capacity. Godefroy et al. (1996) could show that these components can be affected differently in brain damaged people.

(a) Alertness can be operationalized as simple reaction times or as sustained attention. Examples for the former are the subtest Alertness of the TAP, testing reaction times after presentation of visual stimuli, and a subtest of the Vienna Test System, testing reaction times after presentation of auditory stimuli. Examples for the latter (sustained attention) are the TAP-subtest Visual Vigilance and the VIGO-subtest of the ART-90.

(b) Tests of selectivity require the consideration of diverse stimuli and a selection among alternative responses. Well established are the Go/Nogo-subtest of the TAP, the Vienna Determination Test from the Vienna Test System, specific concentration tests like the d2 or the Stroop-Test.

(c) Information processing capacity is operationalized via tests of shared attention and tests of speed of information processing. Examples for the former are the subtest Shared Attention of the TAP, the subtest PVT of the ART-90, and the Vienna Determination Test of the Vienna Test System. Examples for the latter are the Trail-Making-Test, part A, the ZVT of the Nuremberg Age Inventory (NAI), the d2, and the Paced Auditory Serial Addition Test (PASAT).

Memory

Regarding this aspect of neuropsychological functioning, it should be at least differentiated between short term memory, working memory, long term memory, and orientation (concerning time, place, situation, and person). Moreover, in the context of severe deficits in memory and orientation the diagnosis of dementia is an important task for neuropsychologists.

(a) Short term memory is often operationalized via repeating lists of words or numbers, well established are the subtests of the WAIS-R (Wechsler Adult Intelligence Scale – Revised), the BAT (Berlin Amnesia Test), or the ZVT subtest of the NAI. For the assessment of visual short term memory, good tools are the Benton-Test and the subtest Pattern Recognition of the BAT.

(b) Working memory can be assessed via the subtest Working Memory of the TAP, requiring processing of visual stimuli, or via the PASAT, requiring processing of auditory stimuli.

(c) Long term memory can be assessed, e.g., via five subtests of the BAT (Unstructured Recall, Semantic Interference, Recognition, Proactive Interference, Recall with Semantic Structure), via the subtest Word List of the NAI, or via more extensive tests of learning and memory which also allow for comparison of performance with verbal versus non-verbal materials or an analysis of topographic memory (see e.g. Rivermead–Behavioural-Memory-Test, RBMT; Learning and Memory Test, LGT-3).

(d) A good tool for testing orientation in inpatient rehabilitation has been developed by Cramon and Säring (1982). Unfortunately, this scale can not be used for neuropsychological assessment in the context of ambulant rehabilitation.

(e) The Mini Mental Status Test is well established in the assessment of severe cognitive deficits. A similar diagnostic tool has been proposed with the Zürcher Variante. Another diagnostic tool for the assessment of dementia, the Functional Assessment Staging (FAST), has been developed from the Brief Cognitive Rating Scale (BCRS). The FAST primarily focuses on questions of everyday competence and independent care, whereas the BCRS focuses primarily on the degree of cognitive impairment. The Nurses' Observation Scale for Geriatric Patients (NOSGER) is a good complement to other scales for the assessment of dementia, since it relies on observations of caregivers. Similarly, the Alzheimer Disease Assessment Scale (ADAS) consists of two parts: an interview and an observation of a patient's behaviour. The Hachinski Ischemic Scale (HIS) can be used for a differentiation between Alzheimer and multiinfarct dementia. Moreover, two structured interviews were proposed for the assessment of dementia: the SIDAM, a structured interview for the diagnosis of Alzheimer dementia, multiinfarct dementia, and other kinds of dementia, and the Brief Assessment Interview (BAI).

Coping with Illness and Emotional Status

Assessment of this aspect of neuropsychological functioning can rely on several psychometric scales, e.g. TSK or FKV, that allow for a reliable and valid measurement of coping strategies, which can be interpreted as dimensions explaining for the variance observed in patients' reaction to symptoms and deficiencies. Moreover, it can be useful to explore patients' coping with pain sensations. Here, the SVS (Klinger & Morawetz, 1993) can be regarded as a good diagnostic tool.

As a consequence of insufficient adaptation to neuropsychological problems, patients can develop severe emotional disorders. Therefore, it must be analysed whether patients meet the diagnostic criteria explicated in the classification of ICD-10 or DSM-III-R/DSM-IV. Moreover, neuropsychological assessment should integrate psychometric scales to gain insight into patients' emotional status. Several psychometric scales allow for a reliable and valid measurement of depression, control beliefs or anxiety. However, especially at the beginning of neuropsychological assessment and rehabilitation, patients' deficiencies might force the clinician to do without the initial application of self-rating scales and to rely on

extrospective information instead. However, the Cornell Depression Scale, originally developed for the assessment of depression in patients suffering from dementia (Alexopoulos et al., 1988), is a diagnostic tool primarily relying on the observation of patients' behaviour and requiring only a minimum of cognitive abilities.

Executive Functions

Only a part of the neuropsychological assessment of executive functions relies on standardized psychological tests. Since deficiencies in executive functions primarily become apparent in ecologically valid analysis of everyday activities, cognitive and emotional status tests are only of minor relevance in the assessment of this aspect of neuropsychological functioning (e.g. McCarthy & Warrington, 1990). Nevertheless, some executive functions, especially mental flexibility and concept development, can be assessed through psychological testing.

(a) Mental flexibility can be operationalized via tendencies of perseveration or via change of routines. Good diagnostic tools are the Wisconsin-Card-Sorting-Test (WCST), the Trail-Making-Test, part B, the Booklet Category Test (BCT), and the Means-Ends–Problem Solving Tasks (Spivack et al., 1976).

(b) Concept development can be assessed via measures of word fluency and reasoning. The respective subtests of the LPS and the I-S-T-70 are diagnostic tools of high reliability and sufficient validity.

FUTURE PERSPECTIVES AND CONCLUSIONS

It has been shown that reliable and valid diagnostic tools are available for assessing aspects of neuropsychological functioning. However, components of neuropsychological test batteries too often focus exclusively on basic abilities and skills, i.e. the impairment level of neuropsychological assessment. Unfortunately increasing performance in tasks requiring basic abilities and skills cannot be regarded as an indicator of effective rehabilitation as long as the generalization of these advances has not been proven. As a consequence, further research is needed to improve our understanding of the relationship between impairment and disability. Putting forward the assessment of the disability level is a prerequisite for such research.

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RELATED ENTRIES

Applied Fields: Neuropsychology, Equipment for Assessing Basic Processes, Attention, Memory (General), Executive Functions Disorders

NORM-REFERENCED TESTING: METHODS AND PROCEDURES

INTRODUCTION

This entry provides a definition of norm-referenced testing emphasizing its specific characteristics as it pertains to educational and psychological testing. The different uses and applications of norm-referenced tests as highlighted by the most popular types of comparisons made are also noted. Third, the advantages and disadvantages of norm-referenced testing are discussed while future applications and uses of norm-referenced testing are described in the concluding section.

DEFINITION AND CHARACTERISTICS OF NORM-REFERENCED TESTING

Norm-referenced testing refers to the process of developing and applying tests to enable the interpretation of an examinee's score relative to that of other examinees. Norm-referenced tests provide answers to the question: 'How much of the measured construct does a person possess in relation to the comparable norm group?' Norm-referenced testing differs from criterion-referenced testing (CRT) as the primary purpose is to determine how examinees compare to each other and not to what examinees know or can do. While the use of information from these tests might differ, for both norm- and criterion-referenced tests, many of the same stringent test development procedures have to be followed.

The distinguishing characteristics of norm-referenced tests noted by Popham (1990), Thorndike (1997), and many others include:

- individuals are placed on a continuum defined by a range of particular behaviours expressed in a specific population;
- a quantitative answer to the question 'Where does this individual rank relative to that of a specific-referenced group?' is provided;
- items typically span the entire range of difficulty values;
- standards of performance are not inherent in the instrument and are only defined after the distributions of scores have been determined;
- no set minimum passing score is defined a priori;

- test scores are expected to show considerable variability.

USES AND APPLICATIONS

The primary reason for using norm-referenced testing is to discriminate among examinees; that is, to highlight differences among examinees by producing a dependable rank order of examinees on the construct measured by the test. Typically, most aptitude, interest, and personality inventories are norm-referenced since there are no universally acceptable or relevant criteria to compare the scores against. Norm-referenced testing provides useful information for making decisions in the worlds of learning, work, and play; for example, determining appropriate development levels of children with specific difficulties or selecting the most suitable applicant for a job.

In practice, comparisons in performance among examinees are made using norm tables. Norm tables provide a frame of reference for interpreting the scores of particular examinees in comparison to the particular normative group that defines the set of standards (Murphy & Davidshofer, 1998). Depending on the purpose of testing, norm tables can be developed at different levels (national, local) and for different samples of the population (e.g. males and females or second language speakers). It is important to note that norm tables can only be developed for instruments in which a total score can be calculated, for example a test or a scaled questionnaire. However, if norm tables are to be useful, they must be based on recent data, be representative of the population, and be relevant to the group of interest (Murphy & Davidshofer, 1998).

The process of constructing norm tables, called norming, can be a complex, costly, and time-consuming process that usually entails two stages: (1) the test is administered to a representative sample of examinees for whom the test was developed; and (2) the raw scores obtained on the test are converted to scale scores that define the type of norms developed. Three additional points need to be noted. First, norms can only be developed for standardized tests. If tests are not standardized, by definition any comparison would not make sense as examinees take the test under different conditions. Second, norm tables must be completed before any norm-referenced test scores are released. Third, all norm tables have to be regularly updated since norm groups (especially national samples) generally change over time. Depending on the purpose and use of the test, norms are typically updated every 5 to 8 years.

A thorough discussion of the different types of norm tables, the different ways of classification, the procedures for calculating these tables, and the specific advantages and disadvantages of each type is beyond the scope of this entry. Instead, the most common norm tables used, namely percentile ranks, normalized standard scores, developmental scales, and deviation IQ scores (Murphy & Davidshofer, 1998; Nitko, 1996), will be briefly discussed.

Percentile Ranks

Percentile ranks indicate the percentage of examinees from the norm group that falls below a specific raw score. For a particular examinee, the percentile rank indicates the percentage of persons that s/he has outscored in the norm group of interest. For example, a person with a percentile rank of 79 has outscored 79% of the examinees on whom the test was normed.

Normalized Standard Scores

Normalized standard scores are raw scores from a norm group that have been transformed via a non-linear transformation to approximate a normal distribution. Two types of scores frequently used include the normalized z-score (mean 0 and standard deviation 1), and the normalized T-score (mean of 50 and standard deviation 10). For example, the performance of a person with a normalized z-score of 2 (T-score of 70) is similar to the performance of the top 3% of the norm group.

Developmental Scales

Developmental scales compare an individual to that of the average person in the norm group at a similar age or grade level. Paediatricians, for example, commonly use age equivalent scales to ascertain whether children are undergoing any unusual growth patterns by comparing the height or weight of a child to the expected rate of

growth for children of a similar age. Grade equivalent scales, expressed as a decimal 4.5 to indicate the 4th grade and 5th month, provide information on how an examinee's score compares to other examinees at various grade levels. For example, a raw score of 43 which may have a grade-equivalent score of 7.0 indicates that the examinee performs at the level of a student beginning the seventh grade.

Deviation IQ Scores

The IQ score, probably one of the most debated and controversial topics in the field of psychological assessment, was originally proposed as an index of intellectual development and defined as the ratio of the examinee's mental age to his/her chronological age. To address the shortcomings of the IQ score, defined as a ratio of mental age to chronological age, the deviation IQ score, with a mean of 100 and a standard deviation of 15, was introduced (Anastasi & Urbina, 1997). Deviation IQ scores range between 55 and 145 with scores at the higher end indicating above average performance and scores at the lower end indicating below average performance.

ADVANTAGES AND DISADVANTAGES

The advantages and disadvantages of any testing process must be considered in the context for which the testing is conducted. One advantage of norm-referenced tests is that these tests provide a basis for comparing examinees when making selection and/or diagnostic decisions. This is especially relevant in the context of psychological assessment where there are no fixed criteria or performance standards to compare against. In addition, norm-referenced tests are often broader in focus than criterion-referenced tests and are more useful in providing a broad overview of examinee performance (Popham, 1990).

The biggest disadvantage usually associated with norm-referenced tests is that little information is provided regarding what an examinee knows or can do. This disadvantage, however, is mainly applicable to achievement testing. A second disadvantage relates to the interpretation of norms as standards. In this context, the emphasis should be on how people *currently* perform and not on how they *should* perform. This issue, however, can easily be addressed by ensuring that norm tables are properly used.

FUTURE PERSPECTIVES AND CONCLUSIONS

Three reasons for why norm-referenced testing is here to stay are as follows: (a) there is the natural tendency for humans to want to know how others are doing and where we fit in; (b) there is the need for greater information to facilitate improved decision making, which is especially relevant for accurate diagnosis and identification of appropriate intervention strategies; and (c) in the context of a general lack of fixed or agreed-upon criteria, norm-referenced information at least provides some basis for comparison. For the near future two aspects need to be highlighted: (a) the greater use of information technology for making norm-referenced comparisons and interpretations, and (b) greater synergy between norm- and criterion-referenced decisions in all testing processes.

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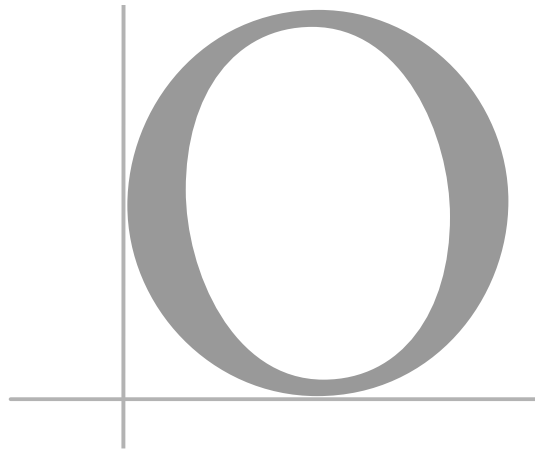
RELATED ENTRIES

Achievement Testing, Classical and Modern Item Analysis, Criterion-Referenced Testing: Methods and Procedures, Item Bias, Classical Test Theory



OBJECTIVITY

INTRODUCTION

'Objectivity' is an ambiguous term with many meanings, some of which do not even overlap. It refers to different kinds of entities and is used in various scientific disciplines. Even in psychological assessment, there are at least four different concepts of objectivity. The most important one is that of an evaluation criterion for psychological assessment instruments which stands on the same level as the two other criteria of reliability and validity. The generality of these criteria and their applicability to all assessment instruments beyond the more narrow class of psychological tests is an issue of much debate in psychological assessment.

PHILOSOPHICAL NOTIONS OF OBJECTIVITY

There are various notions of objectivity in philosophy. Gauker (1998) differentiates between the correspondence conception and the intersubjective conception of objectivity. The most important feature within the correspondence conception is mind-independence. An objective judgement is a judgement concerned with mind-independent facts which are as they are independent of what anybody may think them to be. Objectivity or objective truth in this sense is a matter of correspondence with what is out there, i.e. with a mind-independent reality. Within the intersubjective conception of objectivity, a judgement is objective if an evaluation of it as true or false may proceed without regard to the question whose judgement it is (Gauker, 1998: 161). An objective judgement in this sense expresses the consensus of rational discussants. For other notions of objectivity in philosophy see Bell (1992).

NOTIONS OF OBJECTIVITY IN PSYCHOLOGY

Many uses of the term 'objectivity' in psychology are influenced by the philosophical notions of objectivity. The standard view of scientific truth in psychology heavily borrows from the correspondence conception of objectivity. Even opponents to this view, such as, for example, constructivists and constructionists (*cf.* Gergen, 1994), construe objectivity (of knowledge) as correspondence of the cognitive-social constructions with a reality that is independent of cognition. And adherents to the related systemic approach (*cf.* Schiepek, 1986) construe objectivity (of a theory) as a naive direct representation or description of reality. Both notions are very close to the correspondence conception of objectivity. If adherents to the systemic approach construe objectivity (of propositions) as independent from the conditions of observation, the feature of mind-independence becomes obvious. From a constructivist or constructionist point of

view, the correspondence conception of objectivity is based upon an illusion. Objectivity in this sense is not attainable. This epistemological claim is transferred to the domain of psychological assessment and forms the basis on which the use of the concept of objectivity as an evaluation criterion for psychological assessment procedures is questioned (*cf.* Schiepek, 1986).

NOTIONS OF OBJECTIVITY IN PSYCHOLOGICAL ASSESSMENT

Constructivists and constructionists tend to ignore that the correspondence conception of objectivity does not play a prominent role in psychological assessment. In this domain, the intersubjective conception is much more important. Of the four different notions of objectivity, which are in the centre of discussion in psychological assessment, none is based upon the correspondence conception. Which are these notions?

The most important one emerges from psychological testing (*cf.* Walsh & Betz, 1995). Within psychological testing, objectivity (of collected, scored, and/or interpreted diagnostic findings) is construed as an evaluation criterion of psychological measurements to be ensured by the standardization of conditions (of administration, scoring, and/or interpretation of an assessment procedure). This notion of objectivity is usually at stake if the issue of objectivity is discussed in psychological assessment, especially in debates between adherents to qualitative and quantitative approaches.

Another notion of objectivity is used within item response theory. It is called specific objectivity and it refers to comparisons between persons (*cf.* McDonald, 1999: 291). If the result of a comparison between two persons is independent from the measuring instrument, i.e. the item sample used, the comparison is called specifically objective.

A third notion of objectivity goes back to Raymond B. Cattell (1986) and his followers who construe objectivity (of a psychological test) as non-transparency of the intention of assessment for the examinee. Questionnaires which are susceptible to faking good or faking bad attempts are transparent in this sense and, therefore, subjective procedures.

The fourth notion of objectivity is the most familiar one in the area of behavioural assessment (Silva, 1993) and shows the closest relations to the intersubjective conception of objectivity. In behavioural assessment objectivity (of observation) is construed as an interpersonal agreement among two or more observers who observe the same sequence of events. Sometimes, interobserver agreement is discussed within the context of the criterion of reliability (*cf.* Suen & Ary, 1989).

OBJECTIVITY AND STANDARDIZATION

The first notion of objectivity in psychological assessment explicitly acknowledges that the result of an assessment depends upon the conditions under which the assessment takes place. Since an elimination of the influences of the assessment conditions on the assessment result is impossible, a standardization of these conditions is required. Otherwise, that is the argument, it would not be possible to relate the assessment results to the single case concerned (Westmeyer, 1996: 316f.). The standardization has to apply to the three phases of administration, scoring, and interpretation of an assessment procedure (*cf.* Table 1).

Table 1 makes it very clear that the inference from the behaviour of a single case in the assessment situation to the attribute or characteristic of the single case is justified if and only if the effects of all other factors which exert their influence on the behaviour of the single case, on the scored, and on the interpreted findings, and which are mentioned as arguments of the functions f_1, f_2, and f_3, can be neglected or ignored. The problem is that there are no conditions under which this can be done. If only one single case at one point in time is considered, and that is the standard situation in the practice of psychological assessment, it is impossible to abstract from all the other factors which are of influence, apart from the attribute or characteristic of the single case to be assessed. Hence, it is not justifiable to relate the interpreted assessment data only to the single case. They cannot be constructed merely as propositions about characteristics of a single case. They have to be construed as complex, multi-placed relations, which have to take into consideration the various factors of which they depend.

Table 1. Aspects of objectivity of psychological assessment procedures

Administration
Behaviour of the single case = f_1 (attribute or characteristic of the single case concerned; other attributes or characteristics of the single case; characteristics and behaviours of the assessor; assessment technique; setting in which the assessment takes place; time of assessment; ... ; interactions between two or more of these factors)
Scoring
Scored findings = f_2 (recorded behaviour of the single case; characteristics and behaviours of the scorer; scoring technique; setting in which the scoring takes place; time of scoring; ... ; interactions between two or more of these factors)
Interpretation
Interpreted findings = f_3 (scored findings; characteristics and behaviours of the interpreter; interpretation technique; setting in which the interpretation takes place; time of interpretation; ... ; interactions between two or more of these factors)
Inference
The to be assessed attribute or characteristic of the single case concerned is usually inferred from the interpreted findings or is conceived of as identical with them.

The situation is not very different if more than one single case or one single case at more than one point in time is considered. Standardization does not mean elimination of the influences which the various factors mentioned on the right side of the equations in Table 1 exert on the results occurring on the left side. Standardization does mean trying to hold these influences constant. That is a completely different matter. Even in the case of a successful standardization of administration, scoring, and interpretation of an assessment procedure, the control of unwanted influences on the result of the intended comparison has to remain incomplete, since it is impossible to control for all interaction effects mentioned in the three equations of Table 1. Therefore, there is no fundamental difference between the situation where an assessment procedure is applied once to one single case and a situation where an assessment procedure is applied twice to one single case or once to two single cases. In each case, the results depend upon the factors listed in Table 1, and the attributes or characteristics to be assessed are only one of those.

FUTURE PERSPECTIVES AND CONCLUSIONS

In traditional approaches to psychological assessment and even within constructivist, systemic or qualitative approaches, diagnoses or case formulations as the products of assessment processes are sets of (hopefully) confirmed idiographic hypotheses referring to the single case concerned. The detailed enumeration of the circumstances and conditions under which the results have been produced are not part of the case formulation. But the idiographic hypotheses cannot stand for themselves. They have, considered by itself, no determinate or determinable empirical content. Only if they are embedded into an adequate methodological environment, which comprises all the methodical constructions to which one has to refer in the course of testing the hypotheses, is it possible to answer the question about their empirical content. The set of elements, which constitute the methodological environment, also include those factors that influence an assessment result and are listed in Table 1.

Although an idiographic hypothesis refers to a single case, the assignment of a certain empirical content to this hypothesis is always relative to the particular methodological environment into which the hypothesis is embedded. And this is not only the case for psychological assessment from a psychometric point of view, but for any kind or variant of psychological assessment. No case formulation can be regarded as adequate which does not give a detailed account of the constructions, which make up the methodological environment. Without a standardization of the administration, scoring, and interpretation of the applied assessment procedures, i.e. without satisfying the criterion of objectivity, it is hardly possible to give such an account. This underlines once again the importance of this notion of objectivity.

Increasingly becoming aware of the different notions of objectivity in psychological assessment, and the universal importance especially of the first one, may bridge the gap that still exists today between so-called quantitative and qualitative approaches, or between psychometric and systemic or constructivist ones. The criteria of objectivity, reliability, and validity, properly understood, are not confined to psychometric test procedures, but are relevant to all assessment instruments whatever their origin. Recently, a further extension of the range of applicability of this notion of objectivity has been proposed. A Task Force sponsored by the European Association of Psychological Assessment introduced, as a proposal for discussion, Guidelines for the Assessment Process (GAP) which imply, more or less, a standardization of the whole assessment process (Fernandez-Ballesteros et al., 2001). Consequently, the criterion of objectivity could not only be applied to assessment instruments, but to assessment processes as well.

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RELATED ENTRIES

RELIABILITY, VALIDITY (GENERAL), ASSESSMENT PROCESS

OBSERVATIONAL METHODS (GENERAL)

INTRODUCTION

Observational methods applied to natural or habitual contexts are scientific procedures that reveal the occurrence of perceptible behaviours, allowing them to be formally recorded and quantified. They also allow the analysis of the relations between these behaviours, such as sequentiality, association, and covariation. In many situations, observational methods are the best strategy, or even the only strategy possible (Fernández-Ballesteros, 1993): examples are the assessment of low level intervention programmes, interactions between peers, between children and adults, between the deaf and hearing, etc., social interactions at different ages, disputes between

couples or in the workplace, the behavioural repertoire of the baby, poor body posture for specific tasks, kinetic non-verbal communication (of teachers, sportsmen and women, actors and actresses, etc.), analysis of movement in multiple activities, occupation of a particular space, and the analysis of norms of socialization and desocialization.

Assessment in natural contexts through observation is unquestionably complex (Anguera, Blanco, Losada & Sánchez-Algarra, 1999). In all settings we find a range of behaviours which form a pyramid structure (Fernández del Valle & Fernández-Ballesteros, 1999). Starting from the top of the pyramid, we can break down daily life in a natural context into different levels such as family, health, school, leisure, sports, etc., revealing a tree structure with a hierarchical subdivision of situations in which behaviours that tend towards molarity interact with their natural contexts. Towards the base of the pyramid, the perceptible behaviours are increasingly molecular.

BASIC DECISIONS

Assessment in natural contexts needs a clear definition of the scope of our activity, in particular in two areas: content, and procedure or methodology.

As regards *content*, we must set the thematic limits of the specific everyday behaviour in question. There are three restrictions on the object of assessment:

(a) *Its perceptibility: total or partial.* Much has been written on perceptibility, and the positions taken have tended to depend on the psychological schools taken as a reference point. Our position is clear, in that we consider manifest behaviours – behaviours which involve total perceptibility, and which can be more reliably delimited.

(b) *The fact that it is a part of everyday life and of the natural environment of the individual.* Assessment generally focuses on habitual aspects or sectors of the life of a human being. The thousands of days and millions of hours that make up the everyday activity of an individual constitute a frame of reference that is easily wide enough for study.

(c) *Interaction with the environment.* Any behaviour needs a reference point inside its environment. For us the reference point is the molar set of the places defined in the area in which the human activities that characterize the individual's behaviour occur. Certain environments offer ideal conditions for the detection of needs: family, school, playgroups, leisure groups, etc.

(d) *Possibility of monitoring over time, as opposed to an appraisal of sporadic, chance occurrence of specific behaviours.* A dynamic approach to the study and diagnosis of human behaviour is required, imposing time limits on the interactive flow, and allowing diachronous study of certain episodes of behaviour.

From the *procedural or methodological point of view*, we should analyse why observational methods are well suited to assessment within natural contexts (Nell & Westmeyer, 1996).

Methodologically, assessment in natural contexts is particularly suited to the implementation of unobtrusive procedures to appraise the behaviour of an individual (Anguera, 1993). *Observational methodology* has both advantages and disadvantages. Amongst its advantages are its flexibility, its ability to adapt to very different behaviours and situations, its rigour in the application of the various procedural operations, and the non-restrictive and unobtrusive nature of its appraisal of real situations. Its main disadvantages are the time required, the difficulty of reducing or eliminating the reactivity bias, the complexity of the process of observer training and the restrictions imposed by ethical considerations.

DEVELOPMENT OF THE PROCESS

The process to be followed in observational methods comprises five main stages:

Correct Delimitation of the Behaviour(s) and Observation Situation

The delimitation of the subject and its contents determines to a large extent the success of the

research and facilitates the decision-making process. It is obvious that the activity has to be carefully delimited, as do the period of time, the subject(s), and the situational context. Not only does access to this information substantially improve the planning and design of the research, but the information is absolutely necessary for adapting the series of specific steps in the procedure to the contents in question. In this first phase the requirements of inter- and intra-session homogeneity must be met, because one of the most incisive criticisms of observational methods in its classical period (until the 1980s) was that the heterogeneity of different sessions or even within the same session would disqualify any possible analysis of the process under study. Likewise, this delimitation will help to eliminate biases, especially those of reactivity and expectancy.

Ad hoc Production of an Observation Tool

The extraordinary diversity of situations that can be systematically observed means that we cannot rely on standard tools, and must devote time to preparing ad hoc instruments for each study. The basic tool of observational methods is the category system, which has been progressively accompanied by the field format. The category system is more widely used due to its essential theoretical support. It is a closed system, single-coded, and non-self-adjustable, whereas field formats are especially suitable in situations of high complexity and little theoretical consistency; they are open systems, appropriate for multiple codifications, and highly self-adjustable (Anguera, 1995).

We should also mention rating scales, still occasionally used today.

Category Systems

A category system is constructed by the observer and is designed to provide a sort of *receptacle* or *mould* made of an empirical compound (reality) and a theoretical framework, to which the recorded behaviours will be assigned. Not only should the individuality of each category be studied, but the structure of the system as a whole as well.

The production process goes back and forth between reality and theory:

1. The best starting point is the production of the *repertoire* or list of features of behaviour (reality) so that it can be assumed to be *exhaustive*. This requires a large number of observation sessions. Conventional measures are used consisting of the establishment of a minimum number of successive sessions (three, four, five ...) in which no behaviours other than the ones recorded take place.
2. The next step is to propose certain conceptual criteria that allow us to group the features of behaviour according to similarity; these groups are given a provisional name.
3. Next, returning to reality, the new sessions are viewed and the behaviours of interest are assigned to the provisional groupings defined in point (2).
4. Now, from the theoretical perspective, we analyse whether the degree of homogeneity between behaviours is adequate. If necessary, some of the groups are broken down, or modified, in order to preserve (1) a conceptual differentiation between the provisional categories that we have made, (2) the possibility of assigning all the behaviours of interest to one of these categories, and (3) homogeneity between the behaviours assigned to these provisional groups.
5. Once these modifications have been made, we view new sessions, assigning the behaviours to the new categories. The process is repeated until all the categories form a system that is exhaustive within the area or situation observed and is mutually exclusive inside a particular dimension or level.

Exhaustiveness is the idea that *any* behaviour chosen from the subject's behavioural repertoire inside the environment can be assigned to one of the categories. *Mutual exclusiveness* refers to the non-overlap of the categories that comprise a system, and so each behaviour is assigned to one and only one category. However, from the point of view of the levels of interest this may not be possible – or even desirable – since very often we are interested in considering various levels of

response occurring at the same time, and so we would create multiple categories that cover all the possible combinations of the initial ones.

The categories are defined in a way that considers all their nuances, and should be accompanied by examples and counter-examples to increase their specificity.

Of course, the choice of categories can vary, and depends on who produces them. The category systems relative to a specific situation or behaviours are equivalent if during the categorization process the same criteria are adopted. However, this equivalence is a general one – not category by category, but of the whole set of categories.

Field Formats

Field formats date back to an old recording technique which has gained in consistency and is considered today as an observation tool. In the last fifteen years its development has been spectacular. Its production involves the following steps:

1 Establishing the instrument's criteria, in accordance with the objectives of the study (e.g. in the assessment of the ecological/behavioural use of the objects in the surroundings by an individual, the possible criteria would be location, verbal behaviour, activity, contact with objects, etc.).
2 List of behaviours (not closed) corresponding to each of the criteria and/or situations, recorded from the information gathered during the exploratory stage.
3 Assignation of a system of decimal coding for each of the behaviours recorded deriving from each of the criteria and which allows the use of any of them in a lower-order hierarchical system. Depending on the complexity of the case, the system may be double or triple code.
4 Production of the list of configurations. The configuration is the basic unit in the recording of field formats, and consists in linking codes corresponding to simultaneous or concurrent behaviours, which will allow an exhaustive recording of the behaviour flow, and makes subsequent data analysis considerably easier.

The configurations are based on synchronous and diachronous criteria: synchronous, because all the codes of each configuration correspond to simultaneous behaviours – one of each criterion – so that if one or more codes in a configuration are modified, this gives rise to the next. The diachronous criterion is based precisely on this succession of configurations.

The main differences between the category system (CS) and field format (FF) are shown in Table 1.

Rating Scales

This observation instrument, a dimensional recording system, is only occasionally used because of the need for an attribute or a dimension, which is not always easy or even possible.

Rating scales are lists of behaviour to which observers assign grades – usually ordinal numbers – to reflect their opinion of the intensity or degree of permanence of the behaviour.

Even when rating scales are accompanied by a correct definition in each of the estimations, the risk of subjectivity in most cases is high, because of the high level of inference that they entail. This means that these instruments must be used with great caution.

Data Collection and Optimization

The behaviour flow in any observation situation is far richer than it initially appears. Once we

Table 1. A comparison of category systems and field formats

Criterion	Category system	Field format	Advantage
Structure	Closed system	Open system	FF
Relation to theory	Theoretical framework essential	Theoretical framework recommended, not essential	CS
Dimensionality	One-dimensional	Multidimensional	FF
Codification	Single-code	Multiple-code	FF
Flexibility	Rigid system	Self-adjustable system	FF

have delimited the objective, as described previously, we now code the behaviours that interest us, after establishing the units of behaviour, and after constructing an ad hoc instrument. Nonetheless, the recording thus obtained may be low quality, for a variety of reasons: the starting criterion for the observation sessions, the choice of a particular day, the existence of periods between sessions which are not observed, whether recording during the session is continuous or interrupted, the possible lack of synchronization between observers if there are more than one, or the lack of consistency of a particular observer after recording the session, etc.

The recording must be submitted to a data quality control test which will act as a filter and will then give the observer the assurance that the data can be reliably analysed (Blanco, 1991, 1993).

Data Analysis

The data analysis should be carried out inside a specific design structure for the study in question. There are standard and non-standard designs, so named according to whether the research plan follows a pre-established design structure. The flexibility of observational methods and their specificity mean that prototype designs cannot be used; though we provide some guidelines (e.g. diachronous, synchronous, or diachronous/synchronous designs), these guidelines are by no means rigid; nonetheless, they suggest specific data analyses that are particularly well suited (Anguera, 1997).

Diachronous designs are an evaluative approach to the follow up of a unit over time. The unit may be an individual, or a small group of individuals that make up a unit. If the parameter used for the recording is frequency (i.e. extensive follow up) diachronous designs may take a variety of forms: panel analysis, regression equations, or temporal series, depending on the number of sessions recorded. In contrast, if the recording parameter is order or duration (i.e. intensive follow up) then sequential designs, through sequential analysis, can identify stable patterns of behaviour (Quera, 1993; Bakeman & Quera, 1996; Bakeman, Quera, McArthur & Robinson, 1997). These patterns may be either prospective or retrospective, and are extremely important in programme evaluation, since they provide an objective assessment of the progressive modification of the behaviour.

Synchronous designs highlight the relation between a variety of units (different individuals, or different questions to be evaluated in an individual or in a group of individuals) at a specific moment (a session). This relation is associative in symmetrical synchronous designs (log-linear analysis) and causal in asymmetrical synchronous designs (logit analysis).

Diachronous-synchronous designs – *lag-log* designs – are used in the most complex situations, corresponding to a follow up over time of a variety of units. Depending on the nature of the follow up, the various units involved, and the nature of relations between them, twenty-four different diachronous-synchronous designs can be used, thus covering all the evaluation situations of this kind.

Interpretation of the Results

The results should be interpreted in the light of the presentation of the initial problem. The results of the process on many occasions are the starting point for an intervention, or for taking decisions.

FUTURE PERSPECTIVES

The advances made in recent years clearly suggest that the short and mid term future of observational methods will be characterized by two types of development:

First, the design of *software* which will allow unlimited recording of codification, concurrence, sequentiation and temporality (Hernández-Mendo, Anguera & Bermúdez-Rivera, 2000; Hernández-Mendo, Bermúdez, Anguera & Losada, 2000; Hernández-Mendo & Anguera, in press).

Second, the systematic development of observational designs, unknown only a few years ago, that will ensure appropriate organization and analysis of the recordings.

CONCLUSIONS

We have looked at the whole process of assessment in natural contexts. As we stated in

the Introduction, assessment in natural contexts involves developing a procedure that highlights the occurrence of everyday behaviours, and allows an analysis of the relations between them. These relations can be identified objectively as a result of the analysis of data linked to the corresponding observational design. The results should be evaluated in accordance with suitable diagnostic parameters, analysing them in such a way that ensures identification of the structures of behaviour – via their different relations – underlying the perceptible behaviours so as to implement an appropriate treatment.

Countless low intensity intervention programmes and early intervention plans form part of our everyday activity; many of them pass unnoticed. There are many examples that we could mention, and in all of them the efficacy of the implementation is subject to appropriate assessment, which is based essentially on the application of observational methods.

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RELATED ENTRIES

Observational Techniques in Clinical Settings, Observational Techniques in Work and Organizational Settings, Analogue Methods, Behavioural Settings and Behaviour Mapping, Landscapes and Natural Environments, Person/Situation (Environment) Assessment, Self-Observation

OBSERVATIONAL TECHNIQUES IN CLINICAL SETTINGS

INTRODUCTION

This entry is written from a learning perspective that emphasizes the need to objectively evaluate behaviour as part of clinical assessment. Two practical and cost-effective techniques for obtaining behavioural samples (specimens) are discussed. The first method entails home tape recording of representative interactions. Methods of incorporating these data into treatment are discussed in addition to their assessment uses. Actigraphy is the second objective method. Behavioural measurements of waist and/or wrist activity every minute of the day and night for one, two, or more weeks can be very informative. Evidence demonstrating the desirability of obtaining behavioural measurements from children suspected of having ADHD is presented. The broader implications of these data are discussed.

OBSERVATION IN CLINICAL SETTINGS

A clinician's approach to assessment is driven either explicitly or implicitly by their theoretical orientation. I declare my theoretical orientation to contextualize this entry. I understand normal and abnormal behaviour from a parallel distributed processing (PDP) connectionist neural network (CNN) approach to learning and memory that includes both cognition and affect. Tryon (1995) has given introductory details of this position, and reasons for holding it. McLeod, Plunkett, and Rolls (1998) provide coverage that is more complete. I refer to all PDP CNN models as neural network learning theory (NNLT) because they are brain-inspired memory systems that learn from experience. Memories are learned and learning implies memory; otherwise learning would not be cumulative. Consequently, one can speak of learning and memory as interdependent facets of a single *learning-memory* process. This general approach to learning is a superset of operant and respondent conditioning that includes all forms of cognitive and emotional processing at both cortical and subcortical levels. The relevant contribution of this theoretical orientation to this entry is that experience drives the learning-memory process. Therefore, it is important for clinicians to learn as much as possible about the past and present experiences of their clients. Direct access to prior experience is not possible and therefore clinicians must rely on interview data from the client and others. We will discuss ways to make direct contact with current events.

People mainly seek professional help for behavioural and psychological problems when faced with a behavioural and/or psychological excess or deficit that persists beyond an acceptable time in themselves, their spouse, parent, child, or other family member. The clinician should first determine the frequency, intensity, and duration of these excesses and/or deficits. The clinician should then determine what triggers these excesses or deficits – what discriminative stimuli set the occasion for these excesses or deficits. The clinician also needs to determine if any social and/or other consequences currently maintain these excesses or deficits.

Clinicians can readily observe how the client behaves in session with them and with their spouse, children, and/or other family members if a joint session is held. While such observations may suggest clinical hypotheses, they constitute a small behavioural sample and are restricted to an office setting, which differs in important ways from the natural settings one wishes to generalize to. Clinicians can interview the client and other family members about behaviour that occurs outside the office but the results are frequently biased by the client's perspective. Research on eyewitness credibility clearly demonstrates that people make poor observers (Loftus & Hoffman, 1989). Psychologically distressed persons engaged in family strife are even more likely to bias reports of their behaviour and the behaviour of others. In short, one can expect widely discrepant and strongly held views of the same events across

respondents. Clinicians are frequently hard pressed to know where the truth resides. Behavioural observation is one method for obtaining the desired information. Tryon (1998) has discussed this technology. There are several reasons why clinicians do not use behavioural observation. They mainly concern difficulty and expense not covered by insurance. Observers need to be found, trained, and paid for their work which increases costs. Insurance companies may not reimburse these expenses. Observers need to visit the home and/or school, which raise logistical as well as privacy issues. More time is required to decode and analyse these data which further increases expense. The home tape recording method described in the next section is a compromise solution that offers most of the benefits of behavioural observation but is much more economical and far less invasive. It also provides opportunities for clinical intervention that might not otherwise be available.

HOME TAPE RECORDING

General Procedure

Audio tape is an inexpensive and unobtrusive technology that captures many facets of behaviour. In the days before television, people enjoyed dramatic episodes on radio because listeners readily interpreted the sound effects. The same is true for tape recordings obtained from natural settings such as the home. Much clinically rich information can be obtained by recording events in the home. Tryon (1999) has discussed this technique in greater detail than can be accomplished here and has provided background literature.

The procedure is simple. The first step is to obtain informed consent and/or ascent from those persons whose voice will be recorded. This is generally not a problem. Couples frequently present for treatment together as do families. Parents of troubled children readily understand the benefits of taping actual incidents of the behaviour they are concerned about. In general, people who seek treatment for behavioural/relational problems generally welcome the availability of first hand objective data.

The second step is to connect a high quality, preferably amplified, omnidirectional microphone to a high fidelity audio tape recorder and place it in a room where incidents of the type presented for treatment are known to occur. This frequently ends up being the breakfast or dining room table or in the living room. Audio tape equipment is among the most heavily discounted consumer products, which is what makes this technology affordable.

The third step is to collect one or more behavioural samples (specimens). This can most simply be done by inserting a 120 minute cassette and letting it play to the end, reversing the tape, and letting it play to the other end, continuously until a target event has been recorded. Recorders equipped with an auto reverse function automate this process. Alternatively, if trouble exists getting a child ready for school in the morning, then turning the recorder on before the child awakes is recommended. Likewise, the recorder can be turned on prior to other meals if conflict is expressed during lunch or dinner. It is important that tape recording begins before a critical incident occurs. It is far less helpful to turn the recorder on after an incident has begun. The objective is to record before, during, and after a target incident has resolved.

The tape is removed and another tape inserted in preparation of a second incident of the targeted problem. The second tape enables the clinician to test hypotheses formulated on the basis of the first tape. The third tape enables the clinician to replicate a previously supported hypothesis. In the case where the second tape does not replicate a hypothesis formulated from the first tape, it provides an opportunity to modify the hypothesis. The third tape provides an opportunity to test this formulation and the fourth tape provides an opportunity to replicate this reformulation. The extent to which additional tapes are needed depends largely upon what one learns from the tapes.

Clinical Intervention

Clinicians can use these tapes in at least three ways. The first method is where the client mails the tape to the clinician in advance of the next session and the clinician listens to the tape before seeing the client. Clinicians may bill for the time this takes as they are listening to the client. This procedure has the advantage of allowing the

clinician to experience the auditory stimuli associated with the events of concern to their client. Verbal behaviours are completely captured. Behaviours such as slamming doors leave clear auditory signals. Failure to respond to comments, requests, or commands is revealed by silence followed by a repetition of the verbal statement. Hearing who said what to whom augments the clinical material obtained during interview and/or testing and gives the clinician a better understanding of the relationship dynamics. How the incident began is of special interest. Who did what to whom to instigate the incident? How the incident escalates is also of special interest. Why did matters get worse? Who could have done what to resolve the problem? Did the problem escalate because of what someone did or because of what they did not do; because of what they said or did not say? The therapist can gauge the extent to which each participant's in-session presentation of prior incidents is biased towards reporting negative events. Depressed patients are especially prone to distort facts in this way. This phenomenon is generally called state-dependent (mood-congruent) recall (Matt, Vazquez & Campbell, 1992). It pertains to happy as well as sad emotions.

A second clinical method is for the client to bring the tape with them and listen to it with the therapist during the next session. If the session is just with the client, then the therapist can ask the client to narrate the events filling in any missing facts, motives, etc. The clinician can tape this session in order to record the new information provided by the client. If the session includes the husband and wife or all family members, then all participants can narrate the events. Again, it is a good idea to tape record this session. People sound different to themselves on tape because they do not also hear themselves via bone conduction. This helps provide psychological distance. Since the next session occurs several days or more after the recorded incident, this time delay provides additional psychological distance. These factors combined with the understanding that the tape captured what really happened helps people face their contribution to the relationship/behavioural problem at issue. Sometimes just the experience of hearing themselves 'misbehaving' is sufficient to stimulate critical introspection and planful change.

A third clinical option is to have couples or families review the tapes together prior to their next visit. The goal here is for them to use this technology to identify continuing and new problems and more effectively solve them without additional professional intervention.

Tryon (1996b) described a procedure for diagnosing, categorizing, reinforcement contingencies that can maintain behavioural excesses and deficits. Home tape recording can facilitate this process through either informal or formal methods. A primary value of this system is that assessment and behavioural diagnosis lead prescriptively to intervention.

ACTIGRAPHY

Forty-eight DSM-IV disorders cite psychomotor retardation or agitation, or sleep disorder, that is detectable through movement as part of their formal inclusion or exclusion criteria (Tryon, 2001). Tryon (1996a) reviewed the literature and reported that validity coefficient of actigraphy against polysomnography ranged from 0.49 to 0.98 with most validity coefficients in the 0.80s and 0.90s. These behaviours mainly occur outside of the session and are therefore not directly observable by the clinician. An increasing diversity of actigraphs are available that can measure and record activity levels 24 hours a day for several weeks (Montoye, Kemper, Saris & Washburn, 1996; Tryon, 1991; Tryon & Williams, 1996; U.S. Department of Health and Human Services, 1996).

The DSM is trait oriented in that the behaviours described in the inclusion and exclusion criteria are assumed to persist for at least two weeks in order to make a diagnosis. These are not transient conditions. The clinician consults with parents, family members, teachers, and others to learn more about behaviour that they cannot directly observe. Actigraphy provides an objective method for measuring behaviour over weeks and months as necessary in order to make more informed diagnostic decisions and in order to evaluate the effects of treatment. Actigraphs (Tryon, 1991; Tryon & Williams, 1996) are most frequently attached to the waist and/or wrist. The waist is best for measuring energy intensive movements. When the waist moves independent observers will

likely also note movement. The wrist has been the preferred site of attachment for sleep studies as this body site moves most frequently while awake.

Attention Deficit Hyperactivity Disorder (ADHD) is the most frequently diagnosed behaviour disorder in children affecting approximately 3 to 5% of school-aged children (National Institutes of Health, 2000). Reports by teachers and parents form an important basis of these diagnoses. Tryon and Pinto (1994) demonstrate the need for objective data when making judgements about activity level. This example is intended to make the general case for measuring activity level when pertinent diagnostic questions arise. The Hyperactivity Scale IV of the Conners Teacher Rating Scale (CTRS: Conners, 1973) was administered to 450 boys from six parochial schools from grades 1 to 6. Norms developed by Goyette, Conners, and Ulrich (1978) were used to assign boys to one of three groups. The 22 boys who scored two or more standard deviations above the normative mean were classified as 'clinically' hyperactive. The seven boys who scored from 1 to 1.99 standard deviations above the normative mean were classified as 'mildly' hyperactive. A random sample of 31 boys from the remaining children who scored less than one standard deviation above the mean were classified as 'normally' active. All 60 of these children were rated on the Motor Excess subscale of the Revised Behaviour Problem Checklist (RBPC: Lahey & Piacentini, 1985) and the Nervous–Overactive subscale of the Teacher Report Form (TRF: Achenbach & Edelbrock, 1986) by the same teacher who rated them with the CTRS. No child was on medication. All three teacher rating scales were strongly intercorrelated: CTRS and RBPC, $r(58) = 0.89$, $p < 0.001$; CTRS and TRF, $r(58) = 0.79$, $p < 0.001$; RBPC and TRF, $r(58) = 0.79$, $p < 0.001$.

Digital step counters (Free Style USA from L. L. Bean, Inc.) were worn by all 60 children at the waist in school and at home, from the time they got up until they went to bed, for 14 consecutive days. Parents recorded wearing time. Activity was expressed as steps per hour of wearing time. The means (and standard deviations) of activity measures were as follows: normal = 283.28 (139.41), mild = 500.83 (241.54), and clinical = 816.86 (799.04). First week activity measures correlated $r(58) = 0.46$, $p = 0.01$ with CTRS, $r(58) = 0.44$, $p < 0.01$ with RBPC, and $r(58) = 0.32$, $p < 0.05$ with TRF. Second week activity measures correlated $r(58) = 0.55$, $p < 0.01$ with CTRS, $r(58) = 0.58$, $p < 0.01$ with RBPC, and $r(58) = 0.44$, $p < 0.01$ with TRF. These data all seem to strongly support the contemporary practice of basing clinical diagnosis of ADHD partially on teacher ratings. However, sorting subjects within each of the three groups by activity level and plotting all three groups of subjects on the same graph revealed that the most active normal subject was level with the 15th most active child in the 'clinical' group. Put otherwise, 15 of the 22 children rated as 'clinically' hyperactive on the CTRS took no more steps per hour than the most active child rated as 'normal'. If all children rated as clinically hyperactive by teachers had been medicated to control hyperactivity, a not unlikely event, then the error rate would have been $15/22 = 0.68 = 68\%$. The possibility of incorrectly identifying motor excess in two-thirds of children rated clinically hyperactive by teachers is a serious clinical problem. Objective data are clearly indicated and can be obtained in various cost-effective ways as mentioned above (Tryon & Pinto 1994).

Activity norms do not exist. Clinicians therefore need to obtain activity measurements from control children who are of the same age, sex, and preferably in the same classes and after school activities as the target child. At least a one-week and preferably a two-week behavioural sample should be taken in order to replicate each day of the week once. Behavioural assessment can be continued during pharmacological and/or behavioural treatment in order to document change or the lack thereof with regard to activity level. It is not necessary to continue to monitor control children. Their two-week behavioural sample can be used as the target values which treatment should aim towards if it seeks to normalize the activity level of the targeted ADHD child. This establishes an ecologically valid treatment criterion as opposed to settling for statistically significant decreases that may not be practically meaningful.

FUTURE PERSPECTIVES

Both methods of data collection discussed above use technology to inform clinicians about client

behaviours that take place outside of the session. Technology continues to develop and will provide additional opportunities through time. Newer actigraphs are currently available that can record activity every minute of the day and night for 88 consecutive days. Other actigraphs estimate caloric expenditure from waist activity and assist the wearer to reduce their body weight through increased activity. Some actigraphs measure ambient light intensity. GPS receivers can be used to track where a person is at all times of the day and night. Heart rate can also be digitally recorded in the field. Small web cameras and the Internet can enable password protected observation in the home and elsewhere. Feedback actigraphs are being developed to help hyperactive children better regulate their behaviour. These devices can readily be integrated into reinforcement programmes to enhance children's motivation for compliance. Other technological advances are expected.

It is presently easier to collect than to analyse activity data. Many statistical methods for analysing these data are available but consensus has yet to be reached regarding which methods are to be preferred. This is a broad and wide-open area for future research.

CONCLUSIONS

Research has demonstrated that many people do not accurately recall past events especially when they are emotionally distressed. Tape recordings capture speech and the auditory consequences of behaviour such as door slamming. Audio taping can reveal important interpersonal–family dynamics. It can also focus therapy in productive ways described above.

People cannot accurately quantify their activity level and would not be willing to do so even if they could every minute, or every 15 or 30 minutes of the day let alone the night. Yet, this information is relevant to 48 DSM-IV diagnostic categories. Actigraphy entails unobtrusive methods for obtaining high quality time series activity measurements. It should be used in all situations where motor excess or deficits impact clinical diagnosis to avoid problems such as the one described. Actigraphy should also be used to evaluate treatment effects or the lack thereof.

Both home tape recording and actigraphy entail the collection of what I call 'behavioural specimens' that can subsequently be analysed in various ways. They provide an objective record of events that can be compared to the client's perceptions, if desired, or used to the understand and evaluate clinical conditions. I believe that both home tape recording and actigraphy are important to behavioural assessment and clinical practice.

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RELATED ENTRIES

Applied Fields: Clinical, Observational Methods (General), Applied Behavioural Analysis, Behavioural Assessment Techniques

OBSERVATIONAL TECHNIQUES IN WORK AND ORGANIZATIONAL SETTINGS

INTRODUCTION

The assessment of observable human behaviour is one of the core problems of Work and Organizational Psychology. Beginning in its early history the discipline applied measurement and observational techniques of experimental psychology by simulating concrete work settings and tasks and assessing reaction times, for example, of tram drivers or aircraft pilots. Even before the growth of radical Behaviourism, it was influenced by the time and motion studies of Frederic W. Taylor's Scientific Management. Blum and Naylor (1968: 174) in their classical textbook emphasized the importance of the development of observable criteria: 'The criterion is basic to all measurement in industrial psychology. To overstate its importance would be literally impossible. Without adequate criteria, industrial psychology is ineffective and ceases to be a science. In other words, the magnitude of the contribution of industrial psychology is *completely* determined by the adequacy of the criterion measures evolved.'

FIELDS AND LEVELS

Observational techniques for the assessment of human behaviour can be found in all fields of modern Work and Organizational Psychology, for example in:

1 Human–Computer Interaction
2 Task and job analysis
3 Performance appraisal
4 Leadership behaviour and work activity of managers
5 Performance in Assessment Centres
6 Customer service behaviour
7 Team performance
8 Productivity measurement of organizational behaviour

Most observational techniques have been developed at the individual level. Micro-processes, movements of keystrokes and reaction times by milliseconds are studied in the field of Human–Computer Interaction. Observational techniques applied to job analyses, or Assessment Centres (AC), also focus on the

behaviour of the individuals; however, they embrace longer series of actions or a broader set of criteria. The observer tries to assess all possible criteria, which are assumed important for the job.

The next level is the assessment of interactions between two and more people. However, observation techniques in the field often neglect that human behaviour results from an interaction process. For example, it is typical for leaderless group discussion observations in ACs to rate the performance of all individual group members by trained observers. The same applies to observational techniques of co-operative leadership behaviour and work activity lists of managers, or ratings of the friendliness of service persons interacting with 'mystery customers'. The influence of the behaviour of the interacting persons can be ignored only if they show a highly standardized behaviour – as perhaps in the case of trained mystery customers. Standardizing interaction behaviour is difficult. People with different cultural backgrounds interpret the same standard behaviour differently. In studies of intercultural interactions, it is necessary to analyse the social situation, interaction history, and intercultural meaning of the social and behavioural context and to develop special instruments for the assessment of the interactions in different cultures or intercultural teams (Smith & Bond, 1998).

Interrelated groups are units of social systems called organizations. The organization therefore forms the last level of assessment in work and organizational settings. Typical criteria are absence rate, productivity of the organization, or market share and return on investments.

It is important to decide which level of observation or unit to use and which will result in the most useful information. It is possible to assess criteria of the individual, group, and criteria of overall organizational level behaviour as well. Von Cranach (1996) and McGrath and Tschan (2001) developed a group action and multilevel organization or complex systems theory and favour multilevel analysis. They assume that human actions are always organized on many levels (individual and several social systems levels) that are interrelated. Each level mirrors specific behaviour attributes and influences, but more research is necessary to explore the differences and relations.

Below we will concentrate on a short description of illustrative examples of psychological techniques but will also mention and discuss similar techniques of the neighbouring disciplines.

EXAMPLES OF OBSERVATIONAL TECHNIQUES

For nearly 100 years, engineers and social scientists have applied behaviour observation techniques in time and motion studies. They are based on classification systems of observable motion units (for example 'move hand to target', 'grasp target by fingers'). The observation protocol records the sequence and time of the motions observed. The purpose of the assessment is to identify the 'best-way' (normally the shortest sequence of motions) and take it as a model for training and for the definition of standard operation time.

In the field of Human–Computer Interaction, researchers began by rediscovering these techniques and enthusiastically assessed and collected lots of behavioural data by automatic log file protocols of the computer systems and constructing 'best-way models' for software design and the training of novices. However, humans are different and their behaviour can be easily misinterpreted. Therefore, behaviour protocol data today is not interpreted without additional data from thinking-aloud techniques and interviews. The 'Heterarchic Task Analysis' (Greif, 1991) is an illustrative example of perhaps the most intensive micro-process analysis in the field. It integrates observation of keystroke behaviour (by log files), video records (up to three cameras and split screen presentation) and video-confrontation interview. Similar techniques are applied to analyse the interaction process of the customer when using the Internet services of electronic business firms.

Efficient and adaptive human task performance nearly always demands cognitive information processing. Since these processes are unobservable for most assessment instruments of processes, tasks or jobs it is preferred to apply a combination of observation and interview, called observation-interviews. The assessment of human behaviour by a typical job analysis instrument is normally performed in a sequence. It starts with a listing of the tasks and a description of typical sequences by a semi-standardized interview. The second step is

an observation period (one to four hours). It ends with a scaling of a set of items describing 'normal' job behaviour (the interviewer normally gives the ratings). Based on multiple factor analysis or theory oriented clustering of the items, the authors of the instruments offer a tabulation of the item values and an assessment of general job dimensions. Typical job demand dimensions are job complexity, variability and decision latitude, or in the field of stress, time pressure, daily hassles, and social stress (e.g. by conflicts). The assessment can give useful information for the construction of personnel selection and performance appraisal instruments, wage groups, and training programmes. Modern performance appraisal techniques apply a variety of scaling methods, like Behaviourally Anchored Rating Scales (BARS, Smith & Kendall, 1963).

Pritchard (1990) developed a complex scaling approach of the productivity, effectiveness, and overall individual, group and organization performance, called Productivity Measurement and Enhancement System (Promes). A design team develops quantitative, behaviourally related measurement criteria based on a task analysis and agreement on the overall objectives of the units. For all measures of the units, a (linear or curvilinear) function is constructed which shows how much contribution is being made to the overall organizational productivity by each level of the scaling values. Based on the system, regular written reports are given to unit personnel and managers and a feedback system for the employees is implemented. Long-term studies of the application of Promes and performance feedback systems show a very strong improvement and large effect size of overall organizational criteria of productivity.

FUTURE PERSPECTIVES AND CONCLUSIONS

The service of modern consultancies is based on the analysis and comparison of economic data. More and more, they advance to the assessment of human performance ratings. However, they seem to prefer expert interviews or questionnaires, constructed without any control of the reliability of the scales or validation of their assumed relationship to observable behavioural measures. This seems to be a pragmatic solution, which is much less time-consuming. However, since the reliability and validity of this data is unknown, the usefulness of the resulting conclusions is questionable. Psychological assessment techniques in the field sometimes may be impracticable. Evaluation studies are necessary which test the validity of simple expert rating techniques or 'light versions' of the complex techniques mentioned above. However, the study of human behaviour in work organizations and organization settings in itself is a complex problem and therefore will always challenge extensive psychological theorizing and measurement technologies.

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RELATED ENTRIES

Applied Fields: Work and Industry, Applied Fields: Organizations, Centres (Assessment Centres), Observational Methods (General)

OPTIMISM

INTRODUCTION

In this entry, we review approaches to the measurement of optimism and the closely related construct of hope. Emphasis is placed on existing measures, but we also discuss assessment issues to be addressed in future research.

ETYMOLOGICAL HISTORY OF OPTIMISM AND HOPE

The term *optimism* and its ostensible cousin *pessimism* are relatively recent arrivals on the historical scene (Siçinski, 1972). In the 1700s, Leibniz characterized optimism as a mode of thinking, and Voltaire popularized the term in his 1759 novel *Candide*, which was critical of the apparent shallowness of optimism. Pessimism appeared a century later, independently introduced by Schopenhauer and Coleridge.

In their original forms, optimism and pessimism were not symmetric. Optimism as discussed by Leibniz was cognitive, reflecting a judgement that good would predominate over evil, even if goodness entailed suffering. In contrast, pessimism as discussed by Schopenhauer was emotional: the pessimistic individual was one for whom suffering would outweigh happiness. Note that someone can be optimistic in the cognitive–Leibniz sense yet pessimistic in the emotional–Schopenhauer sense.

The term *hope* shares with optimism and pessimism an orientation towards future events and experiences but has a much longer history. Along with faith and charity, hope was a chief virtue in Judaeo-Christian discourse. Hope referred to positive expectations about matters with a reasonable likelihood of coming to pass. Over time, hope (and hopelessness) became entwined with optimism (and pessimism). The connotations of each concept spilled over into the others.

Contemporary approaches to hope and optimism thus share three features. First, both refer to a future-minded stance blending thought and feeling. This stance is a belief that in the future, good events and associated positive feelings will be more likely than bad events and associated negative feelings. Second, akin to their original meanings, hope and optimism are somewhat grounded in reality – they are illusions perhaps, but not delusions. Third, optimism and hope entail beliefs about agency: the individual can act to make good events more likely and bad events less likely.

PSYCHOLOGICAL APPROACHES TO OPTIMISM AND HOPE

Some writers – usually social philosophers – treat hope and optimism as features of general human nature to be praised or decried. In contrast, others – usually research-minded psychologists in the personality or clinical tradition – regard hope and optimism as characteristics that people possess to varying degrees. Three research streams define this latter approach. Each line of work has an associated self-report measure, has focused on the consequences of the individual difference as opposed to the antecedents, and has spawned a large literature demonstrating that hope and optimism (or at least the absence of their opposites) are associated with desirable outcomes like positive mood and good morale, perseverance, effective problem solving, popularity, good health, long life, freedom from trauma, and success in academic, athletic, military, occupational, and political domains.

First, Scheier and Carver (1985) studied a personality variable they identify as *dispositional optimism*: the global expectation that good things will be plentiful and bad things scarce in the future. Scheier and Carver's perspective is that all realms of human behaviour entail the identification and adoption of goals and the regulation of actions vis-à-vis these goals. In this self-regulatory model, optimism refers to how people perceive impediments to their goals. In the face of difficulties, do

people believe that goals will be achieved? If so, they are optimistic – if not, they are pessimistic. Optimism leads to efforts to attain the goal, whereas pessimism leads to giving up.

Second, Seligman and his colleagues approached optimism in terms of *explanatory styles* – how individuals characteristically explain the causes of bad events (Buchanan & Seligman, 1995). Based upon the attributional reformulation of the learned helplessness model (Abramson, Seligman & Teasdale, 1978), this approach suggests that those who explain bad events using external, unstable, and specific causes are optimistic, whereas those who favour internal, stable, and global causes are pessimistic. The original helplessness model proposed that following uncontrollable aversive events, animals and people become helpless – passive and unresponsive – presumably because they have learned that there is no contingency between actions and outcomes. This generalized learning that actions are unrelated to outcomes produces later helplessness. As predicted, explanatory style is correlated with outcomes such as depression, illness, and failure.

Third, Snyder (2000) defined *hope* as the expectation that one's goals can be achieved. According to Snyder, goal-directed expectations are composed of two separate components. The first is agency, or one's determination to achieve goals. The second is pathways, or one's beliefs that successful plans can be generated to reach goals.

MEASURES OF OPTIMISM AND HOPE

As individual differences, optimism and hope (and/or pessimism and hopelessness) have over the years inspired several dozen measures. Most have been self-report questionnaires, although researchers have also employed interviews, observer reports, or content analyses. In addition, an optimism subscale composed of MMPI or MMPI-2 items allows archived MMPI protocols to be rescored after the fact (Malinchoc, Offord & Colligan, 1995).

In the case of explanatory style and hope, there are self-report measures for children and adults, as well as content analysis strategies for scoring these characteristics from written or spoken material (see Lopez, Ciarlelli, Coffman, Stone & Wyatt, 2000; Reivich, 1995). Although dispositional optimism has not been assessed among younger individuals, the straight-forwardness of the self-report measure implies its suitability for early teens or even children. Hope can also be assessed by observer-reports and interviews. There are also various domain-specific versions of hope and explanatory styles (e.g. hope concerning family life; explanatory style for academics).

As noted, each of the well-known contemporary research traditions has been facilitated by reliable and valid measures. The most important of these are summarized in Table 1. Convergence among the different measures of hope and optimism has not been the subject of much research, although the occasional study finds a modicum of agreement.

FUTURE DIRECTIONS

Several issues relevant to the assessment of optimism and hope need further scrutiny.

Tonic versus Phasic Assessment

One criticism of personality assessment is that typical measures ignore whether a given personality characteristic is *tonic* (constant) or *phasic* (waxing and waning according to its use). Are there settings or situations in which an individual difference characteristic allows one to 'rise to the occasion' (or not)? Hope and optimism are usually measured as if they were tonic, but they seem especially pertinent at times of potential transition or when personally relevant outcomes loom. Perhaps the best way to measure hope and optimism is at these occasions.

Cross-Cultural Assessment

Researchers have begun translating measures of optimism and hope and administering them around the world (e.g. Lee & Seligman, 1997). Two conclusions sum up most existing research: (i) people in different cultures sometimes show mean differences that are readily interpretable along cultural dimensions (e.g. people in collectivist Asian cultures have a less optimistic explanatory style than their individualistic Western

Table 1. Major measures of optimism and hope

Revised Life Orientation Test (LOT-R; Scheier, Carver & Bridges, 1994)
- self-report questionnaire composed of eight items (two fillers) reflecting optimism or pessimism which the respondent rates in terms of endorsement on 0–4 scales
- internal reliability (alpha coefficients): ~0.80
- test–retest reliability: ~0.60–0.80
- construct validity: correlates 0.30 with active coping and 0.50 with coping by positive reframing, even when controlling for neuroticism and self-esteem

Attributional Style Questionnaire (ASQ; Peterson et al., 1982)
- self-report questionnaire composed of six good events and six bad events for which respondent writes 'one major cause' and then rates each cause on 1–7 point scales according to its internality, stability, and globality
- internal reliability (alpha coefficients): 0.40–0.60 for individual dimensions; 0.70 for composites
- test–retest reliability: 0.50–0.60 for individual dimensions; 0.70 for composites
- construct validity: correlates ~0.25 with various indices of helpless behaviour: depressive symptoms, academic failure, morbidity, and so on

Hope Scale (Snyder et al., 1996)
- self-report questionnaire composed of twelve items (four fillers) reflecting agency or pathways, which respondent rates in terms of endorsement on 1–4 point scales
- internal reliability (alpha coefficients): ~0.80
- test–retest reliability: ~0.80
- construct validity: correlates –0.50 with hopelessness scale, and –0.40 with depressive symptoms

counterparts), and (ii) the correlates of hope and optimism are nonetheless similar across cultures. For future research, we suggest doing more than just comparing and contrasting mean scores across samples. The causes and correlates of hope and optimism may differ across cultures in accordance with cultural features such as prevailing religious ideology.

Assessment of Collective Optimism and Hope

In everyday use, optimism and hope are terms often applied to collectivities: families, groups, and organizations, even entire nations and cultures. Yet, psychologically oriented researchers have been slow to study what can be termed *collective optimism* or *collective hope*, and most studies to date have been at the individual level. We suggest that future researchers grapple with how to assess optimism and hope as group properties, following the lead of investigators of collective efficacy (e.g. Zaccaro, Blair, Peterson & Zazanis, 1995). We are not calling for the reinvention of the group mind but simply recognizing that members of a collectivity share optimistic or pessimistic beliefs about their group and its future.

Collective optimism and pessimism can of course be assessed by averaging individual-level scores of group members, but a more interesting strategy is to look at products of the collectivity: religious texts, political platforms, popular songs, grade school primers, newspaper stories, and the like. To be sure, most of these products are created by individuals, but to the degree that they become widely endorsed by the collectivity, we can speak of them as a statement by that collectivity about how it regards itself and its future. Content analysis strategies developed to score individual-level products (e.g. letters, psychotherapy transcripts) can be applied to collectivity-level products. For example, we have scored the optimism versus pessimism evident in annual reports by corporations to stockholders, finding that more optimistic accounts predict higher stock prices one year later (Lee, Peterson, Wang & Gillespie, 2000).

FUTURE PERSPECTIVES AND CONCLUSIONS

The constructs of hope and optimism are of great interest to contemporary psychologists. The research literature to date is fragmented because of the existence of different measures which – perhaps – tape somewhat different aspects of these constructs. Thus, the most immediate goal for future research should be the development of a single measure of optimism and hope that

captures all of their features: positive expectation, positive emotion, positive motivation (agency), and positive behaviour (pathways). This composite measure should further try to gauge whether one's optimism and hope are realistic.

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RELATED ENTRIES

Personality Assessment (General), Attributional Styles

ORGANIZATIONAL CULTURE

INTRODUCTION

While research of corporate/organizational 'climate' looks at the link between individuals, groups, and performance experienced on a daily basis (e.g. communication, networking, reward systems, leadership styles), the term 'organizational culture' refers to the context in which these events occur.

Organizational culture (OC) is what a group learns over a period of time as it solves its problem of survival in an external environment and internal integration (Schein, 1990). Schein points out three areas where culture manifests itself: observable artefacts, values/norms, and basic underlying assumptions to which most researchers refer to. OC supports effective control (to regulate behaviour), normative order (to guide

behaviour), promotion of innovation (in a culture that encourages creative thinking), strategy formulation, and employee commitment. Sackmann, Phillips, Kleinberg, and Boyacigiller (1997) suggest in that respect that cultural context contains greater regional, national, industry and regional level, and within the organization a functional, hierarchy and tenure level, that are influenced by gender, profession, ethnicity and religion.

Another aspect of OC highlights how well an individual fits an organizational context (O'Reilly, Chatmann & Caldwell, 1991). In this regard values and expectations of individuals interact with facets of the situation (e.g. incentive systems, norms) to affect the individual's attitudinal and behavioural responses. Furthermore OC-concepts guide OD and Change Management activities. The sustained interest in OC throughout the past decade has confirmed that, in order to understand and change an organization, a researcher must examine the linkages between underlying values, organizational structures, and individual meaning (Denison & Spreitzer, 1991).

In regard to the assessment of OC it is challenging that values/norms and basic assumptions influence behaviour on a subconscious level and are therefore not directly accessible for questioning or observation. Even the examination of artefacts and their meaning remains at first on a descriptive level (e.g. in the form of typologies), because terms of measurement and correlations have not been established yet.

CULTURE AS INTERNAL AND AS EXTERNAL VARIABLE; AND AS ROOT METAPHOR

Smircich (1983) distinguishes between cultures either as an independent (external) variable (like the culture of a nation), as a dependent (internal) variable (like corporate culture), or as a root metaphor for conceptualizing organization.

Culture as an *External* Variable

Culture as an external variable refers to the specific culture of a country influencing organizations. This specific culture is brought into the organization by leadership practices (e.g. commitment to employees, collective decision making) and leads to comparative management studies that investigate, e.g., variations in management styles, employee practices, and attitudes across countries, e.g. Japanese and American (Ouchi, 1981).

Instruments to assess culture as an external variable include the following. Hofstede (1994) tried to determine empirically the main criteria by which national cultures differ, by using his *Values Survey Module* ((VSM) 1994 IRIC; see Table 1). He distinguishes *Power Distance*, *Uncertainty Avoidance, Individualism–Collectivism*, and *Masculinity–Femininity*. The four value framework which was later expanded to five values (long-term-orientation) has had quite an impact not only on researchers but also on the way cross-country comparisons or value profiles were generated (Spector, Cooper & Sparks, 2001). However, Spector et al. (2001) recently showed that internal consistency (coefficient α) statistics from samples representing 23 nation/provinces tended to be poor and mainly failed to achieve a criterion of 0.60. Even when data were aggregated by samples, coefficient αs were poor for all but long-term orientation. A replication of Hofstede's ecological factor analysis (from 1994) failed to support the five subscales. Spector et al. (2001) suggest that the construct validity of these scales is suspect, and that they should be used with caution.

In reference to Hofstede (1994), one needs to closely examine the selection and meaning of the four, later five, dimensions. It is suggested by Strohschneider (2001) that there might be several more cultural aspects than originally found by Hofstede, i.e. religious assumptions about mankind or approaches to problem solving. Because of the low reliability of the test, one might also conclude that the representatives of the different cultures addressed the specific items in a quite differentiated manner. It seems that the closeness of each dimension was not apparent.

Culture as an *Internal* Variable

The term OC as an internal variable acknowledges that organizations themselves are culture-producing phenomena. Similar to the researchers of culture as an external variable early research activities like Deal and Kennedy's (1982) lead to types of Organizations that ought to be typical for success, e.g. tough-guy macho (e.g. Media and Computer Companies); work hard, play hard

Table 1. Instrument to assess organizational culture in chronological order

Culture as an **external** variable			
Hofstede (1998; IRIC, 1994) Values Survey Module (VSM)	National *Values* Large vs. small power distance Strong vs. weak uncertainty avoidance Individualism vs. collectivism Masculinity vs. femininity Long- vs. short-term orientation	Spector et al.'s (2001) replication: Cronbach's α: −0.46 to 0.57, only acceptable for long-term orientation (0.74)	Validity: No information found
Culture as an **internal** variable			
Kilman and Saxton (1983) Culture Gap Survey (CGS)	*Behavioural norms* Technical/Human concern Short-term/long-term orientation Task support, Task innovation Social relations, Personal freedom	Retest reliability: 0.83–0.94 Cronbach's α: 0.60 (personal freedom)–0.86 (technical concern) in a study by Xenikou and Furnham (1996)	Validity: No information found
Glaser (1983) Corporate Culture Survey (CCS)	Intends to measure *values* and holds four subscales: Values, Heroes/heroines, Traditions/rituals Cultural network	Cronbach's α: 0.55 (rituals)– 0.77 (heroes) in a study by Xenikou and Furnham (1996)	Validity: No information found
Sashkin (1984) Organizational Beliefs Questionnaires (OBQ)	Ten subscales of *values*: Work should be fun Being the best Innovation Attention to detail Work and value of people Quality Communicating to get the job done Growth/profit/other indicators of success Hands-on-management Importance of a shared philosophy	Cronbach's α: 0.35 (quality)– 0.76 (communication) in a study by Xenikou and Furnham (1996)	Validity: No information found
Schriber and Gutek (1987) Time-at-work	Temporal Dimensions of *Norms* Schedules and deadlines Punctuality Future orientation Time boundaries between work and non-work Quality vs. speed Synchronization of work with others through time Awareness of time use Work pace Allocation of time Sequencing of tasks through time Intraorganizational time boundaries Autonomy of time use Variety vs. routine	Cronbach's α range from 0.52 (variety vs. routine) to 0.80 (schedules and deadlines)	Principal component analysis

(*continued*)

Table 1. Continued

O'Reilly, Chatmann, and Caldwell (1991) Organizational Culture Profile (OCP)	*Values* Innovation Stability People orientation Outcome orientation Easygoingness Detail orientation Team orientation	No reliability information found in cited article	Principal component analysis
Quinn and Spreitzer (1991) Culture scales based on CVM Institutional Performance Survey (IPS, Zammunto & Krakower, 1991)	*Values* Group Culture Developmental Culture Hierachical Culture Rational Culture	Cronbach's α: for IPS 0.71 (Rational Culture)–0.79 (Developmental Culture); for Likert scales: 0.77 (Hierarchical Culture) to 0.84 (Group Culture)	Multitrait multimethod analysis convergent validity: 0.212 to 0.513; discriminant validity: W=0.7643**
Cooke and Szumal (1993) Organizational Culture Inventory (OCI)	*Normative beliefs*: Constructive norms (achievement, self-actualizing, humanistic encouraging, affiliative) Passive-Defensive norms (approval, conventional, dependent, avoidance) Aggressive-Defensive norms (oppositional, power, competitive, perfectionistic)	Conbach's α range from 0.67 to 0.92 Interrater: 0.88 to 0.93	Construct validity: a three-factor solution accounts for 65% of variance
Denison and Mishra (1995) Culture Traits Survey	*Culture 'Traits'*: Involvement (Input, Collaboration) Consistency (Agreement, Predictability) Adaptability (Change, Responsiveness) Mission (Direction, Mission)	Cronbach's α range from 0.63 (Adaptability) to 0.81 (Mission)	Correlations for: return on assets and sales growth

Chatmann and Jehn (1994) using the Organizational Culture Profile (OCP, by O'Reilly et al., 1991)	*Values* Innovation Stability People orientation Outcome orientation Easygoingness Detail orientation Team orientation (Q-sorting 54 values into nine categories ranging from 'most characteristic of my firm's culture' to 'most uncharacteristic')	Retest Reliability: range from 0.65 to 0.87	Principal component analysis reveal 7 factors
Howard (1998) Competing Values Model (CVM)	Two primary *value* dimensions: Structural control vs. flexibilty and internal focus vs. external focus Result in: Human relations (Supportiveness, Team orientation) Open systems (Innovation, External legitimy, Aggressiveness) Internal process (Stability, Control) Rational goal (Attention to detail, Outcome orientation) Q-sort and MDS with 54 OCP items	70% interrater agreement	Non-metric scaling
Bluedorn, Kalliath, Strube, and Martin (1999) Inventory of Polychronic Values (IPV)	*Values* Polychronicity (= extent to which people in a culture prefer to be engaged in two or more tasks or events simultaneously, and believe their preference is the best way to do things)	Cronbach's α 0.80 (1. sample)–0.86 (2. sample)	Principal component analysis revealed ten items loading on a single factor Retest correlations range from 0.78 (four week interval) to 0.95 (immediate retest) Content adequacy via Q-sort approach

(e.g. Car Distributors, Retail Sales); bet your company (e.g. Aerospace, Oil, Capital goods); and process culture (e.g. Banking, Pharmaceuticals, Public utilities). In that respect, the Corporate Culture Survey (CCS, Glaser, 1983) consists of 20 items to measure values based on Deal and Kennedy's description of culture types.

Peters and Waterman (1982) on the other hand tried to identify cultural factors of management practices (e.g. bias to action, closeness to the customer). The current research emphasizes internal factors of OC as they seem to influence aspects of change and development in organizations strongly.

Culture as an Internal Variable: Instruments for Assessment

To measure culture as internal variable standard questionnaires about organizational norms or beliefs (e.g. Bernstein & Burke, 1989) or cultural inventories (e.g. Denison, 1996; see Table 1) were developed to allow interorganizational comparison. Most authors believe that although at the beginning of OC research the goal has been 'thick description' relying on qualitative methods such as in-depth, open-ended interviewing and ethnographic observation, these approaches have been bought at a cost: analytic comparison across organizations remain difficult.

Among the most extensively tested and validated instruments are two designed to measure the cultural variations identified in the Competing Values Model (CVM, Denison & Spreitzer, 1991; Zammunto & Krakower, 1991). According to this model, values and assumptions vary along two main dimensions: focus on internal maintenance versus focus on external, competitive position; and emphasis on stability, control, and order versus emphasis on change and flexibility. Cross-tabulating the two dimensions creates a typology of ideal types: the team, the adhocracy, the hierarchy, and the firm. The CVM framework is supposed to be a metatheory, originally developed to explain differences in values underlying various organizational effectiveness models.

Two instruments relying on the CVM are presented by Quinn and Spreitzer (1991). The first instrument, called Institutional Performance Survey (IPS, Zammunto & Krakower, 1991), uses four scenarios to describe each of the four quadrants in the CVM. Respondents are asked to divide 100 points among the four scenarios in the question, depending on how similar they think each scenario is to their own OC (Cronbach's α: 0.71 to 0.79). The second instrument is contrasted with the IPS in that it is designed to use Likert scales, which enable independent measures of each culture quadrant (Cronbach's α: 0.77 to 0.84). Factor analysis provides additional support for the structure of these measures as independent indicators. Also Howard (1998) used the CVM as the underlying model to analyse OC in combination with the Q-sort technique described below.

The Culture Gap Survey (CGS, Kilman & Saxton, 1983) was developed to measure behavioural norms with four subscales reflecting 2×2 framework (technical/human concern and short-long-term orientation). They assessed norms through closed-ended items contained in a standardized questionnaire. The questions are designed to yield four scales covering norms about task support, task innovation, social relationships, and personal freedom. The Organizational Culture Profile (OCP, O'Reilly et al., 1991; Howard, 1998; Chatmann & Jehn, 1994) contains 54 value statements that can generically capture individual and organizational values. Following the general procedure of generating Q-sort profiles, respondents sort 54 items into nine categories, ranging, e.g., from most to least characteristic. Results of the principal factor analysis showed that OC can be characterized by (1) innovation and risk taking, (2) attention to detail, (3) orientation towards outcomes or results, (4) aggressiveness and competitiveness, (5) supportiveness, (6) emphasis in growth and rewards, (7) a collaborative and team orientation, (8) and decisiveness (O'Reilly et al., 1991).

The Inventory of Polychronic Values (IPV, Bluedorn et al., 1999) is a psychometric measure of polychronicity, that means the extent to which people in a culture prefer to be engaged in two or more tasks or events simultaneously (and believe their preference is the best way to do things). Similar to the IPV, the 'Time-at-work' questionnaire (Schriber & Gutek, 1987) is designed to assess various possible temporal dimensions of work organizations, e.g. scheduling, temporal buffers, routine, autonomy, and synchronization.

The Organizational Culture Inventory (OCI, Cooke & Szumal, 1993) measures 12 sets of normative beliefs and behavioural expectations that are categorized into three general types: constructive, passive-defensive, aggressive-defensive. The Organizational Beliefs Questionnaire (OBQ, Sashkin, 1984) has ten subscales measuring organizational values: work should be fun, being the best, innovation, attention to detail, work and value of people, quality, communicating to get the job done, growth/profit/other indicators of success, hands-on management, and importance of a shared philosophy.

Concerning the alpha reliabilities of OCI, OBQ, CCS, and CGS, the OCI secondary subscales (people orientation, task orientation, satisfaction needs, and security needs) show high coefficients of internal consistency ranging from 0.89 to 0.95 (Xenikou & Furnham, 1996). This indicates that when these subscales are used, the questionnaire is the most internally reliable measure of OC compared to the other three. Using factor analysis to examine the various dimensions of OC, Xenikou and Furnham (1996) showed that a five-dimensional model of OC resulted: (1) openness to change in a supportive culture, (2) negativism/resistance to change, (3) the human factor in a bureaucratic culture, (4) positive social relations in the workplace, and (5) task oriented organizational growth. But in regard to instruments used to assess OC, it appears that within-group agreement regarding norms depends partly on the degree to which respondents are similar in terms of positional and demographic factors. Cooke and Szumal's (1993) results suggest that composite cultural profiles should be developed for subunits and groups of employees (e.g. subculture profiles) as well as for the organization as a whole.

In summary, most instruments developed in English-speaking countries and/or North-America try to assess values and vary mostly only in detail. Most of them agree on the labelling of found factors of principal component analysis. They share a common ground, in so far that almost every instrument includes factors which are labelled 'people and team orientation vs. orientation towards outcomes', and 'innovation/openness to change vs. resistance to change'.

Since the period of the middle 1980s, the perspective of culture researchers has expanded from the ideographic point of view emphasizing contextualized and ideographic aspects using field observation, to a more conventional way of comparison and generalization using methods of combined quantitative and qualitative instruments (Denison, 1996). However, measuring OC-dimensions with the help of questionnaires seems to be limited as they measure specific cultural sub-dimensions as surrogates of the cultural whole. They divide a concept which is primarily used to draw attention to the holistic aspect and prejudge the dimensions to be studied. But even if they stress cultural features that prevail across many organizations, they do not help to discover poorly understood patterns and cultural effects that are unique to a particular organization or subculture. It is not clear if the dimensions in question are relevant to a particular culture until the deeper levels of that particular culture have been determined (content validity). In addition, most researchers do not differ precisely between cultural factors, climate variables or values, normative beliefs, norms and attitudes.

Culture as a Root Metaphor

A researcher who looks at culture as a root metaphor shifts his attention to the definition of organization and what it means to be organized (Smircich, 1983). The methodology is based on common actions of employees and researchers. Insiders (employees) are 'forced' to articulate their basic assumptions, and researchers interpret verbal and non-verbal cues based on the values/norms of the insiders. The process of inquiry has to be interactive and iterative. In this regard, e.g., Argyris and Schön (1978) used a case building approach in which members of an organization wrote scenarios that revealed so called theories-in-use that guide behaviour strongly. The interpretation of the data should be done with a flexible approach in mind: the scientist remains open to the answers of his subjects for as long as possible and only then he completes his theoretical concept. This method creates mostly single case studies and makes generalization beyond a single organization almost impossible. In an extreme case, the number of theories on OC equals the number of cultures researched.

FUTURE PERSPECTIVES

As mentioned above, most instruments measuring OC as internal variable have been developed in English-speaking countries and mostly North-American organizations. To see whether these instruments prove to be valid generally and allow comparisons across organizations as promised, they should be replicated in different countries and different organizations, profit and non-profit, to prove statements of reliability and validity. Futhermore, cross-organizational comparison should be conducted to show that these instruments differentiate between organizational cultures accurately. Besides the replication of studies in which the development of instruments were presented to confirm results of reliability and factor analysis, construct validation should be a future concern. Construct validation should lead to results which show that for example 'team orientation' or 'easygoingness' is supposed to be a value and not a matter of organizational climate. In that respect the difference between values, norms, and beliefs has to be clarified on a theoretical basis in the future.

Furthermore, topics like globalization and international mergers of companies make OC an important and 'hot' topic for future discussions. The discussion of OC is also interesting in the context of workforce diversity, where multicultural teams work in multicultural companies bringing culture as internal and external variable closer together. Cultural diversity in thinking and problem solving are also relevant variables in a company. In light of the rising use of ICT (Information and Communication Technology) the research of virtual organizations will gain in importance as well. That means besides further investigations in regard to reliability and validity of existing assessment instruments, the search for relevant cultural factors should be continued.

CONCLUSIONS

It seems appropriate to think about OC in terms of cultural complexity. Reflecting the newness of the field no single methodology predominates. Choices of technique in this regard tend to be related to the researcher's long-term interest in theory building or practical application. But what is shown here is the heterogeneity of constructs to OC, that seem to exist without construct validation. The problem with traditional assessment approaches applying to OC is that they require knowledge of the relevant dimensions that are being measured. Even if they are statistically derived from large samples of items, it is not clear if the original items truly reflect critical cultural aspects. Examining particular cultural features, one needs to know the underlying context of a particular organizational culture, i.e. one would infer incorrectly from artefacts like stories, symbols, and myths if their relation to underlying assumptions were not known.

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Annette Kluge

RELATED ENTRIES

Applied Fields: Work and Industry, Applied Fields: Organizations, Organizational Structure, Assessment of, Total Quality Management, Values

ORGANIZATIONAL STRUCTURE, ASSESSMENT OF

INTRODUCTION

The structure of organizations has long been a point of study for those interested in organizational sciences. In the 1960s and early to mid-1970s, the focus was on how the work the organization performed and the technology used to do the work was related to the structure of the organization. Other early foci included how the structure of the organization was related to so-called 'contextual' factors, including the size of the organization as well as its environment. These early investigations of organizational structure are usually placed under the rubric of contingency theory. Although these early writings on and studies of organizational structure often had the goal of being able to make generalizations about structure and its determinants across a multitude of sectors, this ambitious goal has yet to be fully realized. Much of the work that followed, including present-day studies, has been focused on particular industries or sectors of organizations. This partially stems from the increasing specialization within the field of

organizational sciences, but also is attributable to the contributions of contingency theory: the understanding that not only do the technologies used by organizations differ by such stratifications, but so do the environments in which these organizations are placed (Thompson, 1967). Although there is one set of scales that are widely referenced for their conceptualization of factors that one should consider when assessing organizational structure (Pugh, Hickson, Hinings & Turner, 1968, 1969), there are no standardized scales that are used to study all of the elements of organizational structure across all industries or sectors. What we have instead are scales that would have to be altered and applied to particular industries and psychometrically reassessed, or 'islands' of specialized research on organizational structures that are informed by the earlier work done on this topic.

The first goal of this entry is to articulate what is meant by organizational structure. This will be followed by a review of the major set of scales that has been developed to assess organizational structure, and an analysis of how researchers of one sector, health care, have assessed organizational structure.

DEFINING ORGANIZATIONAL STRUCTURE

It is important to define what is meant by organizational structure, because the definition(s) can be used to assess the face validity of any measures that a researcher could construct. Definitions of organizational structure can be classified into those that are more conceptual and those that are more operational. On the conceptual level, Mintzberg (1983) defines organizational structure as the '... sum total of the ways in which labor is divided into distinct tasks and then its coordination is achieved among these tasks' (Mintzberg, 1983: 2). The contemporary management literature defines the elements of organizational structure to include the following: formal reporting relationships and levels in the hierarchy, grouping together of individuals into departments and of departments into the total organization, and systems to include effective communication, coordination, and integration of efforts across departments (Daft, 2001: 202). Basically, conceptual definitions of organizational structure specify how the organization is differentiated in terms of tasks, reporting relationships, authority and decision-making responsibility, and how these differentiated elements are integrated to coordinate the work that the organization does.

In the operationalization and empirical study of organizational structure, the literature has gone beyond the basic conceptual notions of what constitutes organizational structure to include more specific indicators. In their classic work, Pugh et al. (1968) define the 'dimensions of organization structure' as specialization, standardization, formalization, centralization, configuration (e.g. span of control and subordinate ratios), and flexibility. In addition to his conceptual definition, Mintzberg (1981) also provides a more substantive definition of the 'elements of structure' as the specialization of tasks, formalization of procedures, formal training and indoctrination, grouping of units, unit size, planning and control systems, liaison devices, delegation of power both down and out from the chain of command (Mintzberg, 1981: 104). Daft (2000) echoes these with his structural dimensions of organizational design: formalization, specialization, standardization, hierarchy of authority, complexity in activities or subsystems, centralization, professionalism, and personnel ratios.

ASSESSING ORGANIZATIONAL STRUCTURE

There are many ways to assess the structure of an organization and many goals of such evaluations. Those who perform studies involving organizational structure have been remiss to develop and/or use a set of standardized measures that capture this concept. Instead, the research on structure is quite varied, not only in its purpose, but also in its methods, as many studies have 'reinvented the wheel' with respect to how they measure organizational structure. Like many aspects of organizational studies, there is not a lot of consensus about how to operationalize conceptual models so that they can be empirically assessed. Part of this stems from the fact that there are a great many different kinds of organizations, in many different sectors, processing many different kinds of inputs, producing

many different kinds of outputs, and with a variety of institutional and other environmental demands and constraints. Measuring the structure of organizations may not necessarily be able to be done in the same way across sectors, as the technologies used vary widely, as do the environmental conditions. Consider a large complex organization like Kraft, which has many divisions, or a large hospital that is part of a larger vertically integrated delivery system. Should or can one assess the structure of these two incredibly different organizations in the same way, using the same instruments? Certainly, this would be quite an ambitious task and was one of the goals of the Aston Group. Instead, what we have seen are measures being developed piecemeal or adapted from other work and their reliability and validity assessed on a case-by-case basis.

The scientific criteria used to assess a measure of organizational structure should be consistent with the criteria used to judge any particular measure of interest to social scientists. When assessing measures, the primary point of departure for many social scientists is face validity. Therefore, the first step in assessing whether a particular measure of organizational structure (or other organizational variables) is sound is to see if it has face validity. In the case of survey research and multidimensional scales, further steps must be taken to assess the psychometric properties of the measure using what is accepted as the standard battery of internal consistency assessments (i.e. computing Cronbach's alpha coefficients), and to assess the construct validity by ensuring that the factor analysis was performed in an appropriate way. In some cases, where the goal of the researchers may be more in-line with methodological advancements, the investigators may expend efforts to demonstrate the convergent and discriminant validity of such measures.

The classic reports by Pugh et al. (1968, 1969), the so-called 'Aston studies', measured the structure of 52 organizations in England. The Aston Group developed six conceptual measures of structure, five of which they were able to construct using their data. The six are: specialization, standardization, formalization, centralization, configuration, and flexibility, the last of which was dropped due to methodological concerns.

'Specialization is concerned with the division of labour within the organization, the distribution of official duties among a number of positions' (p. 72). For example, is responsibility for particular functions like accounting located within one position, or is it dispersed across multiple positions? Standardization of procedures is the degree to which there '... are rules or definitions that purport to cover all circumstances and that apply invariably' (p. 74). In this case, organizational procedures are conceptualized as events that have 'regularity of occurrence' and are 'legitimized by the organization'. Ideally, this would be reflective of the degree to which procedures based on customs *and* procedures based on specified bureaucratic procedures are present in the organization. 'Formalization denotes the extent to which rules, procedures, instructions, and communications are written' (p. 75). 'Centralization has to do with the locus of authority to make decisions affecting the organization' or where '...the level in the hierarchy where executive action could be authorized...' (p. 76). In other words, how far up the chain of command one has to go to get permission to take a particular action. 'Configuration is the "shape" of the role structure... [and would be indicated by] a comprehensive and detailed organizational chart' (p. 78). Often, the configuration of the organization is expressed in both the vertical and horizontal spans of control; that is, the number of levels present within the organization and the number of subordinates reporting to the managers of any particular level.

In their study of these 52 organizations, the Aston Group constructed 64 scales, some of which were subscales while others were aggregate measures of the various structural dimensions. Given that this study was done over thirty years ago, it is not surprising then that the methods used to construct and validate these scales were not the same that would be used today. The methods used by the Aston Group partially relied on a '... Brogden–Clemans coefficient to test whether the items scaled and could therefore be regarded as representing a dimension' (p. 70). The Aston researchers claimed that this was an 'index of item-total correlation' and was used because it does not assume that the data are normally distributed. The researchers then used 'principal-components analysis' to group these scales into larger factors or 'summary scales'

(p. 70). Given that this is considered a 'watershed' study for organizational researchers, it is somewhat disappointing that the authors did not provide greater detail of their methods.

Although the scales developed by the Aston Group have become the point of departure for many subsequent studies of organizational structure, some researchers have voiced concern over these scales. In fact, not long after the initial reports on the Aston scales were published, one attempt to replicate the Aston methodology was not completely successful (Child, 1972). Others claim that the variables in the Aston Group's work represent scalar and not vector measures (Mansfield, 1973). More recent research has drawn attention to additional concerns over the unidimensionality of multi-item measures and the aggregation of subscales into summary scales (Grinyer & Yasai-Ardekani, 1981).

SECTOR-SPECIFIC MEASURES

Many of the present-day studies of organizational structure have focused on large, complex organizations and the integrating mechanisms used to coordinate activity among the different parts of these organizations. In the health sector, there has been research on so-called vertically integrated delivery systems. These are multi-institutional organizations that provide a continuum of services to health care consumers, including standard inpatient care and a variety of outpatient services. How such systems and networks of component organizations are structured is important because such structures will impact the degree to which coordination can be achieved among the various components, which, in turn, is believed to have implications for the costs and quality of patient care (Conrad & Dowling, 1990). There have been three reports on the structural components of these types of organizations. One study reported on the degree of 'functional integration' of the various components of health systems, taking the per cent of affirmative responses to a series of yes/no questions pertaining to 49 potential areas that could be functionally integrated across the component organizations (Devers et al., 1994). This study did not report using psychometric techniques to assess whether all 49 potential areas of functional integration were statistically related, but appear to have relied on face validity in constructing this measure. Another study, which also examined functional integration, employed standard psychometric factor analytic techniques as well as an internal consistency analysis in the development of their measure (Gillies, Shortell, Anderson, Mitchell & Morgan, 1993). The third study's purpose was to develop a taxonomy of such health systems and networks, with the elements of the taxonomy, differentiation, integration and centralization, representing structural dimensions of these systems (Bazzoli, Shortell, Dubbs, Chan & Kralovec, 1999). These researchers did not use standard psychometric techniques to arrive at their measure of structure for these systems and network, but instead used cluster analysis and a host of confirmatory methods (split halves reliability analysis, Duncan multiple range tests, and discriminant analysis).

FUTURE PERSPECTIVES AND CONCLUSIONS

The failure of organizational researchers to develop or adopt one set of multidimensional scales to assess organizational structure arises out of the diversity of organizations present in our society. Organizational size, the work performed and the technology used to perform the work, and the organization's environment are important determinants of organizational structures. Given the diversity in organizational technologies, tasks and environments, it is not surprising that a set of standardized measures has been elusive to researchers. The one set of scales that are widely seen as covering many of the aspects of organizational structure need to be tailored to the specific industry to which they are being applied and then psychometrically reassessed. Given the lack of standardized measures, what we have seen are sector-specific measures developed for the purpose of assessing organizational structures. Organizational researchers who study the health sector have been prodigious in their development of such scales.

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RELATED ENTRIES

Applied Fields: Organizations, Applied Fields: Work and Industry, Leadership in Organizational Settings, Risk and Prevention in Work and Organizational Settings, Job Stress, Organizational Culture

OUTCOME ASSESSMENT/ TREATMENT ASSESSMENT

INTRODUCTION

Outcome assessment, or treatment outcome assessment, refers to the assessment of the results of psychological treatment for a patient or group of patients on one or more dimensions of functioning. Although outcome assessment can reflect the results of psychological intervention in many settings (social, organization, school, etc.), the term is most commonly used to refer to the assessment of therapeutic interventions taking place in clinical settings.

Outcomes is one of three dimensions of quality of care identified by Donabedian (1985). The first dimension is *structure*. This refers to various aspects of the organization providing the care, including how the organization is 'organized', the physical facilities and equipment, and the number and qualifications of its professional staff. *Process* refers to the specific types of services that are provided to a patient during a specific episode of care. These might include various tests and assessments, therapeutic interventions, and discharge planning activities. *Outcomes*, on the other hand, refers to the results of the specific treatment that was rendered.

In considering the types of outcomes that might be assessed in behavioural healthcare settings, most clinicians probably would identify symptomatic change in psychological status as being the most important. However, as Sederer, Dickey, and Hermann (1996) have noted,

> Outcome for patients, families, employers, and payers is not simply confined to symptomatic change. Equally important to those affected by the care rendered is the patient's capacity to function within a family, community, or work environment or to exist independently, without undue burden to

the family and social welfare system. Also important is the patient's ability to show improvement in any concurrent medical and psychiatric disorder... Finally, not only do patients seek symptomatic improvement, but also they want to experience a subjective sense of health and well being. (p. 2)

There are numerous reasons for assessing outcomes. For example, outcome assessment can provide a direct measure of how much patient improvement has occurred as the result of a completed course of treatment intervention. Another common reason for assessing outcomes is to demonstrate the patient's need for therapeutic services beyond that which is typically covered by the patient's healthcare benefits. When assessment is conducted for this reason, the patient and the clinician both may benefit from the outcomes data.

Thus, 'outcomes' holds a different meaning for each of the different parties who have a stake in behavioural healthcare delivery, and the outcomes selected for measurement generally depend on the purpose for which the assessment is undertaken.

WHAT TO MEASURE

Probably the most frequently measured outcomes variable is that of symptomatology or psychological/mental health status. After all, disturbance or disruption in this dimension is probably the most common reason why people seek behavioural healthcare services in the first place. Thus, in the vast majority of the cases seen for behavioural healthcare services, the assessment of the patient's overall level of psychological distress or disturbance will yield the most singularly useful information.

However, measured changes in psychological distress or disturbance either (a) provide only a partial indication of the degree to which therapeutic intervention has been successful; (b) are not of interest to the patient or a third party payer; (c) are unrelated to the reason why the patient sought services in the first place; or (d) are otherwise inadequate or unacceptable as measures of improvement in the patient's condition. As alluded to earlier, one may find that for some patients, improved functioning on the job, at school, or with family or friends is much more relevant and important than symptom reduction. For other patients, improvement in their quality of life or sense of well-being is more meaningful.

It is not always a simple matter to determine exactly what should be measured. However, careful consideration of the following questions should greatly facilitate the decision:

1 Why did the patient seek services?
2 What does the patient hope to gain from treatment?
3 What are the patient's criteria for successful treatment?
4 What are the clinician's criteria for the successful completion of the current therapeutic episode?
5 What are the criteria for the successful completion of the current therapeutic episode that are held by significant third parties?

Note that the selection of the variables to be assessed may address more than one of the above issues. Ideally, this is what should happen. However, the task of gathering outcomes data should not become too burdensome. The key is to identify the point where the amount of data that can be obtained from a patient and/or collaterals, and the ease at which it can be gathered, are optimized.

Overall, the variables selected as measures of outcomes should reflect the needs and interests of the patient, clinician, and relevant third parties.

HOW TO MEASURE

Once the decision of *what* to measure has been made, one must then decide *how* it should be measured. In many cases, the most important data will be that obtained directly from the patient using self-report instruments. Underlying this assertion is the assumption that (a) valid and reliable instrumentation, appropriate to the needs of the patient, is available to the clinician; (b) the patient can read at the level required by the instruments; and (c) the patient is motivated to respond honestly to the questions asked. Barring one or more of these conditions, other options should be considered. Rating scales completed by the clinician or other members of the treatment staff may provide information that is as useful as that elicited directly from the patient. Examples include parent-completed inventories for child and adolescent patients. Collateral rating instruments

can also be used to gather information *in addition to* that obtained from self-report measures. When used in this manner, these instruments provide a mechanism by which the clinician, other treatment staff, and/or parents, guardians or other collaterals can contribute data to the outcome assessment endeavour.

Another potential source of outcomes information is administrative data. In most large provider organizations, this information can easily be retrieved through the organization's management information systems. Data related to the patient's diagnosis, dose and regimen of medication, physical findings, course of treatment, resource utilization, and treatment costs, along with other types of data typically stored in these systems, can be useful in evaluating the outcomes of therapeutic intervention.

In summary, outcomes information can be obtained from many different sources that can reflect different perspectives of the results of psychological treatment.

WHEN TO MEASURE

There are no hard and fast rules or widely accepted conventions related to when outcomes should be assessed. The common practice is to assess the patient at least at treatment initiation to obtain a baseline measure, and then again at termination/discharge. Additional assessment of the patient can take place at other points in time; that is, at other times during treatment and/or upon post-discharge follow-up.

Many would argue that post-treatment follow-up assessment provides a good indication of the enduring effects of treatment, and thus is the best or most important indication of the outcomes of a therapeutic intervention. Two types of comparisons may be made on follow-up. The first is a comparison of the patient's status, either at the time of treatment initiation or at the time of discharge or termination, to that of the patient at the time of follow-up assessment. The second type of post-treatment investigation involves comparing the frequency or severity of some aspects of the patient's life circumstances, behaviour or functioning which occurred during an interval of time prior to treatment, to that which occurred during an equivalent period of time immediately preceding the post-discharge assessment. A good example is a comparison of the utilization of medical and/or behavioural health services during the three months prior to treatment to that which occurred during the three months following treatment termination. This approach is commonly used in determining the medical cost-offset benefits of treatment.

In general, post-discharge outcome assessment probably should take place no sooner than one month after treatment has ended. Waiting three to six months to reassess the patient can provide a good indication of the lasting effects of treatment and therefore is preferred. Assessments being conducted to determine the frequency at which some behaviour or event occurs (as may be needed to determine cost-offset benefits) should be administered no sooner than the reference time interval used for the baseline assessment.

Thus, comparison of outcome measures obtained a few months after treatment termination to those obtained at the beginning of treatment can provide a powerful demonstration of the benefits of treatment.

HOW TO ANALYSE OUTCOMES DATA

There are two general approaches to the analysis of treatment outcomes data. The first is by determining whether changes in patient scores on outcome measures are *statistically significant*. The other is by establishing whether these changes are *clinically significant*. Use of standard tests of statistical significance is important in the analysis of group or population change data. Clinical significance is more relevant when evaluating change on measures for individual patients.

The issue of clinical significance has received a great deal of attention in psychotherapy research during the past several years. This is at least partially owing to the work of Jacobson and his colleagues (Jacobson & Truax, 1991; Jacobson, Follette & Revenstorf, 1984, 1986). Their work came at a time when researchers began to recognize that traditional statistical comparisons do not reveal a great deal about the efficacy of therapy. In discussing the topic, Jacobson and Truax broadly define the clinical significance of treatment as 'its ability to meet standards of efficacy set by consumers, clinicians, and researchers' (p. 12).

Jacobson and his colleagues view the determination, clinically significant change as being a

function of both the changes in the outcomes variables from pre- to post-treatment and the patient's functional status at the end of therapy. To this end, Jacobson et al. (1984) proposed the use of a reliable change index (RCI) to determine whether change is statistically significant. This index, modified on the recommendation of Christensen and Mendoza (1986), represents the pre-test score minus the post-test score divided by the standard error of the difference of the two scores. At the same time, Jacobson et al. felt that change in functioning could be conceptualized in one of three ways. Thus, for clinically significant change to have occurred, the RCI must be significant at at least the 0.05 level *and* the measured level of functioning must change such that following the therapeutic episode, it must either (a) fall outside the range of the dysfunctional population by at least two standard deviations from the mean of that population, in the direction of functionality; (b) fall within two standard deviations of the mean for the normal or functional population; or (c) be closer to the mean of the functional population than to that of the dysfunctional population. Jacobson and Truax viewed the third option (c) as being the least arbitrary, and they provided different recommendations for determining cutoffs for clinically significant change, depending upon the availability of normative data.

Overall, the assessment of clinically significant change is relatively easy and provides information that is more useful than that allowed by statistical significance testing alone.

BENEFITS OF OUTCOME ASSESSMENT

Cagney and Woods (1994) identified several benefits that can accrue from assessing outcomes. For patients, these include enhanced health and quality of life, improved healthcare quality, and effective use of the money paid into benefits plans. For providers, the outcomes data can result in improved clinical skills, information related to the quality of the care provided and to local practice standards, increased profitability, and decreased concerns over possible litigation. Outside of the clinical context, benefits also can accrue to payers and managed care organizations (MCOs). Potential payer benefits include healthier workers, improved healthcare quality, increased worker productivity, and reduced or contained healthcare costs. As for MCOs, the benefits include increased profits, information that can shape the practice patterns of their providers, and a decision-making process based on delivering quality care. In sum, outcome assessment can yield benefits to all of those who have a stake in treatment of any given patient.

FUTURE PERSPECTIVES

As the realization of the importance of outcome assessment continues to grow, so too will its implementation by the behavioural healthcare providers and organizations. The advances in technology that occurred during the last decade and those that will undoubtedly occur during the coming decade will facilitate this. In particular, the Internet will enable the cost-effective and efficient administration, scoring, analysis, and reporting of outcomes data, making it a key component in outcomes systems. Also, analysis of outcomes data will become more sophisticated and allow more useful information (e.g. for treatment matching, prediction of level of improvement) to be obtained. In all, outcome assessment will become an integral part of the behavioural healthcare delivery system and will ultimately result in greater patient improvement and satisfaction with treatment services.

CONCLUSIONS

In an era where the value of traditional psychological assessment is being questioned, outcome assessment is quickly gaining acceptance and becoming one of the most commonly performed types of assessment in the behavioural healthcare field. Many psychologists are uniquely qualified by their training to develop and oversee outcome assessment programmes. Consequently, those with the appropriate clinical and research training and experience are in an excellent position to both advance their value as a service provider and to significantly contribute to the advancement of the profession in the healthcare field.

Acknowledgement

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RELATED ENTRIES

EVALUATION: PROGRAMME EVALUATION (GENERAL), GOAL ATTAINMENT SCALING (GAS), OUTCOME EVALUATION IN NEUROPSYCHOLOGICAL REHABILITATION

OUTCOME EVALUATION IN NEUROPSYCHOLOGICAL REHABILITATION

INTRODUCTION

The evaluation of functional outcome of individuals with acquired brain injury (ABI) after discharge has become an integral part of rehabilitation programmes. It is the best way to corroborate the effectiveness of the treatment and to justify charges for rehabilitation services (Cope & O'Lear, 1993; Hall et al., 1994). The quality of a rehabilitation centre is related to the objectively measured outcome obtained upon conclusion of the patient's rehabilitation period.

Outcome is influenced by different factors and is not obtained by measuring any single concept. Acute factors determining the process of acute and post-acute rehabilitation are: the Glasgow Coma Scale (GCS) score on hospital admission, length of coma (LOC), duration of post-traumatic amnesia (PTA), family support, and social status.

In this entry we review the most important and widely used instruments for measuring outcome after acquired brain injury: the Glasgow Outcome Scale (GOS), the Disability Rating Scale (DRS), the Functional Independence Measure (FIM), the Functional Assessment Measure (FAM), Rancho Los Amigos Level of Cognitive Functioning Scale (LCFS), Community Integration Questionnaire (CIQ), the Neurologically-related Changes of Emotions and Personality Inventory (NECHAPI), and the Portland Adaptability Inventory (PAI).

THE GLASGOW COMA SCALE (GCS)

The Glasgow Coma Scale is one of the oldest scales used for measuring outcome after brain injury and was widely used before the development and implementation of new scales. The GCS was developed by Jennett and Bond in 1975 and an extended version by Wilson, Pettigrew and Teasdale appeared in 1998. The original scale has five categories or levels and is very easy

to apply. It does, however, have very poor sensitivity. Upon discharge from an acute care unit or from hospital, the patient is included in one of the 5 levels of the GOS: level 1 is death, level 2 is persistent vegetative state (absence of cortical function), level 3 is severe disability (conscious but disabled), level 4 is moderate disability (disabled but independent), and level 5 is good recovery (back to normal life). These levels can also be grouped as poor outcome (GOS 1–3) and good outcome (GOS 4–5). The extended version divides each of the last 3 levels into 2 each, with a total of 8 levels.

THE DISABILITY RATING SCALE (DRS)

The Disability Rating Scale was developed by Scranton, Fogel and Erdman in 1970 as a measure of general functional status. The usefulness of the DRS in measuring outcome of people with traumatic brain injury was tried by Rappaport, Hall and Hopkins in 1982 in an attempt to improve the GOS. It is easy to administer and an important advantage is that scoring can be used from the acute phase (baseline) up to the discharge of the patient, covering the different recovery phases. The DRS consists of eight categories (the first three categories are simple modifications of the Glasgow Coma Scale) which can be scored from direct observation of the patient, from a personal interview with the patient and even from a phone interview. The DRS has good validity and is highly reliable (Eliason & Topp, 1984; Gouvier et al., 1987; Fleming et al., 1994). On the downside, the DRS has poor sensitivity when used with people with mild traumatic brain injury (DRS < 3) or with people with severe disability (DRS > 22). To increase sensitivity, Hall, Mann, High, Wright, Kreutzer and Wood (1996) recommend adding a half-unit to items 4 to 8. This scale seems to have less ceiling effects than FIM or FIM+FAM.

THE FUNCTIONAL INDEPENDENCE MEASURE (FIM)

The Functional Independence Measure was developed by Keith, Granger, Hamilton and Sherwin in 1987 as a 7 point rating scale with 18 items (a score of 1 for complete dependence and 7 for complete independence). The FIM evaluates self-care (eating, washing oneself, showering/bathing, getting dressed, going to the toilet), sphincter control (vesical and anal sphincter), mobility (movement from the bed, chair and wheelchair, toilet, bath or shower), communication (comprehension, expression), psychosocial adjustment (social interaction, employability), and cognitive function (problem solving and memory). It is one of the most widely used tools to evaluate the functional status of neurological patients, and has been extensively used with patients with traumatic brain injury. Inter-rater reliability is between 0.86–0.97 (Hamilton et al., 1991; Linacre et al., 1994) and it seems to show a good face validity, internal consistency and discriminative capability (Dodds et al., 1993).

The FIM mainly measures common motor and self-care tasks found in everyday activities (13 items, with a maximum possible score of 91). The cognitive deficits (5 items, with a maximum possible score of 35) of the subjects are infra-represented. The principal problem found in this scale is the ceiling effect.

THE FUNCTIONAL ASSESSMENT MEASURE (FAM), THE FIM+FAM

The FAM was created to give more consistency to the FIM and thus eliminate the 'ceiling effect' detected in the latter. The FAM contributed 12 new items which evaluate cognitive, behavioural, communication and psychosocial information. Given that the cognitive or emotional items which are added by the FAM are more complex and difficult to evaluate (unless the person carrying out the observation is trained) through simple observations, the inter-raters reliability has not been well established. The additional items are related to orientation, attention and emotions. The validity correlates significantly with clinical data of the acute phase, as well as with the length of coma, post-traumatic amnesia and Glasgow Coma Scale scores (Hall et al., 1993). León-Carrión (2002) has recently developed a new formula for the FIM+FAM, offering three new functional indexes: Maximum Recovery Percentage, Index of Functionality at Admission

and Index of Functionality at Discharge. The indexes can be applied to the complete scale and to each of the 5 categories of the scale.

RANCHO LOS AMIGOS LEVEL OF COGNITIVE FUNCTIONING SCALE (LCFS)

This scale was originally designed (Hagen et al., 1972) as a useful and easy tool to classify the cognitive functioning of patients with traumatic brain injury. It is widely used in the acute phase, and also currently as an outcome measure after the patient has been discharged. There are 8 levels to which a patient may be assigned on the LCFS: I. no response, II. generalized response, III. localized response, IV. confused/agitated, V. confused/inappropriate, VI. confused/appropriate, VII. automatic/appropriate and VIII. purposeful/appropriate.

Table 1 gives a more detailed description of each level.

COMMUNITY INTEGRATION QUESTIONNAIRE (CIQ)

The CIQ (Willer et al., 1993) has been designed specifically to evaluate the success of the return to the community of a patient with acquired brain injury. It is a 15-item questionnaire evaluating home integration, social integration and integration into productive activities. Questions refer to everyday independent activities such as shopping, household activities, food preparation, visiting friends and so forth. Items are scored from 0 to 2 obtaining a total single score of community integration. The higher the score the better the social integration.

NEUROLOGICALLY RELATED CHANGES OF EMOTIONS AND PERSONALITY INVENTORY (NECHAPI)

The NECHAPI (León-Carrión, 1998) is a clinical tool specifically designed for observing emotional changes presented by individuals who have sustained traumatic brain injury, or with cerebrovascular disorders, brain tumours and neurological disorders. It contains 40 items which family members must rank from 1 to 5, depending on how they feel it defines the patient, a score of 5 being indicative of a high occurrence rate and a score of 1 indicating minimum frequency. Intermediate scores also exist. Family members score each item twice, the first time with reference to the patient before the neurological disorder and the second time with reference to the patient's present neurological status. The 40 items of this inventory are grouped into five factors: anger, sensation seeking, emotional vulnerability, sociability and emotional coldness. The reliability is 0.85. The NECHAPI can be repeated at any time to monitor the emotional progress of the patient after neurorehabilitation,

Table 1. Rancho Los Amigos scale of cognitive functioning

Level I. *No response to pain, touch, or sight*
Level II. *Generalized reflex response to pain*
Level III. *Localized response* Blinks to strong light, turns toward/away from sound, responds to physical discomfort, inconsistent response to commands.
Level IV. *Confused/Agitated* Alert, very active, aggressive or bizarre behaviour, performs motor activities but behaviour is non-purposeful, extremely short attention span.
Level V. *Confused/Non-agitated* Gross attention to environment, highly distractible, requires continual redirection, difficulty learning new tasks, agitated by too much stimulation. May engage in social conversation but with inappropriate verbalizations.
Level VI. *Confused/Appropriate* Inconsistent orientation to time and place, retention span/recent memory impaired, begins to recall past, consistently follows simple directions, goal directed behaviour with assistance.
Level VII. *Automatic/Appropriate* Performs daily routine in highly familiar environment in a non-confused but automatic robot-like manner. Skills noticeably deteriorate in unfamiliar environments. Lacks realistic planning for own future.
Level VIII. *Purposeful/Appropriate* Independent and capable of processing new information. Distant and recent events can be remembered and can figure out complex and simple problems.

as well as to monitor the effect of neuropharmacotherapy on the emotional life of individuals with neurological disorders.

PORTLAND ADAPTABILITY INVENTORY (PAI)

The Portland Adaptability Inventory was created by Muriel D. Lezak in 1987 (see Lezak, 1995) to systematically evaluate the personality and social maladjustment that people with traumatic brain injury can exhibit. Items, with the exception of the alcohol and drugs items, are rated from 0 to 3. Rating is based on raters' observations, family reports, medical records, clinical observations and social history. The internal consistency coefficient is 0.938 for the total inventory. Items are grouped into 3 different scales: Temperament and Emotionality (T/E), Activities and Social Behaviour (ASB) and Physical Capabilities (PC). Some authors found the PAI useful in predicting, at admission, the vocational possibilities of patients following treatment, especially of patients with minor or moderate brain injury (Malec et al., 1991).

FUTURE PERSPECTIVES AND CONCLUSIONS

Outcome measurement after acquired brain injury rehabilitation will be an essential and indispensable task for neuropsychologists working in this field. The goal of outcome measurement is to evaluate the benefit of rehabilitation. Objectification of the results of rehabilitation will become increasingly prevalent due to the demands of insurance companies and patients' families. The other great challenge for neuropsychologists working in this area will be to correlate functional outcome measures to the neuroimages of the patients taken prior to and after neuropsychological rehabilitation (León-Carrión, 1997).

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RELATED ENTRIES

Applied Fields: Neuropsychology, Evaluation: Programme Evaluation (General), Outcome Assessment/ Treatment Assessment

PALLIATIVE CARE

INTRODUCTION

The Palliative Care Movement is based mainly on the modern Hospice Philosophy concerning end-of-life care, its main exponent being the St. Christopher Hospice, founded by C. Saunders. She explains (Sanders, 1993) the two key points that form the nucleus of this philosophy:

- 'the message is: you matter because you are you, and you matter until the last moment of your life. We will do all we can, not only to help you die peacefully, but also to live until you die.'
- the concept of Total Pain (including physical, psychological, social and spiritual elements).

The author also lists the elements that St. Christopher's brought together to set up this work: (a) beds integrated in local community; (b) development and monitoring of symptom control; (c) family support; (d) bereavement service; (e) home care; (f) research and evaluation; and (g) education and training.

There are also some key events that have promoted the expansion and consolidation of this care system:

- The work by Kübler-Ross, using a large series of interviews with terminal patients talking about dying, and reflected in her famous book *On Death and Dying*. This had a huge impact on the public and on many health professionals in the 1960s.
- The beginning of the movement in the USA, in 1974, headed by S. Lack, and its subsequent impact of home care in this country; not long thereafter the same resources were adopted in the UK.
- The first use of the term 'palliative care', as a non-stigmatizing one, by B. Mount, who opened the Palliative Care Service at the Royal Victoria Hospital in Montreal, and its subsequent introduction in other countries.
- In 1987, Palliative Medicine was recognized as a medical speciality in the UK.
- In 1990, the WHO stated that the correct term for this system of care is 'Palliative Care', offering a useful definition thereto: 'The active total care of patients whose disease is not responsive to curative treatment, control of pain, of other symptoms, and of psychological, social and spiritual problems, is paramount. The goal of palliative care is achievement of the best quality of life for patients and their families. Many aspects of palliative care are also applicable early in the course of the illness in conjunction with anticancer treatment.'

And as Doyle et al. (1993) have emphasized, WHO adds: 'Palliative care ... affirms life and regards dying as a normal process ... neither hastens nor postpones death ... provides relief from pain and other distressing symptoms ... integrates the psychological and the spiritual aspects

of care ... offers a support system to help patients live as actively as possible until death ... offers a support system to help the family cope during the patient's illness and in their own bereavement.' As we can see, this implies:

- continuity of care
- multidisciplinary, global care
- family care.

Palliative care researchers and clinicians point out that the main aim of palliative care is to provide as much comfort and/or well-being as possible for patients and families. This, however, is not a simple task, and if we delve deep enough, we can detect many questions that are difficult to answer; in this entry, I will try to point out some considerations about them, justifying the need for assessment, and the areas that we must take in to account to do so appropriately.

The reasons for assessment are ethical, professional and socio-political. First of all, we need to know if we are really promoting well-being, and alleviating suffering, from the points of view of patients and families, as well as what type of interventions produce the effects. Second, we must take cognizance of the real needs of patients so as to learn about such needs, and also to train health professionals and students (instructing them in the right therapeutic instruments). And lastly, nowadays the consolidation of palliative care will not receive support, at least until it can be evaluated, demonstrating a positive cost-efficiency balance (Bayés, 2000).

Some phenomena that complicate the issue of assessment in this field are as follows:

- Different conditions or pathologies in patients
- The changing nature of the terminal situation
- The multiple factors incurred therein
- Differing ages of patients
- The necessary multidisciplinary and interdisciplinary approach/es
- The double objective: patient and family.

DEFINITION OF MAIN ASSESSMENT OBJECTIVES

If clinical global targets are to alleviate suffering and promote well-being, we must assess both phenomena in a comprehensive and systematic way.

Regarding *well-being*: this term has been assimilated to that of *quality of life*; nevertheless, it is possible that instruments of quality of life used in other domains of health will be useless in this case, because they include some certain components that are probably irrelevant to this situation (e.g. functional status will always deteriorate). Researchers try to seek the most suitable measures; they also are constructing new supplementary scales for the usual instruments (Sprangers et al., 1998). Other authors propose that a single question, posed on a linear or categorical scale, should be used to assess quality of life, in preference to other available methods (Donnelly & Walsh, 1966).

On the other hand, the term *suffering* has been assessed in many ways: i.e. psychological suffering (anxiety and depression); presence of physical symptoms, pain as the most devastating symptom; the expressed needs of patients; and, recently, spiritual aspects. All of the above are necessary to understand the situation of patients and family, but it will also be necessary to have global measures of suffering in addition to the specific aspects that contribute to it.

Further, we must seek adequate measures, verbal and/or non-verbal, but always be able to evaluate the subjective perception of the individual about suffering. As we have shown in our research work, the presence of a symptom, and the worry about it, does not always correlate (Barreto et al., 1996). We have made some proposals regarding the global assessment of suffering and well-being (Bayés et al., 1995) using as an indirect reference the fact of how quickly, or how slowly, time passes.

I believe that it is also very important to have *conceptual models of reference* which underlie assessment. Hence, each researcher will have the same framework to advance in knowledge. In this sense, we understand suffering in a way similar to Chapman and Gravin (1993), who did so on the basis of the Lazarus and Folkman notion of threat; the degree of suffering being the result of balance between perceived threat and resourcefulness.

It is also important to emphasize that we need to assess a dynamic adaptation process, not an act, due to the proximity of death and the changing nature of illness progression. In sum, the assessment must be brief, non-intrusive,

global and specific, including sensitivity to rapid changes.

Finally, it is especially relevant to measure *outcomes in palliative care*. Issues included are the utilization of appropriate measurements, study populations, outcomes, accountability, standards of hospice care, etc. Moreover, a research effort is required to develop measurement tools which will utilize patient and family perspectives to measure quality of care (Teno, 1999), taking into account that nearer the death, life takes on new shape, values change and things once ignored become more important. Existing quality-of-care measures do not attend to changes in priorities or to dimensions that acquire new significance. Likewise, it is very important to evaluate palliative care services and identify gaps in them. The identification of unmet needs will be crucial to the development of services which enable people to die in a well-supported environment.

An important review of literature on quality of care, in palliative care settings, was carried out by Hearn and Higginson in 1998. The main objective was to determine whether teams providing specialist palliative care improve health outcomes of patients with advanced cancer, and their families or carers, when compared to conventional services. Improved outcomes were seen in the amount of time spent at home by patients, satisfaction of both patients and their careers, symptom control, a reduction in the number of inpatient hospital days, a reduction in overall cost, and the patients' likelihood of dying where they wished, for those receiving specialist care from a multiprofessional palliative care team. When compared to conventional care, there is evidence that specialist teams in palliative help improve satisfaction, and identify and deal with more patients and family needs. Moreover, palliative care reduces the overall costs by reducing the amount of time patients spend in acute hospital settings. Further evidence can be found in another study by Axelson and Christensen (1998) on financial assessment.

The most frequently used instruments in palliative care settings have been quality of life instruments, such as the MacGill Quality of Life Questionnaire (MQOL) (Pratheepawanit et al., 1999); or a supplementary scale of the QLQ-C30 by The EORTC Quality of Life Study Group (Sprangers et al., 1998). Also, the Edmonton Symptom Assessment System (ESAS) (Bruera et al., 1991), and the Support Team Assessment Schedule (STAS) as an audit instrument (Carson et al., 2000). Moreover, the Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983) has been used to assess psychological states, as well as different instruments to assess pain.

FUTURE PERSPECTIVES

Many more studies need to be developed to know the real impact of the palliative care movement. Global assessment of suffering and well-being should be carried out with brief, simple, sensible, non-intrusive and useful instruments. We must, too, improve services, making effective evaluations of present gaps and unmet needs of patients and families, from the points of view of users. Indeed, efficiency must be demonstrated, avoiding methodological problems of studies already made. I wish to stress the need for more assessment in some abandoned areas. For instance, family needs and well-being, both in illness, and thereafter in bereavement situations. Far more assessment is needed in the field of gerontology and other non-oncologic pathologies. Demented patients and children deserve special attention.

CONCLUSIONS

Palliative Care is a relatively new field dealing with the dignity of dying people and their carers; to date, research has shown its usefulness, to some extent, for patients, families and multidisciplinary health teams. Various trials have been made to assess a number of aspects of this type of care, and the global results thereof. Partial assessment of quality of life, symptoms, specific pain, spirituality and quality of care is now being undertaken. We need global measures to complement this. We also need to know how efficient palliative care is, together with contributions of different professionals.

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RELATED ENTRIES

Applied Fields: Clinical, Applied Fields: Health, Applied Fields: Gerontology, Burnout Assessment, Caregiver Burden

PERCEIVED ENVIRONMENTAL QUALITY

INTRODUCTION

In the last three decades, research in the field of Environmental Psychology has undertaken the task of developing applications for resolving community problems. This is not a specific characteristic of Environmental Psychology, but it has nevertheless served as one of its evolutionary foundations. As Stokols (1995) pointed out, in recent years, applications of environmental-behaviour studies have been oriented towards the solution of certain socio-environmental problems. These include those related to life in the city (stress, noise, overcrowding), residential environment (both indoor and outdoor), working environment, natural resources management (energy, water, air, etc.), natural environments (landscape, preserved and recreational areas, etc.), institutional buildings (housing, schools, etc.), and so on. This has allowed applications in the field of environmental and behavioural research to gain strength in the improvement of public policies and social problem-solving. Researchers believe that their work will eventually help to ameliorate

these problems, maintaining the concept of environmental quality both explicitly and implicitly present at all times. It is necessary to obtain better measures of environmental quality to aid the development of better recommendations for the improvement of human settings.

The term environmental quality has a range of meanings. In a general sense, it refers to the properties or features of a physical environment that define it as an optimal resource in itself or in comparison to others, taking into account present or future human well-being. In psychological terms, environmental quality can be defined as the properties or attributes of a given socio-physical environment that positively influence a person's state of health, a community's well-being and people's capacity to achieve the goals that guide their behaviour. Environmental quality can be considered a synonym of environmental stimulation quality, including both social and physical traits (Wohlwill, 1976). It can alter a person's emotional state, cognitive competence or level of behavioural performance (Evans, 1999), and can influence health and behaviour either positively or negatively, depending largely on whether the quality is 'high' or 'low'.

ENVIRONMENTAL ASSESSMENT FRAMEWORK

The concept of environmental quality and, especially, the concept of perceived environmental quality have been used in the environmental assessment framework. Environmental assessment has been defined as a set of standard procedures for examining and measuring the physical, social and institutional properties of environmental settings (Craik, 1971; Zube, 1980, 1991). Therefore, these procedures describe the relationship between human behaviour and environmental quality in terms of physical, behavioural, descriptive and evaluative measures.

Research on perceived environmental quality and related issues is based on four basic concepts of indisputable importance. The first of these concepts is that of environmental dispositions (Craik & Zube, 1976), which refers to people's tendencies in responding to urban, rural or other types of environments. The second basic concept is that of Social Climate (Moos & Lemke, 1992, 1996). This concept provides the theoretical basis evaluating the psychological impact of residential or institutional settings. Behaviour setting (Barker, 1968), a traditional term within ecological psychology, is the third concept, and refers to the relationship between behaviour and a specific space (*learning about a specific behaviour*, *examining it in its natural environment*, etc.). Environmental competence (Lawton, 1982), based on studies with groups of elderly people, is the fourth concept. It deals with people's satisfaction and achievement of goals in their interaction with environmental resources.

However, a lack of conceptual integration and an absence of relationships among empirical findings measured with theoretical concepts also characterize this field. Various perspectives have acknowledged the need for theoretical integration and the development of conceptual models for environmental research (Gärling, 1998; Stokols, 1995; Canter & Kenny, 1982).

The assessment of perceived environmental quality is a broad notion covering a variety of approaches. In consequence, several different kinds of environmental assessment have developed, depending on the following four criteria:

(a) Type of setting or environment. The assessment of environmental quality may refer to a physical molar environment (large-scale environment) or to a particular environmental aspect (small-scale environment), such as air pollution, water, noise, and so on.
(b) Type of environmental quality indicators. In this sense, Craik (1983) makes a distinction between technical environmental assessment (focused on the recording of the objective physical qualities of a setting and the appraisal of those qualities) and observational environmental assessment (based on the consensual impressions of the places being assessed, in an ordinary language framework, provided by panels of observers).
(c) Type of subjective judgement requested of people, as defined by Kaplan (1991). In this sense, assessment of an environment or setting may be based either on preferential judgement or on a comparative appraisal of different places (Craik & McKechnie, 1974).

(d) Relationship between environmental quality assessment and the decision-making process. In this respect, a distinction is made between predictive (or previous) environmental quality assessment and post-environmental quality assessment. Post-Occupancy Evaluation (POE) is a relevant case of the latter.

Environmental quality assessment is aimed mainly at clarifying environmental policy goals, appraising the effectiveness of environmental protection programmes, estimating the environmental impact of private and public projects and to establish connections between experts' approaches and the needs of lay people (Craik, 1983). Environmental quality criteria are normally based on physical parameters. These parameters are themselves based on specific technical knowledge held by experts, rather than on the subjective appraisal of the place by users or other lay people. Nevertheless, a comprehensive assessment of environmental quality must include both the quality assessment of an environment and its properties and indices of how the environment is perceived.

PERCEIVED ENVIRONMENTAL QUALITY INDEX (PEQI)

The term perceived environmental quality is used, in this context, to denote the environmental quality assessment of a given place from a user's or resident's own experience. Psychologists and experts from other fields (architects, planners, engineers, etc.) have stressed the need for these kinds of studies. As early as 1975, in reference to the land-use quality problem, the National Academy of Sciences and the National Academy of Engineering recognized that 'taking people's measurement of perceived environmental quality into account is an approach which can improve our understanding of land-use, as well as that of many other environmental problems' (NAS-NAE, 1975: 42, cited by Craik, 1983).

Craik (1983) defines Perceived Environmental Quality Index (PEQI) as 'a measure of the quality of a place or setting derived from individuals' evaluations. The index takes account of people's perception of the pertinent attributes of a place and also weights them according to their perception of relative importance' (Craik, 1983: 70).

According to Craik, Perceived Environmental Quality Index can be used for:

(a) Assessing environmental quality aspects involved in the transactions between people and the environment, such as noise pollution, overcrowding, climate, scenic quality of a place, etc. From this point of view, perceived environmental quality is defined as quality of stimulation for individual performance. The main question concerns the extent to which an individual experience of a place or setting aids or constrains the achievement of the individual's goals.

(b) Adding new criteria to technical quality assessment from users' or observers' point of view. This is the case, for example, of studies on the scenic quality of natural landscapes, which are considered to have a high scenic quality due to their ecological or biological importance. Some perceptual variables, such as the presence or absence of vegetation or water, or level of physical deterioration, have been added as new criteria (Daniel & Vinning, 1983).

(c) Estimating the congruence between perceived environmental quality and the objective conditions that favour public health (e.g. in relation to air or noise pollution). An open question in this area is how to relate the assessment of the environmental objective conditions to perceived environmental quality.

(d) Enabling a person-centred as well as a place-centred environmental quality assessment.

For many years, the concept of perceived environmental quality has been employed more in the solution of a variety of environmental problems than as a specific paradigm or approach. During the 1970s and 80s, a series of studies focused on different settings or places with the object of formulating perceived environmental quality indices. An overview of these research developments is presented by Craik and Feimer (1987: 893), and is summarized in Table 1, following the distinction, previously referred to, between technical assessment procedures and the observational assessment approach (the most important references in these scales are also included in the above mentioned chapter by Craik and Feimer).

Table 1. Environmental assessment instruments

Observer-Based Environmental Assessment Instruments
College Characteristics Index
Environmental Descriptor Scales
Environmental Q Set
Group Dimensions Description Questionnaire
Landscape Adjective Checklist
Organizational Climate Description Scales
Regional Q Sort Deck
Social Climate Scale
University Residence Environment Scale
Perceived Neighbourhood Quality Scales
Technical Environmental Assessment Instruments
Water Quality Index
Environmental Noise Measures (U.S.E.P.A.)
MITRE Air Quality Index (MAQI)
Air quality: Aerosol light scattering
Indoor Air Monitoring Programme
Geomorphological Dimensions of Floodplains
Technical Neighbourhood Assessment Indices
Behaviour Setting Survey
Structure Indices for Work Organization
Environmental Assessment Technique

Source: Craik & Feimer (1987: 893)

METHODOLOGICAL ISSUES

The Perceived Environmental Quality Index was considered by Craik and Zube (1976) as a standardized procedure to include users' appraisals in the formulation and assessment of public policies and private projects.

As technical devices for evaluative research, perceived environmental quality indices are a predominant feature of self-report techniques. Participants are requested to give an appraisal of the quality of a particular setting or an aspect of it. Although the majority of research on perceived environmental quality is based on people's direct appraisals, it has recently become important to use groups of trained observers to register the relevant actions and situations in the assessment of an environment's quality. Evans (1999) considers the use of trained observers helpful in determining an environmental factor's behavioural, cognitive and emotional effects. This permits the study not only of personally perceived environmental dimensions, but also of the imperceptible dimensions a lay person (non-expert) senses as environmental stimulation, but which he or she is incapable of determining as caused by a particular environmental parameter.

Hence, perceived environmental quality assessment aims to establish a procedure for participants to give their descriptive appraisal of a physical environment. A standard, valid, reliable and widespread device, enabling the integration of results and accumulation of knowledge on perceived environmental quality assessment, is difficult to attain due to several methodological problems. These problems result from: (1) different samples of environments, (2) different kinds of environmental descriptive assessments and the variety of judgements, (3) the different ways in which environmental stimuli are presented and (4) the diversity of environmental attributes considered.

With regard to the problem of different samples of environments, perceived environmental quality assessment has been used with a wide diversity of places, settings and environmental characteristics. The range of environments whose perceived quality has been appraised includes: visual quality of a landscape, indoor features of a dwelling, and assessment of neighbourhoods, public spaces (squares, streets, etc.), building façades, work settings, educational settings, institutional spaces for children and elderly people, and so on. This has recently led Lawton (1999) to employ the label 'environmental mosaic'. A certain conceptualization is required in the face of such a diversity of environments. Lawton, following Bronfenbrenner's (1979) well-known conceptualization, proposes an environmental taxonomy that makes a distinction between physical environment, personal environment, small group environment, suprapersonal environment and macro-social environment. In spite of the relevance of his contribution, further effort is required to make each one of these types of environment operational, as well as to accurately differentiate between them in order to accumulate further knowledge on perceived environmental quality assessment.

The second problem refers to the different descriptions and subjective judgements researchers have requested from participants, as pointed out by Craik and Feimer (1987). Two kinds of indices can be specifically identified: indices based on preferential judgement and indices based on comparative subjective judgements. The first type expresses an individual's appraisals of the quality of an environment. The second type is used to register an individual's quality assessment of an

actual physical environment in comparison to a given criterion or in comparison to a place with which he or she is familiar. An example from a classic study in this field illustrates the relevance of this differentiation. In their research on neighbourhood assessment, Carp and Carp (1982: 281) include a general preferential judgement item: *living in a local area makes respondent feel angry or peaceful*. It also includes subjective judgements in comparison to a general criterion (*satisfaction with local area as a place to live*) or in comparison to other places (*feelings about block: one of the worst in this part of town or one of the best in this part of town; or rating of local area compared to the ideal*). Craik and Zube (1976), since the very first studies on PEQIs, recognized the fact that indices based on preferential judgements are more closely related to the observer's particular characteristics than indices based on comparative judgements. The latter reveals the existence of greater consensus between observers, as well as among experts and non-experts.

Thirdly, variations may be due to the different ways in which an environment is presented. Since the first studies on perceived environmental quality assessment, there have been technical innovations in the presentation of environmental features. Given their historical significance, mention should be made of research with an environmental simulator at the University of Berkeley, as well as previous studies carried out at the University of Surrey using scale models for the assessment of room cosiness. Furthermore, several studies on perceived environmental quality assessment have taken place in settings that were the object of assessment (residential and institutional locations, schools or workplaces). Different perceived environmental quality assessment strategies can be identified: appraisal of the actual place or setting considered, or simulated presentation, using photographs, pictures, audiovisual images and computer simulations. Recent research has proposed the assessment of concepts of a setting that people have in mind, or of generic places (Kramer, 1995).

The fourth and last problem, of special importance, refers to the diversity of results, given the wide variety of attributes considered in environmental quality assessment strategies. Attributes are features that can be used to subjectively describe an environment, and thus differentiate it from others. To quote Lawton (1999) 'the number of attributes is large and open ended'. In 1987, after reviewing more than thirty studies on perceived environmental quality assessment, Corraliza proposed the classification of attributes in three categories: (1) physical quality descriptors of a place (e.g. size, illumination or ventilation), (2) attributes that depict the salient features of a place or setting (e.g. the predominance of natural versus constructed elements of a scene), hence explaining subjective judgement, and (3) the emotional dimensions that characterize the observer's environmental experience (e.g. affective qualities, according to the terminology of Russell, Ward & Pratt, 1981). Lawton, in the above-mentioned contribution, acknowledges the need to differentiate between descriptive attributes and evaluative attributes of an environment or setting. Descriptive attributes are likely to affect a person's behaviour, but do not necessarily enable him or her to make a positive or negative judgement about the setting (for instance, its size or scale, or its novelty or familiarity). On the other hand, evaluative attributes are defined by subjective judgements that can be represented as variables on a continuum from positive to negative. Table 2 shows a list of attributes based on that of Lawton (1999).

Table 2. Environmental attributes

Descriptive Attributes
Quantitative
Scale
Intensity
Temporal quality
Structural
Proximal versus Distal
Predictability
Diversity
Complexity
Patterned versus Random
Contextual
Interactive quality
Responsiveness
Activity versus Passivity
Novelty versus Familiarity
Evaluative Attributes
Satisfaction
Preference
Affective quality
General quality

Source: After Lawton (1999: 112)

FUTURE PERSPECTIVES AND CONCLUSIONS

As outlined above, much of the research on perceived environmental quality has involved the assessment of specific places with highly variable scales. Rapid changes in communication and information technologies, increasing concern over global environmental problems, and other more or less dramatic aspects (such as loss of scenic quality of urban and natural landscapes or increasing vulnerability to environmental risks, among many others) are reflecting the need to study new factors that affect the quality of the environment but are ignored in people's direct and immediate perceptive appraisals. The influence of emerging illnesses (AIDS, certain types of food poisoning, etc.), technological risks, knowledge about the endangered state of the planet, or risks associated with climatic changes, all removed from individuals' direct living environment, are affecting their perception of environmental quality. The influence of the perceived quality of a distant environment on perceived quality of an immediate environment must be taken into account.

One of the main issues in this area is the attainment of optimal congruence between the criteria of objective and subjective environmental quality. Frequently, different methodological approaches are used and different results are obtained. One of the main challenges for the future is to develop assessment combining objective and subjective measures of environmental quality. This strategy could be helpful in obtaining more reliable and valid measures of perceived environmental quality.

In addition, the importance of identifying groups of specialized environmental users must be underlined and considered when designing perceived environmental quality assessment strategies. Different age groups and cultural differentiation must be taken into account.

Perceived environmental quality standards that consider an individual's total environmental assessment are necessary from a conceptual point of view (Gärling, 1998; Stokols, 1995). Perceived environmental quality assessment must assume the operational management of a complex unit, as represented by the person-in-the-environment. It must be understood as a person or group's set of relatively stable perceived qualities of a physical and/or social environment (Clitheroe, Stokols & Zmuidzinas, 1998: 105).

Finally, the importance of connecting perceived environmental quality assessment to the decision-making processes of planners and decision makers must be emphasized so that research can fulfil one of the fundamental objectives that justify it: the improvement of the human environment and the realization of an optimum level of human well-being.

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RELATED ENTRIES

Theoretical Perspective: Cognitive, Person/Situation (Environment) Assessment, Residential and Treatment Facilities, Social Climate, Total Quality Management

PERFORMANCE

INTRODUCTION

Performance assessment is a class of testing that purports to measure individual and team ability to display complex knowledge and skills. This entry will describe attributes and uses of performance assessments, discuss some technical issues, and point to likely approaches using technology to strengthen their utility. Performance assessment can take many forms, including observed actions (either live or recorded) of the examinee(s), the evaluation of products and related processes created by the respondent(s), or the conduct and outcome of multiple-stage projects. Performance assessment can focus on the output, or end result, or attend to the procedures by which a goal is accomplished. The stimuli eliciting a performance can be many, including simple verbal directions, printed text, computer-supported stimuli, or other agreed-upon signals.

Although performance assessment has sometimes been defined in the negative – as 'not paper and pencil' or not multiple-choice test format – it is very possible that a given performance assessment might incorporate many types of response formats. The main idea in performance assessment is to get an integrated sample of student accomplishment, usually one that requires substantial time to produce. Performance assessments, like other tests, can be administered on a stand-alone basis

at a particular interval, such as the end of the year, or can be integrated more directly into instruction. A collection of performances, creating a portfolio of a student's performance, can be constructed. These portfolios could either document emerging expertise over a period of time or contain a sample of best pieces to show the highest level of performance of which the student is capable. Common attributes of performance assessments are:

- Extended format
- Applied domain
- Complex task
- Constructed response
- Rated or judged scores

While predominantly used to draw conclusions and make decisions about individuals, performance assessments have been used to measure team processes in school, military, professional, and business settings. One such approach that has received much attention in team research is low-fidelity networked simulations (Bowers, Salas, Prince & Brannick, 1992; Weaver, Bowers, Salas & Cannon-Bowers, 1995). These assessments enable teams of individuals to perform a collaborative task, with individually defined responsibilities, using a networked computer environment. Examples of this type of assessment include evaluations of aircrew coordination (Salas, Bowers & Cannon-Bowers, 1995) and team negotiation practices and processes (O'Neil, Chung & Brown, 1997).

The advantages of this form of team performance assessment are many. Notably, these assessments can be achieved at a relatively low cost, particularly in comparison to full-scale simulations or live administration. In addition, such assessments provide for increased experimental control of independent variables in team research. They provide a means to facilitate the breadth and depth of research in the area of team performance assessment. Moreover, these assessments provide a method for the generation and testing of team performance theory (Weaver et al., 1995).

Finally, team performance assessments provide an effective platform for the investigation of the psychometric properties of various team effectiveness measures. There is converging research to support the reliability and validity of low-fidelity networked simulations as a research tool in the investigation of assessing team performance (Bowers et al., 1992).

The purpose or purposes for which a performance assessment is developed and used will guide the degree to which technical standards should be applied to make a judgement of its quality and validity (*Standards for Educational and Psychological Testing*, American Educational Research Association, American Psychological Association, and National Council on Measurement in Education, 1999). To the extent that comparisons from the data will be drawn among different students, classrooms, programmes or institutions, standardized approaches should be used to assure comparable administration. For example, performance assessments used as part of classroom learning may be developed by a teacher group and judged according to very malleable standards or guidelines. On the other hand, if a performance assessment was key in determining whether a student received a diploma or was admitted to a competitive programme, every effort would need to be made to ensure that the assessment was administered carefully and that raters were trained to provide valid scores.

WHAT IS KNOWN ABOUT PERFORMANCE ASSESSMENT?

Considerable research has been undertaken with regard to performance assessments, and although some findings are robust, others are in need of continued exploration. While most results have implications for the quality of the information resulting from the assessment, they may also be pertinent to practicality and utility issues.

Scoring Rubrics

At the outset of the most recent revival of performance assessments, *c.*1989, there was a belief that every new topic and task required its own specially constructed set of scoring guidelines. After considerable research, performance assessment has converged on an approach that uses general categories that are independent of particular domains (e.g. the use of prior knowledge), as well as elements that are domain specific (e.g. use of a split-half approach in troubleshooting electronic malfunctions). In addition, contention has subsided around whether rubrics should be

analytical – that is, composed of numerous subscores – or holistic, producing only one score although requiring the rater to attend to different aspects of performance. Of more importance is the extent to which scores can give a reliable estimate of student performance. When analytical approaches are well designed, it is possible that they can provide information useful for targeted instructional improvement.

Task Generation

There is good evidence that performance assessments can be developed at relatively low cost with an aid for clear task specifications. In research conducted in the state of Hawaii and in numerous local school districts, task formats were designed that facilitated the substitution of new content and increased the likelihood of generalizable results. For example, a task format asking students to examine opposing interpretations of historical events and to write about their interpretation to a friend can be applied at various grade levels and topics (Baker, Freeman & Clayton, 1991; Baker, Linn, Abedi & Niemi, 1996). An efficient means of comparable task generation is desirable since extended performance assessments are memorable, and, in a secure testing environment, may be obsolete after one administration.

Validity

Validity arguments are developed for all measures based on their purposes and the degree to which their use adheres to developers' recommendations. When performance assessments first became popular, there was a notion that they might be exempt from the 'usual' standards of validity and reliability associated with more traditional testing forms. In the early 1990s, writers attempted to clarify the requirements for validity for performance assessments used to estimate individual or school progress and accomplishments. In related works (Baker, O'Neil & Linn, 1993; Linn, Baker & Dunbar, 1991), criteria for evaluating the quality and validity of performance assessments have been proposed.

Most of these criteria are expanded in the *Standards for Educational and Psychological Testing* (American Educational Research Association, American Psychological Association, and National Council on Measurement in Education, 1999). Of special note are the tensions among many of these criteria. For example, if performance assessments are to cover a good deal of content and promote transfer to new domains, they will usually call for higher levels of complexity.

However, these requirements set a high standard if simultaneously (and perhaps most importantly) the key attribute of validity for school-related tests is that they are susceptible to change caused by good instruction. As yet, there is relatively little evidence about the impact of opportunity to learn and achievement on performance assessments (Baker et al., 1995).

Fairness

For a test to be useful, its results should provide no particular advantage or disadvantage to identifiable groups of examinees. At the outset, performance assessment was thought to provide an additional opportunity for heretofore low-performing groups to demonstrate their competence. Unfortunately, the evidence suggests that minority students, in the US at least, seem to have higher rates of non-completion on open-ended responses (Abedi, Lord & Plummer, 1997: 33–37). In addition, although physical performance is often a component of a task (e.g. the weighing of unknown chemicals), most performance assessments have required far more integration of language skills with other subject matter skills. For example, tasks may be presented in extended verbal cues. Responses, even those focusing on problem solving or other action, may require written explanations. As a result, the concern about linguistic demands of tasks has led to a set of efforts in accommodating tasks for second language speakers. The intent is to maintain the challenge and subject matter integrity of the task without overburdening the examinee with unnecessary linguistic barriers.

Practical Constraints

There are numerous reasons for the recession in the use of performance assessments in educational policy environments. Many derive from an inappropriate view of the development costs of such assessments and from the fact that many

vendors charge substantial amounts of money for each examinee, for a relatively small amount of new data. In particular, when instruction has not yet become sufficiently effective to change the strongly skewed data that have been obtained from most performance assessment administrations, it is little wonder that policymakers may prefer less costly approaches to obtaining achievement data.

Nonetheless, one of the promises of performance assessment was that it might model more modern instructional approaches for teachers and students (Herman, Aschbacher & Winters, 1992). When tests that consist almost exclusively of short-answer or multiple-choice items are employed, it is not surprising to observe instructional practices that follow the lead of the test format. It is not unusual, therefore, for the argument for or against performance assessment to rise and fall on cost and practicality. Since performance assessments are generally more costly to score when compared with the optical scanning technology used to score multiple-choice tests, certain approaches to minimize these costs are under development.

One widely used approach involves the scoring of examinations by teachers, where teachers score the work of either their own or others' students. In environments with rapid turnover of teachers or where underprepared teachers are employed, the resulting quality of scoring is not high. Even when protections involving centralized scoring of a substantial proportion of papers are available, adjustments to teachers' scores can be made only to groups and not to individual papers. Thus, such strategies are not useful in the realm of high-stakes testing. Another approach is to use computer-based algorithms to score student papers, and a number of commercial ventures exist to do this. The task is based on a set of prescored papers; the computer-scoring algorithm typically uses a complex regression model to develop scores similar to the operational criteria used by the person-scored system. Thus far, such systems are used only to confirm live rater judgements rather than to supplant them.

Technology

The use of technology obviously has much to offer in the support of performance-based measurement. Technology is already used in assessing students' ability to solve problems in simulated environments, to use expert approaches to search databases and the Web, and to solve collaborative problems. In addition to automated scoring of essays, there are other expert-based approaches to evaluating student online performance.

In addition, automated authoring systems linked to databases of content will enable the construction of comparable tasks with the aid of computers and serve to improve the validity of the assessments as well as to reduce task development and administration costs.

Psychometric Issues

Performance assessments have been criticized for lacking generalizability due to large rater effects in variance decomposition analysis. However, study after study has established that raters can be trained to evaluate student work reliably. Old notions that every performance needs to be scored by at least two raters (and sometimes more) are not supported by the literature, which repeatedly suggests that one well-trained rater may be enough for most assessment purposes (e.g. programme evaluation, system monitoring, instructional improvement, student feedback). Investing in careful training procedures (Baker, Aschbacher, Niemi & Sato, 1992) can reduce administration costs in the long run. Further, researchers have noted that 'quite high levels of generalizability across raters can be achieved when well-defined scoring rubrics are reinforced by intensive training and ongoing monitoring during rating sessions' (Linn & Burton, 1994: 5).

In addition to addressing concerns about lack of generalizability due to rater inconsistency, research has focused on the task-specific nature of performance assessments. Cronbach states, 'The emphasis in performance assessment on tasks requiring extensive working time makes it very difficult to hold down measurement errors associated with task specifics' (Cronbach, Linn, Brennan & Haertel, 1997: 398). Score reliability is also related to the number of tasks that can be said to come from the same domain. Early generalizability studies (Shavelson, Baxter & Gao, 1993) documented that low generalizability among tasks resulted when task characteristics differed. What remains to be seen is whether such generalizability can be reduced by appropriate

instruction directed to the domain from which the tasks are sampled. Unless this is possible, the idea of considering many performance tasks as samples from the same domain would be easy to challenge.

When scores on performance assessments are to be used to classify students with regard to standards, then the likelihood of misclassification as a function of low reliability should be considered. Psychometric researchers have suggested that the standard error (SE) rather than a reliability coefficient should be used to describe the uncertainty associated with the score on performance assessments (Cronbach et al., 1997; Yen, 1997). If scores on performance assessments are used to classify a school or other institution, matrix-sampling designs can help reduce the error in school-level scores resulting from task specificity. However, these designs will not reduce task-specific error in individual-level scores. In addition, score reports for school-level scores should include the per cent of respondents above a designated cut-point (PAC) as well as the standard errors for the PACs.

CONCLUSIONS

Performance assessment is a technique for testing that has notable benefits in its direct connection to learning and theories underlying the development of competence. Technical and practical problems including managing the assessment and assuring high technical quality are yet to be fully resolved.

The psychometric research on performance assessments is not fully conclusive, nor should it be considered complete. As Cronbach and colleagues have recently stated, 'evaluating the uncertainty of assessment results taxes our present psychometric understandings. Thus, more research on technical dilemmas involved in new assessment protocols is urgently needed' (Cronbach et al., 1997: 398).

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RELATED ENTRIES

Applied Fields: Education, Performance Standards: Constructed Response Item Formats, Performance Standards: Selected Response Item Formats, Theoretical Perspective: Psychometrics

PERFORMANCE STANDARDS: CONSTRUCTED RESPONSE ITEM FORMATS

INTRODUCTION

When standard-setting methods were initially developed, most of the assessments consisted of selected-response or multiple-choice items. These methods most often focused on judgements by experts on the probable item-level performance of examinees. For example, the Angoff (1971) standard-setting method asks panellists to estimate the probability that a randomly selected, hypothetical 'minimally competent candidate (MCC)' would be able to answer items from the test correctly. The Nedelsky (1954) method focuses the panellists' judgements on the alternatives comprising multiple-choice questions, asking panellists to identify those alternatives that the MCC would be able to eliminate as incorrect. The probability of an MCC getting the item correct is calculated as a function of the number of remaining options. Obviously, these kinds of methods will not work very well with constructed-response items.

CONSTRUCTED-RESPONSE QUESTIONS

Currently, many assessments contain open-ended questions, either in the form of written essays, oral response, portfolios, observations of performance by scorers of real or simulated patients, or through structured patient management protocols. An important consideration when setting cutscores with constructed-response assessments is the total number of constructed-response questions that comprise the assessment package and the complexity of these questions. In some assessments, the number of constructed-response questions is fairly small (between 5–10) and for others, the number is much higher (15–20 or more).

The magnitude and complexity of the total assessment has implications for the utility of some of the standard-setting approaches used with constructed-response assessments. If the total number of questions and the complexity of these

responses are somewhat limited, procedures that seek a holistic decision about the overall performance of the candidates can be used. When the number of questions is high, the capability of the panellists to make a holistic judgement about the overall performance becomes more difficult. In such cases, strategies need to be employed that use the information on the individual questions to set an overall performance standard. One such approach is to set individual performance standards on the separate questions and then to aggregate these performance standards question-by-question to obtain the cutscore on the full test.

QUESTION-BY-QUESTION METHODS

Several approaches use this question-by-question (sometimes referred to as an exercise-by-exercise) approach. A prevalent strategy employed with constructed-response questions uses an analytic analysis of the probable performance of a typical MCC. In many of these applications, the scoring guidelines identify positive points for specific responses. In addition, negative points can be accrued through making anticipated mistakes. Through an analysis of the anticipated performance of the MCC, combining positive and negative points, the expected score for the MCC is obtained for the question. An aggregation of these question-level expected scores across all the questions in the test serves of the cutscore for the test.

Hambleton and Plake (1995) used extended Angoff approach to have panellists estimate, for five questions scored on a 1–4 point scale, the anticipated score of the MCC. Next, panellists were asked to weight each of the 5 questions, where the weights represent the relative importance of that question to the overall purpose of the assessment. The product of the question's weight and the anticipated score for the MCC on that question was aggregated across the 5 questions to form an overall weighted minimum passing score. This approach attempts to focus the final cutscore not only on the anticipated performance of the MCC on the individual questions, but to take into account the total makeup of the examination in a more holistic sense. Through their weights, panellists can identify more important questions to receive relatively higher emphasis in the final pass/fail decision.

Another method is the 'paper selection' or 'Benchmark' approach. Under this paradigm, panellists are asked to select from a set of examinee performances, the work that best typifies the performance of the MCC. In some applications, the scores on the work are revealed to the panellists, but this is not always the case. The task presented to the panellists is to select two papers from the set of 'Benchmark' papers that either represent or bracket the anticipated performance of the MCC. Panellists' aggregate results are presented to the panel, often followed by discussion, and then the panellists make a revised estimate of the performance of the MCCs on this question. Their average value is used as the cutscore for the question. The process is repeated for each question that comprises the assessment. The final cutscore is determined by summing the results across the questions in the assessment. Critical to the success of this approach is the quality of the Benchmark papers and how well they represent their intended score point.

Another method, called the Analytical Judgment Method or AJM (Plake & Hambleton, 2001), is a judgemental procedure that focuses panellists' attention on actual student work. The panellists' task is to classify student papers into one of several performance categories defined to capture levels of performance as expressed by the multiple performance categories. The classification scale consists of several categories, for example Below basic, Borderline basic, Basic, Borderline proficient, Proficient, Borderline advanced, Advanced. With the AJM, each of the questions that comprise the assessment is considered independently by the panellists. For each question, the panellists review each of several (usually 50 or more) student papers, sampled to present the full score continuum, and are asked to make categorical assignments regarding the performance levels represented by the quality of the student's work. Student papers are not presented in the same order across the questions. The panellists do not know the author identification of the student's work, so the panellists are not able to make a total judgement about the overall work of an individual student; rather the panellists classify the papers for the students independently for each of the test questions. Scores for papers that were assigned to the borderline categories are used in deriving the cutpoints.

HOLISTIC APPROACHES

Some methods attempt to capture the totality of the examinees' performance by considering their overall examination performance. As mentioned above, the utility of these approaches is limited to programmes whose assessments allow for a meaningful conceptualization of the totality of the candidate's performance. Often this involves assessments with a limited number of constructed-response questions.

One approach that addresses the holistic nature of the examinee's performance is the Judgmental Policy-Capturing (JPC) Standard Setting Method (Jaeger & Mills, 2001). Panellists make classification decisions concerning the overall quality of examinee performance based on profiles of scored performances across all questions or tasks. One application, used in an operational standard setting with the National Board for Professional Teaching Standards certifications, involves a 1–4 point scale for overall candidate performance where, in general, a '1' represents unacceptable performance that clearly does not warrant Board certification, a '2' indicates a candidate performance that is inadequate for Board certification, a '3' represents performance that satisfies the criteria for Board certification, and a score of '4' signals exemplary performance that exceeds the performance criteria for Board certification. It is expected that the final standard would fall in the region of the overall scale that represents performance that is consistent with criteria for National Board Certification.

After training on the nature of the exercises and the meaning of the scores, panellists are trained in the use of the policy-capturing methodology. Through a series of iterations, panellists are asked to make and, perhaps, modify their classification decisions on a large number of candidate performance profiles. Based on a regression algorithm that attempts to capture a compensatory decision model that is consistent with each of the panellist's policy, weights are derived to be used in calculating a weighted average overall performance score for each candidate. The median of panellists' captured policies can be used in developing a performance standard. Candidates with overall performance scores above the standard would receive certification, and those with scores below the standard would not. The final decision of the location of the performance standard involves another step where panellists focus on the profiles and overall performance scores that are in the vicinity of the scale-implied cutscore (e.g. close to 2.75). The final choice of the cutscore is then determined by the panellists' judgement of the minimally acceptable overall performance score for Board certification.

Another approach that considers the profile of examinee performance is the Dominant Profile approach, developed by Plake, Hambleton, and Jaeger (1997). This approach involves having panellists, who are fully cognizant of the exercises and the meaning of the exercise scores, derive decision rules that capture their view of the score levels across the profile components necessary to pass the test. Under this approach, panellists can articulate decision rules that are complex and reflect mixed decision models. For example, they could set a conjunctive rule for part of the profile (a minimum score on a particular question) and compensatory rules for other parts. Once the decision rule for the 'just barely acceptable' profile is established, any profile that has scores that meet or exceed that profile are deemed to 'pass'. Therefore, these 'dominating profiles' are those that represent passing scores whereas other profiles of scores would be deemed as failures.

The Bookmark (Mitzel et al., 2001) approach also has the panellists consider the full test, but the test questions have been ordered on difficulty. This method is used most often with tests that are comprised of a mixture of multiple-choice and constructed-response questions. An item-response theory method is used to scale the questions (both multiple-choice and constructed-response) onto a common scale. The panellists' task is to locate in this ordered test booklet the location where a minimally competent examinee would be expected to answer the preceding items correctly and the subsequent items incorrectly. Panellists' results are discussed between rounds, with panellists providing their rationales for the locations of their bookmarks. Typically, three rounds are conducted and convergence in bookmark location usually occurs across the rounds. An average of the panellists' round 3 bookmark location is used as the recommended minimum passing score.

The Body of Work (Kingston et al., 2001) approach involves having panellists sequentially

view full test booklet response for examinees at varying score levels. Initially, panellists examine test booklets from a broad range of examinee performance. Based on their analysis of these test booklets, more test booklets are provided to them to consider, this time from a narrower range of score performance. In the final round, panellists classify student test booklets in pass (1) and fail (0) categories. The minimum passing score is determined by using logistic regression. The test score where the probability of passing is 0.5 is selected as the minimum passing score based on the Body of Work approach.

In summary, a variety of standard-setting approaches have been developed for use with constructed-response questions. One method involves focusing on the questions one at a time and setting a minimum passing score on that question. Combining the individual question-by-question minimum passing scores is then typically used as the overall examination cutscore. The minimum passing scores are typically determined by having the panellists either go through an analytical process of identifying the points on the question that would be expected to be earned by the MCC or by selecting from Benchmark papers the work that exemplifies that of an MCC.

A few methods have attempted to use a more holistic, full examination, approach by focusing the standard-setting process on examinee score profiles. These methods have been used typically with assessments that have a small number of questions. These approaches allow for the totality of examinee performance across the specific questions to be the basis for the performance standard.

EVALUATING THE RESULTS FROM A STANDARD-SETTING ACTIVITY

One of the most challenging parts of a standard-setting activity is knowing whether the results are appropriate. There is no 'gold standard' to aid in knowing if the performance standard is 'right' or not. Instead, the validity of the performance standard is judged by evaluating the results from the standard-setting workshop. Kane (1994) provided a framework for evaluating the validity of a performance standard (procedural, internal, and external). In addition, Hambleton (2001) presents a series of questions that should be considered in evaluating the results from a standard-setting activity. These 20 questions are:

1 Was consideration given to the groups who should be represented on the standard-setting panel?
2 Was the panel large enough and representative enough of the appropriate constituencies to be judged suitable for setting performance standards?
3 Were two panels used to check the generalizability of the performance standards?
4 Were sufficient resources allocated to carry out the study properly?
5 Was the performance standard-setting method field tested in preparation for its use in the standard-setting study, and revised accordingly?
6 Was the standard-setting method appropriate for the particular assessment and was it described in detail?
7 Were panellists explained the purpose of the assessment and the uses of the test scores at the beginning of the standard-setting meeting?
8 Were the qualifications and other relevant demographic data about the panellists collected?
9 Were the panellists administered the assessment, or at least a part of it?
10 Were the panellists suitably trained on the method to set the performance standards?
11 Were descriptions of the performance categories clear to the extent that they were used effectively by panellists in the standard-setting process?
12 If an iterative process was used for discussing and reconciling rating differences, was the feedback to panellists clear, understandable, and useful?
13 Was the process itself conducted efficiently?
14 Were the panellists given the opportunity to 'ground' their ratings with performance data and how was the data used?
15 Were panellists provided consequential data (or impact data) to use in their deliberations and how did they use the information?
16 Was the approach for arriving at final performance standards clearly described and appropriate?
17 Was an evaluation of the process carried out by the panellists?

18 Was evidence compiled to support the validity of the performance standards?
19 Was the full standard-setting process documented?
20 Were effective steps taken to communicate the performance standards?

These questions are not specific to standard-setting methods for constructed-response assessments, but are applicable to standard-setting methods in general. Some of them are more challenging to meet with complex performance assessments, such as question no. 9 which asks whether the panellists were administered the assessment. For some complex performance type assessments, it would be unrealistic to ask the panellists to engage in the actual assessment activities. However, it is important that the panellists have a deep appreciation of the complexity and difficulty level of the tasks that the examinees are being asked to complete for the assessment.

FUTURE PERSPECTIVES AND CONCLUSIONS

The purpose of this entry was to identify standard-setting methods that are appropriate to use with assessments that ask the examinee to complete tasks, such as an essay examination, a performance task, or a portfolio. Most of the long-standing standard-setting methods (such as those proposed by Angoff and Nedelsky) were designed for multiple-choice assessments. Although it is possible to extend some of these approaches for use with constructed-response assessments, that is not always the case. This is particularly true with complex performance assessments.

In this document, several methods for use with constructed-response assessments were described. These methods were differentiated based on whether they considered the parts of the assessment analytically or holistically. Overall, these methods are designed to provide indications of appropriate performance standards or cutscores that are congruent with the complexity and difficulty of the tasks presented to the examinees. Because there is no 'right' answer of 'gold standard' to use in evaluating the outcomes of a standard-setting activity, evaluation criteria are presented the question of the reasonableness and appropriateness of the panel convened, the methods used, and the results.

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RELATED ENTRIES

Criterion-Referenced Testing: Methods and Procedures, Performance Standards: Selected Response Item Formats, Applied Fields: Education, Theoretical Perspective: Psychometrics

PERFORMANCE STANDARDS: SELECTED RESPONSE ITEM FORMATS

INTRODUCTION

Setting performance standards means implementing a process that identifies one or more points on a score scale to create categories of observed test scores. More fully, Cizek (1993: 100) has defined standard setting as 'the proper following of a prescribed, rational system of rules or procedures resulting in the assignment of a number to differentiate between two or more states or degrees of performance'. This differentiation can result in dichotomous classifications such as Master/Non-master or Pass/Fail. Standard setting can also result in more than two categories or achievement levels, such as Basic/Proficient/Advanced or the familiar grades of A, B, C, D, F.

In practice, setting a performance standard has become nearly synonymous with deriving one or more cutting scores. However, as Kane (1994) has pointed out, 'it is useful to draw a distinction between the *passing score*, defined as a point on the score scale, and the *performance standard*, defined as the minimally adequate level of performance for some purpose ... The performance standard is the conceptual version of the desired level of competence, and the passing score is the operational version' (p. 426, emphasis in original).

Specialists in the field of educational measurement have developed numerous methods for deriving levels of performance and a wide variety of applications for standard-setting methods exists. Standards are established for determining school readiness; for communicating student achievement in school subjects; for granting admission to institutions; for selection for special services; for suggesting diagnoses or treatments, for placement into specialized programmes; and for awarding certification or granting licensure. Overviews of the many approaches to standard setting can be found in several sources (see, e.g., Berk, 1986; Cizek, 1996a, 2001; Jaeger, 1989; Livingston & Zieky, 1982).

Although the methods for standard setting are numerous, care must be taken to match the method used to the particular characteristics of the assessment and context in which the standard setting is conducted. Linn (1994) has suggested that standard-setting procedures can be distinguished based on the four unique purposes of exhortation, exemplification, accountability, and certification of achievement. It is also common to categorize methods as reflecting *absolute*, *relative*, or *compromise* standards. Jaeger (1989) has grouped standard-setting methods into two categories, those which are *test-centred* and those which are *examinee-centred*.

It can also be useful to classify standard-setting methods by the response format dictated by the items or tasks comprising the assessment, i.e. either *constructed-response* or *selected-response* formats. The remainder of this entry consists of two major sections: a review of some of the most common methods for establishing performance standards on selected-response (e.g. multiple-choice) assessments; and a brief summary of professional guidelines for doing so.

STANDARD-SETTING METHODS

The following subsections describe major standard-setting methods that have traditionally found wide use on assessments comprised of selected-response format items. The methods are described in order of their introduction in the psychometric literature. All but one of the methods that will be described (Nedelsky) can be – and have been – fairly easily adapted to tests consisting of other item/task formats. Conversely, many newly introduced methods have been developed specifically for use with tests consisting of constructed-response items/tasks. Two such examples would be the Bookmark method (Mitzel, Lewis, Patz & Green, 2001) and the Analytic Judgment method (Plake & Hambleton, 2001). It is also important to note, however, that nearly all of the newer methods

could be applied to tests consisting of a mix of item formats, or even to tests consisting exclusively of selected-response items.

The Nedelsky Method

The method introduced by Nedelsky (1954) involves assigning values to multiple-choice test items based upon the probability of examinees being able to rule out incorrect options. Nedelsky introduced the concept of hypothetical, minimally competent examinees. Nedelsky used the term *F-D student* to refer to those persons who were on the borderline between receiving a course grade of F (failing) or D (passing). By extension, Nedelsky's conceptualization has been extended to applications involving examinees who are on the borderline of being considered competent or not competent, licensable or not licensable, adequately prepared for professional practice or not, and so on.

To use the Nedelsky method, standard-setting participants begin by discussing (and, commonly, by reaching consensus about) the characteristics of the hypothetical minimally competent examinee in the area covered by the test. Then, relying on that conceptualization, participants carefully inspect each item in the actual test form that will be administered to the examinees. For each item in the test, standard-setting participants identify all options that a hypothetical minimally competent examinee would rule out as incorrect. The reciprocal of the remaining number of options is each item's *Nedelsky value*. Under the assumption that a minimally competent examinee would rule out the obviously incorrect options and guess at random from the remaining options, the Nedelsky value for an item can be thought of as representing the probability that such an examinee will answer the item correctly. For applications involving five-option multiple-choice items, Nedelsky values can range from 0.20 (no options could be ruled out as obviously incorrect) to 1.00 (all options but the keyed response could be ruled out). In most applications, the sum of the Nedelsky values across all test items is used as the passing score.

When a panel of standard-setting participants is used, group consensus about each item's Nedelsky value may be pursued to arrive at a single rating for each item. Or, the average of participants' individual ratings could be used as the rating for each item. A final option would be to sum the probabilities across items for each participant (yielding a recommended passing score for each participant), then calculate the average of the individual passing scores.

The Nedelsky method has the advantage of computational simplicity, and it is easy for participants to understand and apply. However, it appears to be used infrequently compared to other methods, and limitations of the method may be one reason for this. For example, Berk (1984) has noted that the scale of Nedelsky values does not permit probabilities between 0.50 and 1.00. Shepard (1980) has hypothesized that this restriction and the fact that participants are often reluctant to assign Nedelsky values of 1.0 may explain why the Nedelsky method often results in standards that are lower than those obtained using other methods.

The Ebel Method

A method proposed by Ebel (1972) also requires participants to make judgements about each item in a test, and also relies on the conceptualization of the minimally competent examinee. To implement the Ebel method, participants provide estimates of the difficulty of individual test items, judgements about the relevance of the items, and predictions about examinees' success on combinations of the difficulty and relevance dimensions. Ebel proposed that participants categorize items according to four levels describing their judgements about the relevance of each item for distinguishing successful overall performance in the area covered by the test (Essential, Important, Acceptable, Questionable) and three levels describing the participants' judgements about item difficulty (Easy, Medium, Hard). Participants then make judgements about the per cent of items correct in each relevance-by-difficulty category that should be required of the hypothetical minimally competent examinee group in order to pass the test. The recommended passing score resulting from application of the Ebel method is found by first multiplying the number of items in each relevance-by-difficulty category by the per cent of those items judged to be necessary for passing. These products are then summed and the sum is divided by the total number of items to yield a recommended passing score.

Although the Ebel method is conceptually and computationally simple, it has also received criticism. For example, the method reveals inadequacies in the test construction process (e.g. Why should any item judged to be of questionable relevance be included in an examination?). It requires judgements that may not be necessary (e.g. empirical item difficulty values are often available).

The Angoff Method

The method developed by Angoff (1971: 514–515) has proven to be one of the most popular methods for setting standards on tests comprised of selected-response items. The method, and its many variations, has also been adapted to tests consisting of other than selected-response format items (see, for example, Hambleton and Plake's [1995] description of an 'extended Angoff procedure' to set standards on performance assessments, or Loomis and Bourque [2001] for application of a modified Angoff approach on the National Assessment of Educational Progress).

Like the other item-based procedures, the Angoff method requires standard-setting participants to review each item in a test form and to provide judgements regarding the performance of minimally competent examinees. The unique aspect of the Angoff method is that the judgements participants make are in the form of estimated percentages of the minimally competent group that will answer each item correctly. Thus, ratings provided by participants using the Angoff method can range from 0 to 100. In practice, however, the lower end of the range is usually set at the chance level; for example, on a five-option, multiple-choice item, the lower bound of Angoff ratings would be 20.

In most instances, Angoff's originally suggested procedure is modified to include two or more rounds of ratings as a way of reducing interrater variability. Participants (sometimes called *judges*) are also often provided with normative data (in the form of item *p*-values) or consequence data (in the form of anticipated pass/fail rates) in one or more of the rounds of ratings. (Modifications like these are often incorporated in other standard-setting methods as well.)

The Contrasting Groups Method

In contrast to procedures that require participants in the standard-setting process to make judgements about test items, examinee-centred methods require participants to make direct judgements about persons. Those judgements are combined with information about the actual performance of the same group of persons on an examination. One such method is known as the *contrasting groups* method (see Livingston & Zieky, 1982). The method involves asking participants, who have knowledge of both the examinee population and the knowledge or skill level judged identified as 'mastery' or 'passing' in the area tested, to classify a sample of examinees as either competent or not competent. This group of examinees is also administered the actual examination that will be used for decision making. This process permits the formation of two distributions of test scores: one for those judged to be 'masters' and one for those judged to be 'non-masters'.

To set a cutting score using the contrasting groups method, the two distributions of test performance are examined to find a point on the score scale, usually the point at which the tails of the master and non-master distributions overlap. Livingston and Zieky (1982: 40) recommend that the test score distributions of these contrasting groups then be plotted and smoothed. To derive a passing score, they recommend that 'one logical choice is the test score for which the ''smoothed'' percent-qualified is exactly 50 percent'.

The Borderline Group Method

The borderline group method is another example of an examinee-based procedure. Zieky and Livingston (1977) proposed using a single group judged to be at the borderline separating competent from non-competent performance. Like the contrasting groups procedure, the borderline group method requires participants who are familiar with the range of examinees' knowledge and skill. Judgements are made regarding which examinees are on the 'borderline' between competent/not competent or pass/fail, and a sample of examinees is administered the actual test form that will be used for decision making. The median score of this subsample of examinees judged to be 'borderline' is used as a recommended standard.

The Hofstee Method

Some standard-setting methods blend information about absolute levels of knowledge or skill

required of examinees and normative judgements about acceptable pass/fail rates. One such method was suggested by Hofstee (1983) who observed that important classification decisions are 'based on two classes of premises, one political and the other cognitive' (p. 109). Because methods like Hofstee's represent an attempt to strike a balance between these competing perspectives, they are sometimes referred to as 'compromise' methods.

The Hofstee method is implemented by asking each standard-setting participant to respond to four questions:

1 What is the lowest cutoff score that would be acceptable, even if every student attained that score on the first testing?
2 What is the lowest acceptable cutoff score, even if *no* student attained that score on the first testing?
3 What is the maximum tolerable failure rate? and
4 What is the minimum acceptable failure rate?

These mean values, over judges, associated with responses to these four questions are referred to, respectively, as k_{min}, k_{max}, f_{max}, and f_{min}. A cutting score is derived by plotting a line through the points (f_{min}, k_{max}) and (f_{max}, k_{min}), projecting the line onto the distribution of observed test scores, and identifying the point of intersection. From that point, a line drawn perpendicular to the ordinate locates the per cent correct score required for passing; a line drawn perpendicular to the abscissa identifies the corresponding failure rate. Although proposed at a time when the primary application was to multiple-choice format tests, the Hofstee method (like other methods described here) may also be used on tests consisting of other item/task formats.

GUIDELINES FOR STANDARD SETTING

Each of the standard-setting methods described previously requires careful planning, execution, and evaluation in order to make a strong case for the stability and validity of the resulting cut-scores and classifications. An abundance of guidance exists for accomplishing these goals.

Of primary importance are the *Standards for Educational and Psychological Testing* (AERA/APA/NCME, 1999). Among other things, the *Standards* recommend that: 'the rationale and procedures used for establishing cut scores be clearly documented' (Standard 4.19, p. 59); cut scores 'should be established on the basis of sound empirical data concerning the relation of test performance to relevant criteria, (Standard 4.20, p. 60); and when a judgemental process is used, the process 'should be designed so that judges can bring their knowledge and experience to bear in a reasonable way' (Standard 4.21, p. 60). The *Standards* also provide recommendations for technical analysis and reporting. For example, the *Standards* recommend that conditional standard errors of measurement be calculated at cut points (Standard 2.14) and estimates of classification consistency (Standard 2.15) be reported.

A theoretical framework for gathering validity evidence for standard setting has been provided by Kane (1994). Kane identified three sources of evidence that should be pursued, including: (1) *procedural evidence* that 'focuses on the appropriateness of the procedures used and the quality of the implementation of those procedures' (p. 437); (2) *internal evidence* – that is, 'data generated within the standard-setting study itself that can be used as a partial check on the validity of the results' (p. 445); and (3) *external evidence*, in which investigators compare 'the results of decisions made using the passing score to the results of the same kind of decision, or a related decision made in a different way' (p. 448).

A number of authors have also provided practical guidelines for designing, conducting, and evaluating standard-setting procedures. For example, Cizek (1996b) outlined four types of information that should be reported when standard setting is conducted. These include information on: (1) the purpose of the test and the standard setting, including definitions of relevant constructs; (2) the standard-setting method used, including linkages between method and purpose, and linkages between method and the characteristics assessed; (3) the procedures as implemented, including description and rationale for adjustments to participants, judgements, or final results; and (4) technical analysis, including process and qualifications of participants, evidence that participants correctly applied the method, and estimation of variability in results.

A second source of practical guidance is provided by Hambleton (2001). Hambleton

presents 20 key questions that can be used to guide the conceptualization and planning of a standard-setting study, and can also be used to assess the procedures and results of a process that has been implemented. A particularly helpful aspect of Hambleton's work is the inclusion of several tables and forms that provide templates that are easily adapted to a wide range of standard-setting contexts. These include: (1) a list of steps common to all judgemental standard setting; (2) examples of sound performance level descriptions; and (3) a sample participant evaluation form.

CONCLUSIONS

Both the theory and practice of standard setting have developed rapidly over the past 40 years, as measurement specialists have provided rational, systematic solutions to the practical testing problem of setting performance standards. Regardless of the method used, however, the practice of standard setting involves human judgement – it represents the nexus of research design, statistics, instructional design, values, and policy considerations.

The standard-setting methods described in this entry were developed primarily for setting performance standards on assessments comprised of selected-response formats. Each of the methods provides a set of procedures that has been subjected to scholarly scrutiny and, if followed carefully, can yield defensible cutting scores. However, the requirement that *any* procedure must be carefully designed, executed, and evaluated cannot be overemphasized. As others have frankly observed: 'You can't fix by analysis what you bungled by design' (Light, Singer & Willett, 1990: viii).

Finally, it should be noted that standard-setting procedures are not an end in themselves. The cutting score that results from implementation of a standard-setting procedure is usually only a *recommended* standard. Ultimately, the entity with the authority to establish a standard of performance must review, reject, adjust, or approve the results of any standard-setting process.

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RELATED ENTRIES

Criterion-Referenced Testing: Methods and Procedures, Performance Standards: Constructed Response Item Formats

PERSON/SITUATION (ENVIRONMENT) ASSESSMENT

INTRODUCTION

This entry gives an overview of the importance of person/situation interaction for the psychological assessment of either persons or situations, and provides guidelines for the assessment of person/situation interaction.

Any individual's specific behaviour such as a stress reaction varies across situations and can be graphically represented as an intraindividual situation profile of that behaviour. A behaviour shows a person/situation interaction if different individuals vary differently across situations in that behaviour (graphically: their situation profiles are not parallel). In such a case, the interindividual differences within situations are not consistent across situations; hence the behaviour correlates lower than 1 between the situations.

Figure 1 illustrates three typical cases: (a) no person/situation interaction between situations 1, 2 (note that the curves of the two individuals differ, however, in the level of the behaviour); (b) ordinal person/situation interaction between situations 2, 3 due to a ceiling effect (the interindividual rank-order is constant across situations but the sizes of the interindividual differences vary); (c) disordinal person/situation interaction between situations 3, 4 (the interindividual rank-order varies across situations; graphically, the profiles cross).

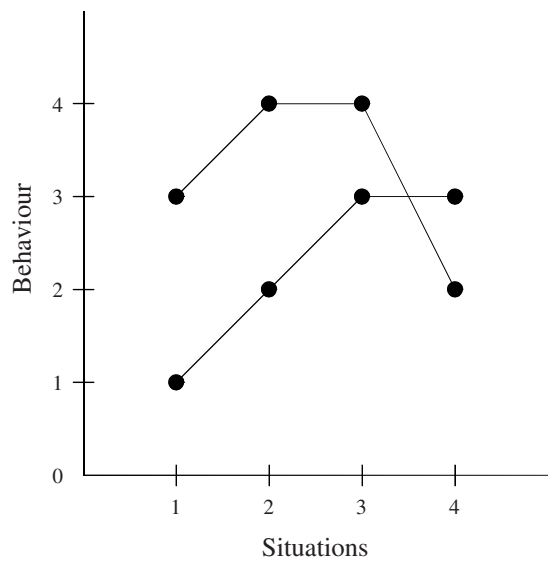

Figure 1. Three typical cases of (no) person/situation interaction. The two curves refer to two individuals (see text).

IMPORTANCE OF PERSON/ SITUATION INTERACTIONS

The importance of person/situation interaction for the assessment of personality traits was first recognized during the consistency debate in the 1970s and 1980s (Mischel, 1968; Kenrick & Funder, 1988). Single behaviours were found to show low cross-situational consistencies, which questioned the assumption of broad personality traits that would allow the prediction of behaviour in heterogeneous situations. However, these studies confounded person/situation interaction and measurement error, and hence overestimated the amount of systematic person/situation interaction. Empirical studies that have controlled measurement error by aggregating trait-relevant behaviour over time or across similar situations have found that the size of person/situation interaction varies greatly between different traits, from virtually zero interaction for subjective well-being to maximum interaction (equivalent to zero cross-situational consistency) for sociability in work versus recreational situations (Diener & Larsen, 1984). Thus, attempts to obtain general estimates of the percentage of variance attributable to persons, situations, and person/situation interaction (e.g. Endler & Hunt, 1966) are in vain.

Furthermore, it has been increasingly recognized that the size of person/situation interaction strongly depends also on the sampling of trait-relevant situations. Whereas it is relatively easy to obtain person samples that are representative of populations such as national age groups or applicants for particular jobs, it is still an unresolved issue how a representative situation sample should be obtained for a behaviour or a personality trait (Ten Berge & De Raad, 1999). The amount of person/situation interaction found will very likely depend on the heterogeneity of the situations in the situation sample. In addition, the extremity of the situations will also influence the amount of person/situation interaction because ceiling and floor effects induce ordinal interactions (see Figure 1).

Finally, person/situation interactions depend on whether an ecologically valid or an experimental design is chosen. In the first case, the frequency of persons in situations is controlled by the persons themselves such as in beeper studies that obtain at random times during the day reports of the current situation as well as experience or behaviour in the situation. In contrast, in experimental designs all persons are assigned to the same situations by the experimenter one by one, and are observed in them or are asked how they would react to them. The size of person/situation interaction tends to be smaller in ecologically valid designs to the extent that persons have opportunities to choose or to avoid certain situations.

An important approach to assessing situations that is often ignored in discussions of person/situation interaction is the definition of dyadic social interaction situations in terms of the interaction partner. People are important social stimuli, and social behaviour obviously varies according to the social role in the situation and to the relationship with the interaction partner. Although the sampling of the situations is much easier in this case, there are surprisingly few attempts to study person/role and person/person interactions systematically. The study of person/person interaction (a special case of person/situation interaction, not to be confused with social interaction!) is complicated by the fact that person B can be considered a situation for person A while person A can be simultaneously considered a situation for person B. Because persons cannot interact with themselves and because persons and situations are not statistically independent factors (e.g. friendliness will positively correlate between dyad members across dyads), traditional ANOVA or correlational methods are not valid in this case. Kenny and associates have developed the social relations model that distinguishes actor, target, and relationship effects (the latter correspond to person/person interactions), and proposed statistical tools for estimating these effects. This approach is increasingly used in person perception, dyadic relationship, and family research (Cook, 2000; Kenny et al., 2001).

So far, person/situation interactions have been discussed from the perspective of personality assessment. They put personality into context, or 'situationalize personality'. In addition, person/situation interactions are also important from the perspective of ecological psychology for the design of working or living

situations. Often, these situations are assessed in terms of mean responses of a person sample, treating the interindividual differences in the responses as error. For example, software engineers try to optimize computer menus for the average computer user. A more differentiated, yet rarely utilized approach is to 'personalize situations' by studying systematic person/situation interactions. For example, persons socialized with computers in the DOS era may rate keystroke menus more positively than younger users, or extroverts may enjoy wizards more than introverts.

SOME GUIDELINES FOR THE ASSESSMENT OF PERSON/SITUATION INTERACTIONS

Because the assessment of person/situation interaction is more costly than assessing only person or only situation parameters, it is useful to ask first whether person/situation interaction is large enough to be assessed at all. The answer depends on the samples of persons, situations, and behaviours that are to be assessed, and on whether the persons are able to select the situations. If the persons are placed into situations whether they like it or not, person/situation interactions are more likely to occur than when the persons can deliberately choose or avoid certain situations. In most cases, empirical studies will be necessary to evaluate the amount of person/situation interaction for the specific assessment task. Here it is crucial to separate person/situation interaction from measurement error, e.g. through aggregation over time or different behavioural indicators of the same construct.

If significant person/situation interaction is observed as indicated by a high ratio of person/situation variance divided by person variance in personality assessment, or a high ratio of person/situation variance divided by situation variance in situation assessment, this does not automatically mean that personality assessments have to respect situational information through the assessment of situation-specific traits, or that situation assessments have to respect personality differences through the assessment of situations for different personality types. Alternatively, the behaviour in situations can be predicted by broad, situation-unspecific traits, or broad, personality-unspecific situations; *a priori* it is not clear which strategy is the more efficient one.

What applies here is what Cronbach and Gleser (1957) called the bandwidth/fidelity tradeoff. This tradeoff means in the case of person/situation interaction that broad bandwidth traits (i.e. situation-unspecific traits such as 'sociable') predict behaviour in a wide range of situations with low fidelity (i.e. low predictive validity), whereas narrow bandwidth traits (e.g. situation-specific traits such as 'sociable with coworkers' or 'sociable with friends') predict behaviour in a limited range of situations with high fidelity (i.e. high predictive validity). In practice, this tradeoff boils down to a tradeoff between assessment costs and costs of incorrect predictions. If incorrect predictions are not very important (e.g. predictions of moral integrity for blue-collar workers), broad traits will often suffice, but if correct predictions are very important (e.g. predictions of integrity for diplomats), more costly assessments tailored to the various crucial situations are in order (see Shoda, 1999, for a detailed discussion of the utility of broad versus narrow traits in the prediction of behaviour). Similarly, even large interindividual differences in the reaction to a particular situation can be ignored in situation assessment if these differences are not consequential.

If person/situation interaction is significant and consequential, a good idea is to develop assessment tools and their interpretation around the notion of a situation profile. A classic example for such profile assessments is the Fear Survey Schedule (FSS) by Wolpe and Lang (1964) that assesses the intensity of fear reactions to various fear-arousing stimuli such as spiders, large groups of people, or medical examinations. Each person is assigned a profile, and persons with similar profiles can be grouped into homogeneous types through cluster analysis or similar procedures. Also, for personnel decisions, the similarity of a person's profile with a required profile can be quantified by computing the Euclidean distance to this standard profile, or it can be decided whether a person's profile falls into a predefined

range of acceptable scores around such a target profile.

If no such 'profiling tool' is available, it can be constructed in three steps: (a) exploring the range of relevant situations, (b) selecting a representative sample of situations, and (c) selecting one or more behavioural reactions that are ecologically valid for all selected situations. These reactions are then observed, or their likely occurrence is probed in an S-R inventory, modelled after the classic S-R inventory of anxiousness by Endler and Hunt (1966). If the situations are defined by concrete persons, or type of persons such as classmate or coworker, this approach leads to a person by relationship quality matrix that represents part of the individual's ego-centred network of social relationships (see Asendorpf & Wilpers, 1998, for an application of this approach). Similarly, situation assessments may be 'personalized' by profiles that plot a behaviour in the situation against different personality types.

FUTURE PERSPECTIVES

Desiderata for person/situation interaction assessment are (a) more research on the classification of psychologically relevant situations, (b) differentiating situation assessments by 'personalizing' the situations, (c) differentiating personality assessment by 'situationalizing' broad traits or factors such as the Big Five, particularly (d) respecting more the role and relationship specificity of behaviour in assessments of social traits, and (e) development of new models for the simultaneous statistical treatment of persons, situations, and behaviours (see Vansteelandt & Van Mechelen, 1998, for an interesting new approach).

CONCLUSIONS

Respecting person/situation interaction is not always necessary and often not wanted in the assessment of persons or situations because it increases assessment costs, but disregarding strong existing person/situation interactions can be even more costly by reducing predictive power too much.

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RELATED ENTRIES

OBSERVATIONAL METHODS (GENERAL), THEORETICAL PERSPECTIVE: BEHAVIOURAL

PERSONAL CONSTRUCTS

INTRODUCTION

Kelly's (1991) personal construct theory views people as constantly trying to give meaning to, and anticipate events in, their worlds. To do so, each individual develops a unique, hierarchically organized system of bipolar personal constructs, which provide a basis for the recognition of similarities and differences between events. Constructs which are superordinate in this hierarchy are assumed to be more important to the individual than those which are subordinate. Any attempt to understand an individual requires an assessment of their personal constructs, so that the world may, in effect, be glimpsed through their eyes. This entry will describe some of the methods which have been developed for this purpose.

ASSESSMENT METHODS

Repertory Grid Technique

Repertory grid technique is by far the most widely used method of personal construct assessment (See entry on 'Subjective Methods' in this volume). A set of 'elements', or aspects of the person's experience, is first elicited from the subject. These are usually significant people and aspects of the self, but this is not necessarily so, and numerous other types of element have been used: for example, relationships, life events, holiday resorts, and therapy sessions. A sample of the subject's constructs is next elicited, usually by presenting a series of triads of the elements and asking, for each triad, how two of the elements are alike and thereby different from the third. Since the technique is extremely flexible, there are numerous alternative ways of obtaining constructs, including free descriptions of the elements, interviews, structured methods designed for children, and supplying of the constructs by the investigator. Although the investigator who is only interested in obtaining a sample of the subject's constructs may not proceed to this stage, the final step in grid procedure is for the subject to sort all of the elements, usually by rating or ranking, in terms of all the constructs.

While some understanding of the subject's construct system may be obtained from visual inspection of the grid matrix, a much more detailed assessment is possible by the use of various computer packages, most of which include cluster and/or factor analyses, and some of which are interactive, eliciting a grid from, and providing feedback on its results to, a subject. Information may be derived from the grid on such areas as:

(i) the content of the subject's constructs, for which several coding systems are available;
(ii) the structure of the construct system, for example how 'tightly' or 'loosely' constructs are interrelated;
(iii) the particular relationships between constructs, which are assumed to indicate the personal meaning of these constructs;
(iv) distances (or degree of perceived dissimilarity) between particular pairs of elements.

In addition, most computer packages provide a spatial representation of the subject's construct system; and some allow the comparison of pairs of grids or the derivation of 'consensus', or modal, grids of a group of subjects.

Since there is no standard form of the grid, general statements about its psychometric properties are fairly meaningless, and in any case it has been questioned whether models derived from mental test theory are appropriate for the evaluation of grids. Nevertheless, various studies attest to the reliability and validity of certain grid measures in particular domains.

Amongst the numerous variations on grid technique are some which depart radically from Kelly's original procedure. One, which he himself developed, is generally referred to as the *Dependency Grid*, and involves asking the

subject to which of a list of people he or she would turn for help in various difficult situations. This allows, for example, an assessment of the extent to which dependencies are dispersed across a range of people. Certain grid procedures developed by one of Kelly's students, Hinkle, may provide an indication of the superordinacy of each construct elicited from the subject (Fransella & Bannister, 1977). In both the *implications grid* and the *resistance to change grid*, constructs fall along each axis of the grid. In the former, the subject is asked which other constructs in the grid are implied by each of their constructs; in the latter, each construct is paired with every other and the subject is asked on which he or she would prefer to shift from its preferred to its non-preferred pole. Various other grid procedures have been developed to explore particular domains of construing.

Autobiographical Texts

The other major assessment technique devised by Kelly was the *self-characterization*, in which the subject is asked to write an autobiographical sketch in the third person as if written by an intimate and sympathetic friend. Although qualitative methods of content analysis are usually applied to such sketches, there have also been attempts to derive quantitative indices from self-characterizations. As Feixas and Villegas (1991) have described, a more extensive autobiographical text may be transformed into a grid matrix of elements and constructs, to which a cluster analysis procedure may be applied.

Laddering, Pyramiding, and the ABC Technique

Hinkle's *laddering* procedure asks which pole of a particular construct a person would prefer to be described by and why, repeating the process for each new construct thus elicited (Fransella & Bannister, 1977). Although every construct in the ladder is assumed to be more superordinate than the preceding one, this assumption has not gone unchallenged. A converse procedure, *downward laddering*, in which the subject is asked, for each construct pole, how they would know that it applied to a person, was assumed by Hinkle to elicit subordinate constructs. As Fransella and Bannister (1977) note, this is also the aim of Landfield's *pyramid technique*, in which the subject is asked what kind of person is described by each pole of a construct, and what characteristics describe people who are the opposite of the new construct poles thus elicited.

A further method which traces the implications of a particular construct, and which is particularly relevant to exploration of the personal meaning, and possible 'payoffs', of a client's symptom, is Tschudi's (1977) *ABC procedure*.

Measures of Personal Construct Transitions and Processes

Kelly regarded emotions as being associated with transitions in construing, and there have been some attempts to assess emotions from this perspective. For example, Viney (1983) applies content analysis scales to an interview with open-ended instructions to assess anxiety, threat, and various other aspects of the subject's experience. Questionnaire measures of such emotions and of other personal construct processes have also been developed, but require further investigation of their psychometric properties.

Although only partially drawing upon personal construct theory, Toukmanian's (1986) system of *Levels of Client Perceptual Processing* provides a useful method of assessing, for example, from therapy transcripts, the extent to which a person is exploring alternative constructions of events.

FUTURE PERSPECTIVES

While it is likely that repertory grid technique will continue to be a popular and versatile method of assessment of the structure and content of construing, further developments in the field, consistent with those in constructivist psychology more generally (Neimeyer, 1993), are likely increasingly to focus on the analysis of less structured material such as narratives, particularly appropriate for the investigation of processes of construing.

CONCLUSIONS

Personal construct assessment methods allow the subject to be considered from his or her own perspective rather than from that of the observer.

One of their principal characteristics is flexibility: they may be adapted to a very wide range of circumstances, they combine both a qualitative and a quantitative approach, and, although commonly regarded as idiographic, they may also be applied nomothetically.

As well as providing an understanding of an individual's construct system and individualized measures of change in this system, they may also be used as intervention techniques to modify construing. This flexibility is reflected in the breadth of application of these methods, which, as well as the clinical context in which they were originally developed (Winter, 1992), have been used extensively in educational (Denicolo & Pope, 2000), business (Stewart & Stewart, 1981), and other fields in a range of cultural settings.

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RELATED ENTRIES

Personality Assessment (General), Theoretical Perspective: Constructivism, Qualitative Methods, Subjective Methods

PERSONALITY ASSESSMENT (GENERAL)

INTRODUCTION

Personality can be viewed as both a composite of physical, psychological, and social qualities that distinguish persons from one another and as a self-regulatory system endowed with proactive properties that enable individuals to interact actively with the environment and to contribute to the course of their own development. The aim of personality assessment, then, is to identify and to evaluate both the distinctive features of each person as they impress themselves upon others and the self-regulative mechanisms that underlie the functioning of personality as a whole system and contribute to its continuity and coherence over time and across situations. Accomplishing these goals requires a wide variety of assessment procedures and techniques. Further diversity in techniques derives from the existence of different conceptions of personality; different theoretical conceptions highlight diverse phenomena ranging from stable personal tendencies to dynamic, affective, and cognitive processes to the management of self and interpersonal relations. Assessors

thus adopt different personality assessment aims in different assessment contexts and employ multiple criteria to evaluate the quality of measurement.

THE DOMAIN OF PERSONALITY ASSESSMENT

Personality assessment refers to procedures designed to identify and evaluate the enduring psychological qualities, including modes of thinking, feeling and acting, that characterize the person as a self-regulatory system and that distinguish individuals from one another. As such it addresses the cognitive, affective, the moral and volitional component of individual functioning including cognitive abilities and styles, temperament and mood, motives, attitudes and values, habitual behaviours, coping strategies, and self-regulatory mechanisms. Although personality assessment has been often identified with the measurement of quantifiable individual differences, it includes both quantitative and qualitative techniques. Assessment serves both research and practice in its provision of descriptive, predictive, and explanatory information about persons.

Personality assessment plays a critical role in a variety of applied settings in clinical, educational, and organizational psychology, to foster learning and motivation, to prevent and to diagnose psychological suffering, and to promote health and to make the best use of individual potentials. A broader understanding of the basic processes that lie at the basis of individual–environment transactions is made possible by close scrutiny of personality variables (commonly construed as dimensions) that are directly related to those processes.

Contemporary personality assessment is marked by a diversity of assessment methods. Different assessment aims lead investigators to focus on different aspects of individual functioning. Different sources of data and assessment techniques are commonly in use. Some assessors aim to measure overt psychological tendencies, whereas other target internal psychological dynamics. Some focus on the expression and regulation of specific personality dimensions, such as aggression, altruism or emotional intelligence, whereas others focus on sets of behavioural tendencies that might yield a comprehensive description of personality and an understanding of its consistency across space and time. Some employ person-centred strategies that highlight the distinctive patterns of affect, cognition, and behaviour that may recur across individuals or be unique of any individual, whereas others employ variable centred approaches that highlight the influences that specific individual characteristics exert on personality development and adjustment over the course of life and across populations. Many investigators aim to provide global personality assessments – that is, assessments of overall behavioural tendencies averaged together across contexts – whereas others pursue contextualized descriptions that capture the ways in which different people vary their characteristic responses across settings.

In principle, personality assessment should target both the distinctive features of any person as they impress others and prove critical in various situations or performances, and the regulative mechanisms which underlie the functioning of personality as a whole system and which grant continuity and coherence over time and across situations. In practice, the assessment goals one pursues generally determines whether one focuses on the former or the latter, and the nature of the data one relies upon.

The kind of data processed to assess an individual's personality may include life outcomes (L-data), observer ratings (O-data), situational tests (T-data), and self-reports (S-data; Block, 1977; Cattell, 1957). The kind of techniques commonly used include individual and group interviews, questionnaires and adjectives list, situational task, physiological measures, projective test, narratives, and biographies.

Different data and techniques in their turn are hardly amenable under common criteria of reliability and validity. Thus, one may wonder whether there is any congruency and convergency among the various set of data and modes of assessment, even when the target persons are the same.

Indeed, personality assessment is a territory of broad diversities where both openness and cautiousness are needed. On the one hand, one should be ready to use multiple data and techniques to dig into the complexity of

individual experience, on the other hand one should recall that data and techniques do not speak for themselves but always are processed and employed in accord with a theory that dictates their selection and use.

The main reason for the existence of diversity in aims, contents, and methods of personality assessment is the presence, in the contemporary field, of different viewpoints and paradigms about personality itself (Caprara & Cervone, 2000). Different theories of personality have competed in the past and yet guide the assessor's decision about the targets, the data and the techniques.

We sketch in the following paragraphs the main events and issues that have marked the progress of personality assessment as a proper discipline.

THE PAST

In the case of personality assessment, as in other domains of psychological inquiry, one finds a long history of conjectures but only a short history of systematic research. Intuitive assessments of personality undoubtedly predate recorded history, in that personality assessment is an inevitable task of everyday social life. No one can resist evaluating other people with whom one has to deal, and no one can resist trying to manage the impression one forms in others.

Before psychologists, poets gave the public what was already common knowledge.

Homer celebrated the courage and anger of Achilles, the devotion of Hector, and the astuteness of Ulysses long before Theophrastus's description of characters (the liar, the adulterer, etc.) or the establishment of the long lasting Hippocratic-Galenic typology (the sanguine, melancholic, choleric, and phlegmatic types). Psychologists only came later to bring order to matters that everybody already knew through common sense and intuition. They reinvented and systematized evaluation procedures which had long been in use to select soldiers, administrators, and servants, and which were a great part of clinicians' repertoire and wisdom.

As in other fields of psychology, it was not easy to replace the intelligence of tradition and of intuition with procedures that were carrying new instruments, rules, and standards. The enterprise was further made difficult by competitive theories about individual functioning and personality.

EARLIER ESTABLISHMENT OF PERSONALITY ASSESSMENT AS A DOMAIN OF PSYCHOLOGICAL INQUIRY

Modern approaches to personality assessment can be traced to the late 19th and early 20th century efforts to assess intelligence, temperament and vulnerability to mental illness (Ajken, 1996).

Galton (1879) was a convinced advocate of measurement of both intellectual abilities and character, and, along with other methods, he was the first to introduce word association, a technique for assessing personality that Kraepelin (1892) and Jung (1910) applied later in clinical situation.

Early contributions of Binet and Simon (1905) and Heymans and Wiersma (1906–1909) and Spearman (1927) are particularly noteworthy, since each marked the beginning of long traditions of research on the assessment of intelligence and temperament.

The Woodworth Personal Data Sheet, the first instrument explicitly developed to assess personality at a mass level, appeared in 1918 (Woodworth, 1920). The Rorschach Inkblot Test, the most famous projective technique ever produced, appeared in 1920 (Rorschach, 1921).

Two main lines of inquiry set the stage of subsequent developments of personality assessment. One primarily focused on phenotypic inter-individual differences, whereas the other was mostly focused on the internal dynamics of personality. Investigators who assessed phenotypic individual differences conceived personality as an architecture of habits or tendencies. This tradition was only marginally concerned with the internal mechanisms underlying psychological organization and integration of the person into a coherent whole. In contrast, students focusing on personality dynamics aimed to understand how different mental structures develop and operate in concert under the push of internal and external pressures. Along this line of thought Freud's contributions exerted an enormous impact on personality assessment for over half a century, both within and far beyond the

psychoanalytic circles. Indeed Freud, although not using the term personality, was providing a theory of personality development, functioning and change, in contrast to most of the psychology of individual differences, which remained confined to the description of behavioural tendencies (Caprara & Cervone, 2000).

In the 1930s–1940s, personality psychology and personality assessment fully established their autonomous position among the most important sub-fields of psychological inquiry. Stern (1935) and Allport (1937) launched the programme of the new discipline of Personality Psychology, and Murray (1938) decisively reoriented personality assessment towards the whole person.

Murray did not hesitate to bring together ideas from different theoretical viewpoints on personality development and functioning, to generate procedures and instruments capable of tapping the manifold aspects of the whole and capturing the uniqueness of each individual. His most memorable contribution to assessment is his invention of the Thematic Apperception Test (TAT), a technique that is still in use. However, no less important for the subsequent developments of personality assessment was his notion of the diagnostic council, in which many clinicians come together to bring different perspectives on a given client, as well as the assessment programme he directed for the Office of Strategic Offices in which multiple techniques, including interviews, informal observations, individual and group task, and projective techniques, provided the data upon which the diagnostic council had to decide the suitability of candidates for particular assignments.

By the mid-20th century, personality psychology was a well-established domain of psychological inquiry. Yet there was not a unique science of personality, since competing theories were far from reaching a common ground upon which to cumulate their knowledge.

Trait psychology, psycho-dynamic psychology, and social learning were the most influential approaches to personality. Trait psychology largely subsumed the individual differences tradition in conceiving personality as an organization whose building blocks are real 'neuropsychic structures ... with the capacity to render many stimuli functionally equivalent, and to initiate and guide consistent forms of adaptive and expressive behaviour' (Allport, 1937: 295). Psycho-dynamic approaches continued to focus on internal processes and mechanisms such as drives and defences. Social learning further widened the traditional scope of learning theory paving the way to subsequent social cognitive theories focusing on imitation, expectations, and the influence of social situations in shaping behaviours, attitudes and motives.

Obviously, these theoretical diversities fostered significant differences in personality assessment techniques; however, real disputes were mostly confined to academic circles. In practice, divergent viewpoints regarding personality did not prevent multiple 'hybrid' solutions.

Projective techniques like the Rorschach test and TAT were largely endorsed by scientists and practitioners that shared very little of their psycho-dynamic background.

Trait inventories were commonly used, no matter whether the notion of trait the assessor was referring to was conceived as an inherited characteristic, a habitual behaviour, or an institutionally defined descriptor of subjective states or behaviours.

By the middle of the 20th century, personality assessment not only could count upon a large variety of instruments but also a consistent body of knowledge regarding the sources of data and the quality of measures. Progress came from work in psychometrics, including the extension of factor analytic methods to personality. The seminal contributions of Cattell (1946), Cronbach (1949, 1951), and Cronbach and Meehl (1955) on the quality of personality measures and on the various methods to ascertain their validity were long lasting and influential.

CONTEMPORARY TRENDS

Over the second half of the 20th century, the vicissitudes of personality assessment continued to mirror the disputes and progress of personality psychology.

The cognitive revolution returned a focus to the subject as an active interpreter of his or her world and led to examine cognitive competencies and styles, personal constructs, beliefs, and expectancies. Interactionism (Magnusson & Endler, 1977) highlighted individual–environment interactions and thus reoriented the

study of interindividual differences from global dispositions to contextualized behavioural strategies. A new conception of personality as agency capable of making things happen according to its anticipations and standards widened the traditional view of personality as a mediating system, largely operating reactively under the guidance of nature and culture (Bandura, 1986). These changes in personality theorizing inevitably created new assessment aims, such as the assessment of skills and knowledge that underlie overt behavioural competencies, and new procedures, including cognitive techniques to measure individual differences in knowledge accessibility and biopsychological techniques for tapping brain systems in personality functioning. In addition, access to large and diverse populations and computer aided psychometrics further widened the scope of the personality assessment process.

A renewed interest in temperament has promoted the development of new procedures to assess earlier features of personality (emotionality, activity level, attention span) mostly related to the regulation of affects and action. Studies on emotional, social and practical intelligence have brought closer traditions of research on intelligence and personality that had often developed along separate pathways, the former focusing on cognitive abilities and problem solving and the latter on interpersonal relations and social behaviours. Work on emotional intelligence revealed the need for new measures to tap aspects of intelligence not covered by traditional IQ scales.

The past decade has witnessed much progress in understanding the cognitive unconscious – that is, informational and motivational processes that operate beyond individual awareness – and in a manner that has little in common with the psychoanalytic unconscious. Measures of implicit cognitiveness, though still in their early stages of development, promise significantly to supplement traditional explicit self-report measures.

Finally, the self-system is a new territory for personality assessment. Here, the goal is to assess the agentic properties of personality, namely the cognitive and motivational structures that lie at the basis of any behavioural dispositions and grant their coherence, distinctiveness, and effectiveness. These lead to a focus on self-representations, self-beliefs, and self-regulatory mechanisms as they operate in concert in specific contexts and across settings. All this implies a revision of traditional constructs of personality psychology as well as of the variables targeted by personality assessment.

This progress cannot be disjoined from the great progress of neurosciences in advancing our knowledge of gene–environment interplay and brain functioning as well as from the technological devices that allow the biological mechanisms underlying thought, affect, and action to be measured. In addition to traditional biosignal measures (HR, EEG, etc.) one can only guess the promise of DNA analysis and of brain imaging for personality assessment.

FUTURE PERSPECTIVES

Throughout much of its history, a great part of personality psychology has been concerned with individual differences in observable variations in styles of behaviour, affect, and cognition. The variations have been organized according to, and traced back to, simple systems of dispositional constructs. Trait constructs have been posited to account for stable patterns of experience and action that people exhibit, and that distinguish them from one another across times and situations. Within this line of thinking, personality has been conceptualized as a hierarchical organization with high-level traits (e.g. extroversion) that organize lower level tendencies (e.g. sociability) which, in turn, supervise lower level behavioural habits (e.g. talkative) (Eysenck, 1970).

A key question here is to identify the number and nature of the high-level traits. In the past, alternative taxonomies competed. Today, a broad consensus has emerged. It centres on five global dispositional tendencies (the so called Big Five): Extroversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness to experience. A variety of self-report and observer-report measures have been produced to assess the five dispositions as well as a variety of other traits that correspond to their different facets of each main trait or the result of their combinations from them and from their combinations. Among the most diffused instruments one finds the NEOPI-R of Costa and McCrae (1992) and

the BFQ of Caprara, Barbaranelli, Borgogni and Perugini (1993).

This approach, however, meets only part of what personality assessment should aim to achieve.

The Five Factor Model (FFM) offers a highly convenient lexicon to help subject–assessor communication. The clarity of the conceptualization of the five factors may increase raters' reliability and reduce interrater variability across settings and times. Its concurrent and predictive validity in educational and organizational settings, as well as in health and adjustment, is well documented (John & Srivastava, 1999; McCrae & Costa, 1999). However, FFM does not go very far beyond description and prediction at the level of surface behavioural tendencies. In reality, it is beyond its reach to explain the underlying mechanisms which govern behaviour and grant its continuity and coherence and it does not say anything about the essential characteristics of being a person, namely self-awareness and intentionality.

Whereas self-report and observer ratings remain the main methods, and habitual behaviours the primary sources of data, of personality assessment, one wonders whether any access is possible to feelings, beliefs and preferences in absence of a theory of the person as a self-reflecting agent.

In this regard, psycho-dynamic theories have been much more sensitive and concerned with the complexity of individual experience. But the Freudian metapsychology, namely its theory of mind, all constructed on the vicissitudes of drives, ultimately collapsed. Looking at recent trends in psychoanalysis, it is quite uncertain whether new object relationships or interpersonal approaches will provide a new body of knowledge regarding development and functioning of personality able to reconcile psychoanalysis with psychology (Caprara & Cervone, 2000). Psychoanalytic scientists and clinicians continue to use interviews and projective techniques but their validity remain questionable as they are hardly amenable to the standard criteria which guide psychological measurement (Lilienfeld, Wood & Garb, 2000).

To find an alternative to psycho-dynamic approaches, able to meet the demands that trait psychology seems incapable to address, one should turn to social cognitive theory.

In conceiving of personality as an open, dynamic, unifying and integrating system, social cognitive theorists (Bandura, 1986, 2001; Caprara & Cervone, 2000) point to the emerging properties of the mind and focus on the processes and mechanisms conducive to knowledge structures which enable personality to function as a proactive self-regulatory system. They do not argue whether people have personal dispositions, nor their determinative role in personality functioning, but rather how dispositions are conceptualized and operationalized. Dispositions may correspond to habitual styles of behaviour rooted in genotypes, or to self-regulatory structures (as internal standards, values, and goals, efficacy and control beliefs, appraisals and outcome expectancies, coping and self-serving mechanisms) resulting from the organization of affect, cognition and behaviour. They claim that self-regulatory structures guide habitual behaviours. Thus, they focus on the construction of personality as an integrative and coherent system as it takes place over the course of life, on the processes which enable the system to function proactively with the environment, and on the self-structures which orchestrate these processes. Where assessment issues come to the fore, the primary targets are self-regulatory structures like self-representations, self-efficacy beliefs, personal goals and standards, as self-reflective and self-directive processes enable individuals to meet environmental opportunities and constraints as well as to maintain personally valued courses of action. Social-cognitive theorists also stress the persons must be assessed with respect to their life contexts. People's self-regulatory abilities enable them to vary their behaviour strategically in accord with the perceived opportunities and demands of environmental settings. One must tap these contextual variations to assess fully the distinctive features of an individual's personality (Cervone, Shadel & Jencius, 2001).

CONCLUSIONS

In general, the contemporary field of personality assessment can be characterized as one that features an increasing sophistication in assessment methods to tap manifold aspects of individuality including and beyond traits. While focusing on personality functioning across

settings and over the entire course of life requires multiple techniques able to meet basic psychometric standards, new technologies carry extraordinary opportunities to collect and to process enormous amounts of data, to monitor ongoing thoughts, feelings, behaviours, and their biological correlates. Progress, however, has not yet led to a uniform set of assessment methods, but to a diverse array of practices that each sheds light on the nature of individuals and individual differences. Both opportunities and diversities underscore the importance of robust theories able to integrate and guide methods and techniques within a unified science of personality.

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RELATED ENTRY

Personality Assessment through Longitudinal Designs

PERSONALITY ASSESSMENT THROUGH LONGITUDINAL DESIGNS

INTRODUCTION

Personality research is concerned with individual differences on the one hand and with the total person on the other (see Pervin & John, 2001). Of course, people are similar in some ways; however, they differ from one another in several aspects. The complex relationships between those aspects make the person(ality) as a whole functioning. But, how can one define personality in a more concrete way? Pervin and John answer this question: 'Personality represents those characteristics of the person that account for consistent patterns of behaviour.' Of course, other definitions are given as well, and dozens of them may be known to the reader. These definitions are more or less useful in focusing on different fields of scientific research of personality, such as organization and dynamics of personality domains, structure and process, traits and states, action and situation, environment and genetics, etc.

The study of individuals from a personality theoretical perspective should answer questions regarding: *What* they are like, *how* they became that way, and *why* they behave as they do. The generic aspects behind these questions can be described by the underlying (meta-)theoretical constructs: structure (what), process (why), and growth and development (how). Theories of personality can be compared in terms of the constructs, tools, instruments, and empirical research designs which they use to determine the what, why, and how of personality.

Structure

The concept *structure* (what) refers to the more stable and enduring aspects of personality. Such structural concepts as *response*, *habit*, *trait*, and *type* have been popular in efforts to conceptualize what people are like. The concept of trait refers to the consistency of individual reponse to a variety of situations and focuses on inter-individual differences and stability (of these interindividual differences). Another related question focuses on the organization of the structural units, e.g. in a hierarchy of these units and inter- and intraindividual stability of the organizational structure.

Process

The concept of *process* (why) refers to the dynamic motivational aspects and constructs which are considered to account for behaviour, e.g. in a large family of personality theories the organism is viewed as seeking a state of balance, homeostasis, or equilibrium.

Growth and Development

Growth and development (how) are related to the concept of structure and process, not only in terms of changes in structure and processes from infancy to maturity, but also – and this is a domain of increasing interest – from maturity to middle age and even to old age.

Again, growth and development are characterized by individual differences, up to the extreme of psychopathological behaviour: why are some people capable of coping with the stress of daily life and generally show high-level life-satisfaction, whereas others develop abnormal responses? Personality theory should suggest intervention strategies by which behaviour could be modified. Empirical research strategies should enable the researcher to differentiate stability and invariance from change in a reliable and valid way.

So, according to Pervin and John (2001), a complete theory of personality must take into account structure, process, development, psychopathology, and change.

The term development refers not only to those processes that are biologically programmed and inherent in the organism, but also to those in which the organism is irreversibly changed or transformed by interaction with the environment.

As the result of one's life history with its accumulating record of adaptations both to biological and to social events, there is a continually changing basis within the individual for perceiving and responding to new events. According to Thomae (1970) personality can be defined as the essence of all events, which unite into an individual biography. From this perspective, development might be described as the individual history of life. Personality development, then, is conceptualized as a reflection of the attempts by the individual to maintain a sense of continuity. Striving for continuity is characterized by the subjective experience of the person's own development. In recent years, two broad classes of methodological techniques, referred to as person-centred methods, have been introduced in response to this challenge: bottom-up and top-down strategies. The bottom-up strategies begin with idiosyncratic individual histories, and the analytical steps identify important commonalities and differences across lives, leading to aggregation of histories into relatively homogeneous groups. The top-down strategies begin with coarse-grained descriptions of heterogeneous – in terms of details of live histories – populations and partition them into progressively more homogeneous subgroups, each of which is described using information over time from multiple life domains. Developmental researchers are increasingly interested in the use of such person-centred methods. Thus, the aim of the investigation of development in middle and old age is not to discover universals, not to make predictions that will hold good over time, and certainly not to control, but, instead, to explicate contexts and thereby to achieve new insights and new understanding.

Development and change are growth driven by environmental determinants (such as culture, social class, family) and by genetic determinants (e.g. differences in temperament), and by interactions of influences from both domains.

These different determinants are illustrated in a taxonomy of traits presented by Schaie (1996). *Biostable traits* represent a class of behaviours that may be genetically determined or constrained by environmental influences that occur early in life, perhaps during a critical imprinting period. These traits typically show systematic gender differences at all age levels, but are rather stable across age, whether examined in cross-sectional or longitudinal data. *Acculturated traits*, conversely, appear to be overdetermined by environmental events occurring at different life stages and tend to be subjected to rather rapid modification by sociocultural change. These traits usually display no systematic gender differences. Their age differences rarely form systematic patterns and can usually be resolved into generational shifts and/or secular trend components upon sequential analysis. *Biocultural traits* display ontogenetic trends whose expression is modified either by generational shifts or by sociocultural events that affect all age levels in a similar fashion. Cross-sectional data for such traits would typically show age × gender interactions.

COMPARABILITY OF CONSTRUCTS

Particularly, studies of personality in adulthood and ageing continue to be dominated by the question of whether personality changes with time and/or ageing or whether it is stable (see Ryff, Kwan & Singer, 2001, for the most recent review).

Early formulations of development, from Jung, Erikson, Bühler, and later, Neugarten, and still later, Levinson, Bould, Vaillant, and Loevinger (for a review see Wrightsman, 1994), illustrate the idea that personality was dynamic and evolving through time. As Costa and McCrae rightly argued, these perspectives needed rigorous empirical testing and validation, and not just enthusiastic endorsement. Drawing on factor analytically derived models, they amassed extensive evidence in support of personality stability in five major dimensions of personality: neuroticism, extraversion, openness, agreeableness, and conscientiousness (Costa & McCrae, 1988). Their findings were based on longitudinal and cross-sectional analyses, self and other reports (e.g. spouse), and included detailed evaluations of whether the obtained effects were best interpreted as due to age, period, or cohort effects.

Of course, personality, personality structures, and personality development have many different aspects, and can be approached from many different (meta-theoretical) angles: trait-perspective on the one hand, self-identity and self, meaning of life, future time perspective, control

beliefs; well-being, affects, quality of life; stress and coping, goals, projects and life tasks on the other hand.

Thus, links between personality (in terms of traits) and constructs such as well-being are of growing interest (see Schmutte & Ryff, 1997). Traits such as neuroticism have been used to predict negative affect and depressive symptoms (e.g. McCrae & Costa, 1990). These queries are fraught with problems of both construct and source overlap (i.e. negative affect is part of what defines neuroticism, and both are typically measured via self-report from the same respondent). High levels of variance explained are likely fuelled by internal tautologies.

Such problems demand greater attention by personality researchers. The difficulties can be partially adressed by careful evaluation of theoretical starting points and measurement instruments as well as use of diverse methods (e.g. self-reports, spousal reports, behavioural observations). At a more general level, however, there is a need for caution, regarding the reification of constructs (traits, well-being, coping, goals, the self), all of which likely share overlapping space in the parsing of differences between individuals. Extending personality research beyond its own confines (i.e. connecting individual-difference variables to other disciplines and domains) is another response to the problem of construct redundancy.

The general problem adressed in every case is that of comparability of personality dimensions and comparability of constructs across cultures, groups, situations, and times of measurement (Rudinger & Rietz, 1999).

This comparability includes measurement and conceptual equivalence, the framework of these just mentioned contexts. Measurement comparability (i.e. equivalence, of instruments or even items) and conceptual comparability (i.e. equivalence of the theoretical constructs) have to be distinguished very carefully.

In life-span oriented research the same theoretical variables are compared, but not necessarily the same instruments, i.e. not necessarily the same items. Probably, one has to formulate items quite differently in different cohorts or measurement points in order to mirror the same construct, facts we know from developmental research across age, e.g. in the field of cognitive functioning or attachment research.

There are at least three levels of inference from empirical measures to constructs (Van de Vijver, 1995):

- macro or domain constructs (e.g. personality, intelligence, social relations),
- instruments (e.g. personality questionnaires, intelligence tests, social relations scales), and
- single items and one-dimensional simple measures (e.g. statements in questionnaires, tapping speed, intelligence test items).

For instance, to clarify this very important issue, often one cannot use the same instrument for measuring quality of life across ages, but one can ask what is important for the subjects of different ages at different points in time and different countries or cultures regarding quality of life. By this procedure one can investigate what each macro-construct means within different contexts. The only non-trivial premise is that concepts used (e.g. quality of life) are present in different contexts with similar semantics. Consequently, one has to rely on idiographical as well as on nomothetical definitions of macro constructs.

These theoretical problems cannot be solved in a satisfying manner by application of statistical models, since measurement comparability and conceptual equivalence are confounded.

METHODOLOGICAL ISSUES

In the field of personality one can focus on methodological priorities. For example, the question of whether personality changes or is stable across adult life was accompanied by extensive attention to issues of research design (cross-sectional, longitudinal, sequential), assessment tools (clinical interviews, projective tests, structured self-report procedures), and strategies of data analysis (structural invariance, correlational and mean-level change).

Design

Focusing on development, growth and change implies that the character of studies of personality has to be time-oriented, i.e. longitudinal.

Although longitudinal research designs can take over on very different shapes, they share the feature that the data describe what happened

to the research units during a series of time points. That is, data are collected for the same set of research units for (but not necessarily) two or more occasions, in principle allowing for intra-individual comparisons across time. In contrast, cross-sectional data refer to the situation at one particular point in time.

The participants in a typical longitudinal study are asked to provide information about their behaviour and attitudes regarding the issues of interest at a number of separate occasions in time (also called the 'phases' or 'waves' of the study).

One distinct disadvantage of every type of prospective longitudinal study (such as the time series, panel, or the intervention study) is that across-time analyses can only be conducted after at least two waves of data collection have been completed.

However, longitudinal data may be collected in a single-wave-study, by asking questions on what happened in the past (so-called retrospective questions) – quite often exercised in personality research. Inclusion of retrospective questions in a questionnaire or interview or exploration would seem a quick and easy way to collect information about what happened to the participants in the past. This information has to be checked carefully, since the quality of answers might suffer from desirability of the respondent, or might reflect the re-appraisal of the past dependent on the present situations, or might be influenced by the tendency to exhibit continuity of life-history. Although such data are collected at the same occasion, they may cover an extended period of time. To define 'longitudinal' and 'repeated measures' synonymously is to confuse the design of a particular study with the form of the data one wishes to obtain. However, the majority of studies belong to the repeated measures type and, consequently, statistical methodology applied in longitudinal research has its focus in repeated measurement problems.

The longitudinal approach in general offers unique opportunities to investigate determinants and characteristics of transitional processes (e.g. Hartelsman, van der Maas & Molenaar, 1998), interindividual differences and/in intraindividual change (Nesselroade & Featherman, 1997), as well as changes in structure and structures of change (McArdle & Nesselroade, 1994). Longitudinal designs offer not only many advantages, but also suffer from drawbacks as selection effects, systematic attrition and different types of selectivity (Bosworth & Schaie, 1999), and from incomplete data sets related to these processes (McArdle & Hamagami, 1991).

Observed Variables and Latent Constructs

Behavioural scientists who investigate phenomena in areas such as personality and motivation are rarely interested in their subject's response to specific items or in the summary scores obtained on a particular measurement scale. Instead, such responses are treated as one of many possible indicators of the respondent's location to an unobservable, theoretically defined, or empirically abstracted scientific construct.

Although we must measure the observable phenotype or surface trait, it is usually the unobserved (latent) genotype or source trait that is the object of inquiry for the definition of stability and (developmental) change.

A variety of techniques are, of course, available under the rubrics of scaling, linear structural equation and factor analysis methods that are suitable to examine the relationship between the observed behaviours and the underlying latent constructs.

Stability and Reliability

The conceptual distinction between stability and reliability has a central role and long history in longitudinal and personality research. Separation of reliability and stability is limited to covariances and correlations, ignoring the mean. In terms of Structural Equation Modelling (SEM) the definition of reliability refers to the assumptions about relations of theoretical concepts to a set of measured variables. Reliability describes the quality or measurement of the phenomena under study. The definition of stability refers to the structural model, specifying the relations hypothesized within a set of theoretical concepts, i.e. latent variables. Stability in this sense mirrors the consistency of interindividual differences in the domain of latent constructs and refers to theoretical assumptions about the time bound process. Stability does not exclude interindividual

differences in intraindividual change at the observed or latent level.

This question is part of the 'trait–state' debate (Usala & Hertzog, 1991). A state-theoretical assumption about the relational system under study can be modelled by Confirmatory Factor Analyses (CFA) models with time correlated factors or by autoregressive models. Since the classical definition of trait and state contains a time bound component (Cattell, 1950), CFA-type models do not seem optimal to disentangle trait and state variance, since the sequentiality of time, the essential feature of a longitudinal data set, is lost.

In the domain of traits, longitudinal age patterns on personality variables are generally quite stable. This has been demonstrated by Schaie (1996) in his Seattle Longitudinal Study (SLS) which did not address the study of personality per se, but he collected a substantial corpus of data on adult development of personality across a large time span and many cohorts. Schaie (1996) came to the following conclusion: 'Significant cross-sectional age-differences were found for all personality factors. However, these differences can largely be explained by a pattern of positive and negative cohort differences. Far fewer significant within-subject changes were found. Most noteworthy were modest within-subject decreases with age in Superego Strength and Threctia (threat reactivity) and a dramatic decline in Honesty. Affectothymia decreases from young adulthood to middle age but increases significantly into old age. Both Community Involvement and Political Concern increase with age.'

Structural Equivalence and Measurement Equivalence

One topic frequently addressed by longitudinal research particularly in the field of personality involves assessment of invariance of constructs over time (Horn & McArdle, 1992; Rietz, 1996). From the traditional perspective the invariance definition of constructs over time is synonymous with definitions of factorial invariance. This involves the same relative magnitude of factor, loadings of variables on factors (measurement equivalence) as well as the same degree of relations between the factors (structural equivalence). The degree of relation between (oblique) factors can range from zero to one in correlational terms. The emergence of qualitatively new structures can be mirrored by relations between factors changing from measurement point to measurement point. Differentiation can be indicated by weaker and weaker relations across time, and dedifferentiation by increasing relations across time. If the relations become perfect, the factors collapse to one factor. Two types of invariance need to be considered: (1) invariance across multiple groups of subpopulations, such as those usually found in cross-sectional studies, and (2) invariance across time for the same individuals measured longitudinally. Structural equation models can be specified that are suitable for statistical tests of the invariance assumption.

Only when factorial invariance has been demonstrated can one assume that quantitative comparisons of differences in developmental trajectories truly reflect changes in the underlying construct.

FUTURE PERSPECTIVES AND CONCLUSIONS

After decades of research, based on studies of increasing sophistication in design, assessment procedures, sample selection, and data analyses, it turns out: personality in adulthood and later life is characterized by stability and change. What is increasingly clear, however, is that there is considerable variation in how much change (or stability) occurs and for whom.

Whether one finds evidence of personality change or stability is driven powerfully by how one conceptualizes personality and how one measures change. Cumulative evidence, based on psychometrically sound assessment procedures and longitudinal or sequential designs, clearly documents stability and continuity in personality, at the same time that it provides unequivocal support for change and discontinuity. Thus, rather than seek categorical either–or answers to whether personality is stable or changing, Helson (1993) offered a variety of ingenious tools, both in collecting and analysing data and in working creatively across samples and designs to advance understanding of all these realities. The scientific challenge has matured to one of using well-crafted longitudinal studies to discern the full range of change and stability processes and, more importantly, to

understand why they occur, since it is possible that individuals show stability in traits and change in developmental characteristics.

Personality research reveals an emergent shift towards more process-oriented studies. That is, studies of whether traits, well-being, coping strategies, goals, or the self-concept change across time are increasingly replaced with studies that attempt to formulate and to test how particular individual-difference variables work together to account for different outcomes. For example, many investigators use coping strategies or goal orientation to predict variations in well-being. In fact, personality researchers frequently document that individual-difference variables matter through demonstrating their capacity to predict (cross-sectionally) or account for changes (longitudinally) in various aspects of psychological well-being, life satisfaction, or positive affect. Other personality variables, particularly those coming from theories of self and intentional action (e.g. social comparison processes, reflected appraisals, goal orientations), are increasingly investigated as factors that mediate, or moderate, the impact of life challenges or losses on well-being and health.

Linking individual differences to macrolevel structural factors and to internal biological processes will require innovative analytical approaches. The basic challenge is how to use longitudinal data across different domains to represent whole lives, aggregating them into meaningful taxonomies that facilitate how given outcomes come about.

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Georg Rudinger and Christian Rietz

RELATED ENTRIES

Personality Assessment (General), Intelligence Assessment Through Cohort and Time

PERSONNEL SELECTION, ASSESSMENT IN

INTRODUCTION

In personnel selection, the decision-maker's task is to predict which job applicants are most likely to perform their jobs well, to fit the organization or the workgroup, or occasionally, to remain on the job after being hired. Decisions are often made on the basis of general impressions, unstructured interviews, or other assessments of doubtful validity. There are, however, a number of methods of structured assessment that have been extensively validated and that are generally regarded as fair and cost-effective. These are described below.

ASSESSMENT METHODS

Five types of tests and structured assessments are widely used in personnel selection and evaluation: (1) assessments of experience and background, (2) structured interviews, (3) standardized tests, (4) simulations and work samples, and (5) assessment centres. Each is discussed below.

Assessments of Biographical Information

More than fifty years of research documents strong and systematic links between the information presented on application blanks and resumés ('biodata') and future job performance and success. This research describes two different empirically based strategies for using biodata in selection: (1) the development of empirical keys, or data-based systems, and (2) the classification of applicants into homogeneous groups based on biographical information. Biodata inventories developed according to these methods are consistently identified as among the most valid and cost-effective methods of assessment for personnel selection (Stokes, Mumford & Owens, 1994). More recent research has moved in the direction of theories that classify persons on the basis of their patterns of past behaviour and that predict future performance based on those classifications.

Structured Interviews

Nearly all employers use interviews as part of their selection systems, but this technique was long held in disrepute by the research community. From the 1940s to the 1980s, research on the reliability and validity of the employment interview portrayed a consistently negative picture (Arvey & Campion, 1982). The correlations between interview ratings and measures of performance or success rarely exceeded the teens and were often embarrassingly close to zero.

More recent research suggests that interviews can indeed be a valid method of selecting employees, as long as structure is imposed (McDaniel, Whetzel, Schmidt & Maurer, 1994). Campion, Palmer and Campion (1997) review the effects of fifteen possible components of structure (e.g. multiple interviewers, scripted questions, answer guides) and conclude that all methods of adding structure seem to help, but there is no professional consensus about which methods of structuring interviews are best or worst.

One interview format, referred to as a 'situational interview', asks examinees to describe how they would behave in several hypothetical but critical situations. Responses are independently rated by multiple interviewers, and composite ratings are used to make decisions about examinees. An alternative is to structure interviews around discussions of past behaviour on the job. Rather than asking what a person might do in a hypothetical situation, interviewers ask what he or she did do in specific situations encountered in previous jobs. McDaniel et al.'s (1994) review suggests that both show higher levels of validity than unstructured interviews, and that situational interviews work best.

Standardized Tests

Written and computer-administered tests of abilities, skills, and personality characteristics are extensively used in personnel assessment, and have been the focus of a substantially large body of research (Schmidt & Hunter, 1999). The use of written tests is much more common for office positions than for production and sales jobs (the *Minnesota Clerical Test* is an exemplar of this class of tests). Written tests are widely used for selection and placement in the federal, state, county, and local governments, and are very common in the military. The *Armed Service Vocational Aptitude Test* is administered to over one million examinees each year, making the Armed Services possibly the single largest consumer of tests and structured assessment methods in the world.

Research in personnel selection has focused most heavily on tests of cognitive ability. Scores on standardized tests of cognitive ability are related to measures of performance and success in virtually every job studied (Schmidt & Hunter, 1999). Compared with other methods of assessment, cognitive ability tests are relatively inexpensive, easy to obtain, have an extensive record of validity, and need not be time-consuming (e.g. the *Wonderlic Personnel Test* can be administered in 12 minutes and scored in seconds). However, there are some features of cognitive ability tests that can limit their attractiveness to organizations. Most important, average scores on cognitive ability tests are likely to vary as a function of race and ethnicity (Neisser et al., 1996). The causes and the meaning of differences in average test scores across groups have been among the most widely researched and contentious issues in the field of psychological testing, with no ready resolutions in sight.

The use of personality inventories as predictors of job performance has been a subject of controversy for nearly 30 years. As a result of several recent reviews of research on personality inventories (Barrick & Mount, 1991; Hough, Eaton, Dunnette, Kamp & McCloy, 1990), there is increasing optimism about their potential usefulness. In particular, there is evidence that measures of agreeableness, conscientiousness, and openness to experience are related to performance in a wide range of jobs. Average validities for measures of these traits are typically lower than those demonstrated by cognitive ability tests, but the evidence does suggest that specific, well-chosen personality inventories can make a worthwhile contribution to predicting who will succeed or fail on the job.

One potential drawback to the use of personality inventories is that many are susceptible to faking (e.g. applicants may distort their responses to appear more dependable or agreeable than they really are). Research on the effects of response distortion suggests that it does not substantially affect the validity of personality inventories as predictors of performance (Hough et al., 1990), but that it can have an influence on which candidates are accepted or rejected.

A potentially more serious drawback to the use of personality tests in hiring is that some of the most popular and widely used tests (e.g. *Myers–Briggs Type Indicator*) have little proven validity and utility. Similarly, projective tests (e.g. the *Rorschach Inkblot Test*) or tests of psychopathology (e.g. *The Minnesota Multiphasic Personality Inventory*) are sometimes used in industry, despite decades of research questioning their validity and usefulness.

There are a number of tests designed to assess integrity, dependability, honesty, etc. (O'Bannon, Goldinger & Appleby, 1989). Although early research on these tests was discouraging, there is now clear evidence that integrity tests have acceptable levels of validity for predicting a variety of organizationally relevant criteria (Ones, Viswesvaran & Schmidt, 1993).

Work Samples and Simulations

It has long been argued that predictions of future behaviour that are based on samples of the

present behaviour are likely to be more accurate than predictions that are based on measures of specific skills, ability, or knowledge. Work-sample tests that are used in personnel selection range from those that involve relative simple tasks to those involving complex samples of performance. There are two common features to all work-sample tests that should be examined in evaluating these tests. First, every work-sample test puts the applicant in a situation that is similar to a work situation and measures performance on tasks similar to those that make up the job itself. Second, every work sample differs in important ways from the job in which it will be used. Even when the tasks are identical to those required on the job, one might expect that examinees trying to impress their prospective employers will show higher levels of motivation in work-sample tests than they will on the job. Thus, one should regard a work sample as a measure of maximal performance rather than typical performance. This is an important distinction, because measures of maximal performance are not necessarily correlated with measures of typical performance.

Assessment Centres

The term 'assessment centre' refers to a structured combination of assessment techniques that are used to provide a wide-ranging, holistic assessment of each participant. Although the assessment centres used in different organizations differ widely in terms of content and organization, there are several features that nearly all assessment centres share in common and that are distinctive to this approach (Bray, Campbell & Grant, 1974). They include: (a) assessment in groups – small groups of participants are assessed simultaneously, (b) assessment by groups – each participant's behaviour is observed and evaluated by a number of different assessors (e.g. managers, psychologists, consultants, etc.), (c) the use of multiple methods – activities might include ability tests, personality tests, situational tests, interviews, peer evaluations, and performance tests, (d) the use of situational tests – nearly every assessment centre uses some type of work-sample or situational test, although they may vary across organizations, and (e) assessment along multiple dimensions – the final rating is a consensus rating along each of several dimensions.

Empirical evaluations of assessment centres have generally been favourable (Thornton, 1992). Assessment centre ratings have been shown to provide valid predictions of future performance, even when there is a long lag between the assessment centre and the subsequent evaluation of employee performance and success. The major drawback of this method is its practicality for screening large numbers of candidates. Assessment centre methods can be very time-consuming and labour-intensive. Time and money are required to develop assessment exercises, train assessors, administer and score the assessments, etc., and this method does not allow one to make quick decisions about a large number of candidates.

EVALUATING ASSESSMENT METHODS

There have been literally thousands of studies examining the relationship between scores on tests, interviews, and other methods of assessment and measures of job performance, work effectiveness, and additional organizationally relevant criteria (e.g. awards, patents, turnover). Reilly and Chao (1982) examined research on alternatives to standard ability tests and focused on eight alternative methods of predicting future job performance: biodata, interviews, peer evaluations, self-assessments, reference checks, academic performance, expert judgements, and objective tests. They evaluated each technique for its criterion-related validity, practicality, and likelihood of providing unbiased predictions of future performance. Their review suggests that only biodata and peer evaluations show levels of validity that are comparable to the validity of paper-and-pencil tests. They also suggest that none of the alternatives show comparable levels of validity with less adverse impact against minority applicants than standardized cognitive ability tests. A report by the National Academy of Sciences (Wigdor & Garner, 1982) reached a similar conclusion, that in employment testing there are no known alternatives to standard ability tests that are equally informative, equally fair, and of equal technical merit. Hunter and Hunter (1984) reached similar conclusions.

Schmidt and Hunter (1999) summarize the practical and theoretical implications of 85 years

Table 1. Estimates of the validity of widely used tests and assessments (Schmidt & Hunter, 1999)

	Job Performance	Performance in Training
Cognitive Ability Tests	0.51[a]	0.56
Work Samples	0.54	–[b]
Integrity Tests	0.41	0.38
Conscientiousness Measures	0.31	0.30
Structured Interviews	0.51	0.35 (combined structured/ unstructured)
Assessment Centres	0.37	–
Reference Checks	0.26	0.23
Job Experience (years)	0.18	0.01
Years of Education	0.10	0.20
Graphology	0.02	–

[a]The results presented here represent the average correlation between scores on tests, work samples, etc., and measures of job performance and performance in training.
[b]Too few studies of the validity of work samples, assessment centres and graphology as predictors of training performance exist to provide credible estimates of these validities.

of research on the validity and utility of selection tests. Their meta-analysis examines the validity of 19 selection procedures for predicting job performance and training. Table 1 summarizes some of their key findings.

The figures shown in Table 1 include a number of statistical and psychometric corrections that are controversial (Hartigan & Wigdor, 1989), and that probably lead to inflated estimates. For example, estimates of the validity of cognitive ability tests that use more conservative corrections suggest that the correlation between scores on these tests and measures of job performance are probably in the 0.35–0.40 range rather than the 0.51 cited in this table (see Hartigan & Wigdor, 1989). Nevertheless, there does seem to be clear and compelling evidence that selection tests can show substantial validity as predictors of performance, and conclusions about the relative validity of these tests (e.g. ability tests show similar levels of validity to situational interviews) appear reasonable.

Surveys of personnel managers (e.g. Ahlburg, 1992) reveal two depressing findings. First, personnel and human resource professionals are often unaware of the most basic findings of research on the validity of various personnel assessment and selection methods. For example, personnel managers in several countries, including the United States, consistently rank cognitive ability tests as among the least valid and useful tools for selection, and they rank interviews as among the most valid and useful tools for selection. The available body of research, which includes thousands of studies conducted in a wide variety of settings, shows that the opposite is true. Second, even those individuals who know which techniques have been shown to have the most or the least validity are more likely to use techniques such as the interview or assessments of experience. It appears that personnel managers' habit of using less valid methods is a difficult one to break.

CONCLUSIONS

A wide range of valid methods for selecting among job applicants is available, and as technology develops (e.g. advances in computerized testing, video-based simulations), it is likely that many of these methods will continue to improve. Unfortunately, there is a substantial gap between the science of selection testing and typical practice in organizations. The largest single challenge in this area is to convince decision-makers to take advantage of structured assessments in making selection decisions. Murphy and Bartram (in press) note that actual selection decisions are rarely based on individual test scores, and that the processes used in organizations to select workers are often poorly documented and poorly executed. Valid selection methods are readily available, but selection decisions are still usually made, in part or in full, on the basis of unstructured, poorly validated methods of assessment.

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RELATED ENTRIES

Applied Fields: Work and Industry, Applied Fields: Organizations, Centres (Assessment Centres), Cognitive/Mental Abilities in Work and Organizational Settings, Physical Abilities in Work Settings

PHYSICAL ABILITIES IN WORK SETTINGS

INTRODUCTION

Human physical performance is a domain of human abilities. Many of the assessment problems in this area are those met by psychologists interested in individual differences in other domains of human abilities. However, until recently, the constructs for describing the domain of physical abilities were not well defined and the range of capacities and measures to be included needed to be specified. This entry deals with research on the definition and organization

of physical abilities, the identification of diagnostic and reliable measures for assessing particular physical abilities, and the assessment and predication of performance in physically demanding tasks and jobs.

There is today particular interest in physical abilities in the workplace due to a number of national and social concerns. One concern stems from the increasing number of women seeking entry into physically demanding work. Women are becoming fire fighters, police officers, soldiers, pilots, construction workers, telephone linemen, warehouse loaders, and are entering other jobs formerly occupied only by men. In the US, it is legally mandatory for employers to demonstrate that they are following procedures that are fair to various members of the labour force – men, women, and different minority and ethnic groups. Such developments increase the need to identify the particular physical abilities required for such jobs and to identify objective, reliable, and valid methods for assessing the relevant abilities in applicants for these jobs.

IDENTIFICATION OF PHYSICAL ABILITIES AND MEASURES

Research in this area grew out of research on the dimensions of psychomotor abilities. Over the years, an extensive series of interlocking, experimental, factor-analytic studies attempted to isolate and identify the common variance in a wide range of psychomotor performances. Subsequent studies tended to introduce task variations aimed at sharpening or limiting our ability-factor definitions (for a review see Fleishman, 1972b). It was established that the psychomotor abilities identified (e.g. control precision, rate control, multi-limb coordination, reaction time, finger and manual dexterity, arm–hand steadiness) have little relation to performance of physical tasks and are independent of abilities in the physical performance domain (e.g. Hempel & Fleishman, 1955).

Physical abilities involve larger muscle groups than do psychomotor abilities and require more gross bodily movements. There had been many questions regarding the different basic physical ability dimensions to be assessed, their definitions, and the basic measures most diagnostic of these abilities. Is there a general strength factor? Are ability factors common to muscle groups? Or to movements involving extensor or flexor muscles? Can prolonged strain introduce new physical ability factors? How do conditions of administration (e.g. timed vs. untimed) affect what is measured? Are terms such as agility, speed, strength, and muscular endurance useful, or are they too general?

Fleishman (1964, 1975) described a programme of large-scale factor-analytic studies examining the interrelationships among actual physical performances. These studies involved large batteries of physical performance tests, specifically designed to test various hypotheses about the organization and nature of physical abilities. These studies identified and defined nine physical performance abilities. A recent large-scale study confirmed these findings for both men and women and with a more diverse set of physical tests (see Myers, Gebhardt, Crump & Fleishman, 1993). This programme indicated the range of performances that involved these abilities, provided detailed definitions of each ability, and identified the tests that were reliable and diagnostic of each of them (see also Fleishman & Reilly, 1992).

Definitions of these are provided below:

Static strength: Maximum force that can be exerted against external objects, including lifting, carrying, or pushing heavy objects.

Dynamic strength: Muscular endurance in exerting force continuously or repeatedly and includes power of the muscles to support or move one's body over time.

Explosive strength: Ability to mobilize energy effectively for bursts of muscular effort.

Trunk strength: A limited dynamic strength ability specific to trunk muscles.

Extent flexibility: Ability to flex or stretch trunk and back muscles.

Dynamic flexibility: Ability to make repeated, rapid, flexing trunk movements, involving resilience of the muscles in recovering from strain.

Gross body coordination: Ability to coordinate the movements of the arms, legs, and torso together in activities where the whole body is in motion.

Gross body equilibrium: Ability to maintain balance with non-visual cues.

Stamina: Capacity to sustain maximum effort requiring cardiovascular/pulmonary exertion over long periods.

Table 1. Examples of tests available to measure each physical ability*

Static Strength	Arm pull
	Dynamometer Grip Strength
	Leg lift
Dynamic Strength	Rope Climb
	Push-ups
	Bent arm hang
Explosive Strength	50-yard dash
	Broad Jump
	Vertical Jump (Versitonic**)
Trunk Strength	Leg lifts
	Sit-ups
	Isometric abdominal
Extent Flexibility	Twist and touch test
	Sit and Reach
	Arthrodial Protractor**
Dynamic Flexibility	Rapid, repeated twisting, and bending-over
	Floor touching test
Gross Body Coordination	Cable jump
Stamina	12 minute walk/run
	Step test
	Treadmill Test**

*More complete descriptions, including conditions of administration, may be found in Fleishman (1964), Fleishman and Reilly (1992), and Myers et al. (1993).
**Tests available from Lafayette Instruments, Lafayette, Indiana 47603.

Extensive definitions, based on research, have been provided elsewhere, along with available tests, for their conditions, administrations, and apparatus for measuring these abilities. Table 1 provides examples of tests with high loadings on each ability factor. These measures have been shown to have high reliabilities, and normative and developmental data based on measures of each ability have been presented elsewhere (Fleishman, 1964; Fleishman & Reilly, 1992).

RELATING THE PHYSICAL ABILITIES TO JOB REQUIREMENTS

The physical ability factors described, and their definitions, provide a framework for thinking about the abilities required for the performance of physically demanding tasks. These nine physical ability factors have been included as part of a more comprehensive taxonomy of human abilities, which also includes cognitive, psychomotor, and sensory-perceptual abilities (Fleishman, 1975; Fleishman & Quaintance, 1984; Fleishman & Reilly, 1992). A methodology has been developed for describing the ability requirements of jobs and job tasks in terms of the complete taxonomy of 52 abilities (Fleishman, 1975, 1979 & 1992; Fleishman & Mumford, 1988, 1991) or, more selectively, in terms of the nine physical abilities described in this entry. The Fleishman–Job Analysis Survey (F-JAS) (Fleishman, 1992) and its constituent Physical Ability Analysis (Fleishman, 1975) provide the job analysis method for linking the physical ability constructs described here to the requirements of occupational tasks.

In this job analysis methodology, each of the carefully defined ability definitions are presented, each with a corresponding 7-point rating scale containing empirically derived task anchors at high, middle, and low points on each scale (see Fleishman, 1992). Respondents (job incumbents, supervisors, or job analysts) rate the level of each ability required for particular jobs or job tasks on ability rating scales, providing a profile of the job's ability requirements.

Using these and related methods, the physical requirements of thousands of jobs have been determined, including police, electrical power plant workers, telephone line workers, tyre manufacturer workers, dockworkers who load ships, warehouse workers, steel mill labourers, court security personnel, electric and diesel train operators, paramedical personnel, refinery workers, military occupational specialities, gas pipeline workers, maintenance workers, and mechanics of different types. Other researchers can now add substantially to this list (Fleishman, 1988; Fleishman, Costanza & Marshall-Mies, 1999; Hogan, 1991). Interrater reliabilities are high and there is very high agreement between profiles of ability requirements obtained from incumbents, supervisors, and job analysts.

SELECTION AND VALIDATION OF PHYSICAL ABILITY TESTS IN JOB SETTINGS

This job analysis method selects tests that result in valid and fair assessment batteries (see Fleishman & Mumford, 1988). Generic tests of basic physical abilities and work-sample tests involving these abilities have been shown to yield substantial

criterion-related validities. In several studies, where specific comparisons were made, there was no superiority in validity of work-sample tests over a battery of generic tests. Multiple *R*s in the 0.50s are not exceptional and multiple *R*s in the 0.60s and higher have been achieved. Generic tests of basic physical capacities offer the flexibility of differential weighting within the same battery of tests across different jobs. A nationwide industry study of 45 power utilities showed the generality of these validities across a variety of situations and subgroups (Cooper et al., 1981). There is no evidence for differential validity as a function of gender or race.

These studies demonstrate empirical criterion-related validities of physical ability tests. Other studies have validated the generic tests selected against job sample tasks specifically designed to emphasize different physical capabilities (Hogan, Ogden & Fleishman, 1979; Wunder, 1981; Myers, Gebhardt, Crump & Fleishman, 1993). This is further evidence of the construct validity of these physical ability tests.

Since the tests with most adverse impact on women (i.e. tests of static and dynamic strength) are often the most valid, it becomes particularly important to demonstrate their job relevance and validity across gender groups. Attempts at reducing adverse impact, at the expense of validity, may not be in the best interests of the female applicants or the organization, if the result is subsequent injury and lower job performance.

A conclusion from this research is that tests of practically every category of physical ability identified have shown significant validity for some job or other. Thus, tests of Extent Flexibility and Gross Body Equilibrium have shown validity for some jobs, but tests of Static Strength have shown validities for many more jobs. Some, but relatively few, physically demanding jobs require Explosive Strength or Stamina, since few jobs require activities such as running, jumping, or prolonged cardiovascular activity – but they are critical for some jobs. Examples of jobs requiring high levels of different physical abilities are:[1]

Static Strength: fire fighter, ambulance attendant.
Dynamic Strength: road repavers, steel mill workers.
Explosive Strength: lifeguards, police officers.
Trunk Strength: auto mechanics, plumbers.
Extent Flexibility: warehouse order selector, telephone line worker.
Dynamic Flexibility: fruit harvest worker, wall paper hanger.
Gross Body Coordination: basketball player, ballet dancer.
Gross Body Equilibrium: high-rise construction worker, gymnast.
Stamina: firefighter, mountain trail guide.

RELATING PHYSICAL ABILITIES TO MEDICAL SYMPTOMATOLOGIES AND IMPAIRMENTS IN JOBS

The importance of providing relevant information about job requirements that can be linked to information about disabilities, medical symptomatologies and diagnosis, and rehabilitation is increasingly recognized (Fleishman, 1999). Disability assessment programmes require better information about the job tasks that individuals with different disabilities can and cannot perform safely and effectively. One line of research involved classifying jobs in terms of common levels of requirements in each of the F-JAS physical ability scales (Fleishman & Quaintance, 1984). Occupational medical specialists were able to link disqualifying symptomatologies in relation to the different levels of job ability requirements (e.g. Fleishman, 1988; Hogan, Ogden & Fleishman, 1978; Fleishman & Hogan, 1978). This kind of information is valuable in assessing whether workers can return to their jobs or whether they can do other jobs. Other applications of these ability scales involved development of a computerized support system integrating information about the physical requirements of jobs with diagnostic procedures practised by physicians for use in occupational health and personnel services (Halpern, 1996).

FUTURE PERSPECTIVES AND CONCLUSIONS

Physical abilities measurement has become an active area of research with many conclusions possible about the constructs needed to describe physical performance, the distinctions between them, and their limits and generality across different kinds of physical performances. Tests

have been identified to reliably measure each physical ability and job analysis methods have been developed to identify the job tasks which require different physical abilities. These methods have been shown to result in tests with criterion-related validities predicting performance of individuals in a wide range of jobs involving physically demanding tasks.

A more recent encouraging development has been the use of the physical ability concepts and methods in disability assessment programmes (Fleishman, 1988 & 1999). More research is needed on how medical specialists can utilize this information in making more reliable and valid decisions about jobs that individuals with different medical impairments can and cannot do effectively and safely.

In other studies (e.g. Fleishman, Gebhardt & Hogan, 1986), the linkage of information obtained from the rating scale methodology with physiological and ergonomic indices of work capacity was demonstrated. It was shown, for example, that ratings using adaptations of Borg's Rated Perceived Exertion (RPE) Scale (Borg & Ottoson, 1986) predicted actual (independently measured) metabolic costs of performing a wide range of tasks. It was possible to predict metabolic costs across a wide array of jobs from the subjects' ratings of perceived effort even if the subjects had not actually performed the tasks.

These scales also were shown to predict ergonomic indices of work performance. It was shown, for example, that the weights of the objects moved was more related to perceived exertion than the distances the objects were moved (over the distances examined). These types of studies have promise for predicting and reducing physical exertion requirements in job situations, through job redesign.

It should be pointed out that the disciplines of exercise physiology and ergonomics have much to tell us about physical capacities in the work place. Future research should explore the further integration of human performance, physiological, and ergonomic concepts and methodologies in the predication and understanding of work performance in physically demanding jobs.

Note

1 Fleishman and Reilly (1992) provide many more examples of jobs and tasks requiring each ability, along with description of tests available to measure each ability and detailed definitions of each ability.

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Edwin A. Fleishman

RELATED ENTRIES

Applied Fields: Work and Industry, Applied Fields: Organizations, Motor Skills in Work Settings, Personal Selection, Assessment in

PLANNING

INTRODUCTION

The scientific literature about planning provides multiple definitions of the construct because planning has many components and because scholars have focused on different aspects of planning (e.g. Miller, Galanter & Pribram, 1960; Schank & Abelson, 1977; Zelazo, Carter, Reznick & Frye, 1997). A composite definition presents planning as 'a set of complex conceptual activities that anticipate and regulate behaviour. Planning relies on representation of the environment, anticipation of solutions to problems, and then monitoring of strategies to see whether they meet the problem and follow the plan. To plan is to act simultaneously on three levels: in the reality of the problem, in accordance with an imagined scheme [to reach the desired solution], and in the role of mediator between the scheme and the behaviour' (Scholnick & Friedman, 1987: 3).

WHY IS IT IMPORTANT TO ASSESS PLANNING?

Partly because of the complexity of planning and partly because researchers focus on different components of planning, the scientific knowledge about why, how and when people plan is not comprehensive or detailed. It is important to continue to refine methods of assessing planning for several reasons. First, effective planning is associated with efficiency and success in achieving goals, whereas deficits in planning are associated with learning disabilities and retardation. In addition, planning is pervasive across all areas of human life, yet does not occur in every situation.

It is therefore important to determine the cultural, social, and task-specific conditions under which people plan or fail to plan, as well as conditions that are conducive to effective and efficient planning when people do plan. Furthermore, planning has been shown to characterize behaviour at all ages, but the evidence detailing the developmental course of planning skills is incomplete.

ASSESSMENT METHODS

Test developers have generated different methods to assess planning skills according to their conceptualization of planning and the developmental status of the persons evaluated. Detailed information about the different tasks can be found in Friedman, Scholnick, and Cocking (1987), Friedman and Scholnick (1997), and Denckla (1994).

Structured and Abstract Problem-Solving Tasks

Much of the scientific literature about planning is based on tasks in this category, and these types of tasks emerged before other types were conceptualized. Perhaps the most well known abstract problem-solving task is the Tower of Hanoi (TOH; Denckla, 1994; Scholnick, Friedman & Wallner-Allen, 1997), which has been used with both adults and children. The standard task utilizes three identical pegs evenly spaced across a rectangular board. A fixed number of rings differing in size are placed on one or more of the pegs in varying patterns which depend on the problem to be solved. The task calls for rearranging the rings to match a configuration different than the original while obeying the rules of the game. Rules include never placing a larger ring on top of a smaller one (size constraint), moving only one ring at a time, and placing rings only on pegs.

Variants of the TOH (e.g. Klahr & Robinson, 1981; Welsh, 1991) were created to simplify the task demands. Methods of simplification include providing a visual representation of the solution, using cans of different sizes instead of rings, and tapering the pegs. The latter two methods were meant to remind the player of the size constraint rule. Additional means of simplifying the task for younger players include colour coding the rings or cans and embedding the task into a story about three monkeys of different size who like to jump on trees. The Tower of London is another variant of the TOH. It utilizes three coloured beads that are to be placed on pegs of three different heights. As in the other tasks, the goal is to achieve a prescribed solution in the minimal number of moves while obeying a set of constraints.

Tasks Simulating Real-Life Situations

Psychologists discovered that children's cognitive performance is more advanced than anticipated when test problems are embedded in familiar domains of knowledge. In order to assess planning in this more ecologically valid way, psychologists developed planning tasks that simulate real-world situations with which children are familiar. In these tasks, testers require children to carry out a set of activities while obeying task constraints in settings such as a mock neighbourhood, grocery store or classroom. To demonstrate, in the grocery-store task, a child is presented with a model store with pictures of items along the aisles and items to be retrieved. The child is then asked to get the requested items in the shortest possible route. Other simulated real-life tasks include planning a birthday party or beach trip. Another simulation task is to present children with meaningful vignettes in which story characters must develop plans to solve problems. The children are then asked to create plans to solve the problems faced by characters in the vignettes.

Interviews and Questionnaires

A less-common method of assessing planning is to ask people what aspects of their life they think require planning and what plans they use to fix and prevent problems. This methodology is used with individuals across the lifespan. In this approach, adults might be asked to think about a recent problem, conflict or challenge and describe its details; children might be asked about something they have had to work hard on, something that bugged them or something that had to be fixed. Once they describe the problem, they are asked about their anticipation and prevention of the problem (Berg, Strough, Calderone, Meegan & Sansone, 1997). The interview/questionnaire approach also has been used to assess

contraceptive use among adolescents (Adler, Moore & Tschann, 1997).

Observations

The least frequently used approach to assessing planning behaviours is direct observation. In this approach, investigators observe speech and behaviour that indicate goal setting and planning, as well as contexts that lead to effective and efficient goal achievement. For example, investigators have observed whether research scientists are more productive using specific, challenging goals or the goal of doing one's best (Locke, Durham, Poon & Weldon, 1997). The observation method is used in child and adult populations and in solitary as well as interactive planning situations. Methods for coding such planning vary in detail and complexity. They include approaches such as transcribing and coding dinnertime discussions between family members (Gauvain & Huard, 1999) and creating Time-Event Matrices based on actions observed during hypothetical planning situations (Streufert & Nogami, 1997).

FUTURE PERSPECTIVES

We recommend three means of improving the assessment of planning. First, planning involves multiple skills: representing a problem, setting a goal, deciding to plan, creating a plan, implementing and monitoring the plan, and reviewing outcomes (e.g. Scholnick & Friedman, 1987). It is possible that people have different profiles of skills when it comes to planning, with some stronger on some aspects of planning (e.g. setting goals, creating a plan) while others are stronger on other aspects (e.g. implementing the plan, monitoring implementation). Yet, at present, researchers and clinicians tend to measure a single component of planning skills (e.g. efficiency), rather than performance on all of the various sub-components of planning. We recommend that testers create individual *profiles* of planning skills in order to understand individuals' strengths and weaknesses on each sub-component of planning. Such profiles have practical implications. For example, organizations could use profiling to assign tasks to employees based on their differential strengths.

Second, existing assessments should be analysed to determine which specific components of planning they assess. Before individual profiles and thorough assessment batteries for planning can be created, testers need to know which specific cognitive or behavioural demands (i.e. sub-components) a task requires, as well as the degree to which those demands are central to success on the task. Although there are a few exceptions (e.g. Scholnick, Friedman & Wallner-Allen, 1997), such task analyses have not been prevalent and would be useful.

Third, performance on planning tasks in part reflects the values of the culture and the individual, familiarity with the requirements of the task, and motivation to engage in planning. While the importance of such moderators is self-evident, current assessments of planning do not control for individual differences on such moderators. We recommend that moderators of planning be evaluated and controlled in assessment batteries of planning. In summary, the field of planning assessment has done much to quantify and understand a tremendously complex task that involves individual, cultural, and contextual variables; however, more refined means of assessment are needed to further clarify the interplay of the multiple skills involved in planning.

CONCLUSIONS

The assessment of planning is difficult because planning is multifaceted, is used in almost all of life's arenas, and is influenced by familiarity with task characteristics and by personal values and motivation. Yet, reliable methods of assessment that are sensitive to age differences and to cognitive deficits have been devised and used both in research and in clinical evaluation. Methods of assessment include abstract problem-solving tasks, tasks simulating real-life situations, and interviews, questionnaires and observations. These methods could be improved upon by the creation of assessment batteries that tap (a) all components of planning and (b) factors moderating performance on planning tasks.

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RELATED ENTRIES

Applied Fields: Education, Theoretical Perspective: Cognitive, Planning Classroom Tests

PLANNING CLASSROOM TESTS

INTRODUCTION

Any instruction requires continuous student assessment for the purpose of enhancing the quality of the instructional processes and improving student learning. The test development process needs planning and systematic procedures for the whole process of test construction in order to enhance the reliability and validity of the assessment results to be used for instructional decisions. This entry gives a general guideline in planning and analysing classroom tests and future developments and trends in classroom assessment as well.

STEPS FOR PLANNING CLASSROOM ASSESSMENT

Student assessment within the framework of classroom instruction requires planning of the following tasks:

1 Determining the purpose of the test
2 Preparing test specifications
3 Writing test items
4 Assembling test forms
5 Administering tests
6 Evaluating test results

Each step has its own procedures and requires detailed descriptions of planned activities.

Determining the Purpose of the Test

In using classroom tests, teachers may have a broad purpose such as 'grading' at the end of a semester, but in some instances they may rather focus on a specific purpose such as 'whether students demonstrate understanding of mole concept in a non-routine problem setting'.

No matter how broad or narrow the decisions to be made, teacher-made tests are used for various general purposes, as indicated below:

- Understanding entry characterisitics of students,
- Monitoring learning progress of the students throughout the instructional process,
- Understanding the reasons for persistent learning difficulties among students,
- Grading general achievement level of students at the end of instruction,
- Evaluating the effectiveness of instructional processes and materials,
- Providing feedback for students to monitor and assess their learning progress,
- Enhancing student understanding of their interests and progress,
- Identifying students' strengths and weaknesses in terms of different aspects of subject matters they cover,
- Identifying students' strengths and weaknesses in terms of cognitive processes to be developed,
- Providing information for the school administration to convey and implement curricular, extracurricular and counselling activities,
- Selecting students for some remedial or advanced level courses,
- Conducting research studies in terms of students' learning and progress.

In a broader sense, even though assessment results are used for different purposes, the core of the classroom tests focuses on student needs and expectations, and the results are generally used for selection, placement, instructional, pedagogical, and administrative decisions. Focused on instructional processes, classroom assessment is generally organized around placement, formative, diagnostic, and summative decisions (Bloom et al., 1971; Gronlund, 1993; Nitko, 1989).

In the very first step of planning classroom tests, standards to which students' performance will be compared and evaluated should also be determined. Teachers need to specify a minimum competency level either by referencing performance of a group, or setting a minimum standard task that students should demonstrate. The nature of the minimum competency level to be used could be norm-referenced or criterion-referenced, depending on the purpose of testing. For instance, grading may require norm-referenced interpretations; on the other hand, preparing students for a new learning task may require a minimum level of understanding of a set of concepts which could be done within the framework of criterion-referenced testing.

Preparing Test Specifications

In this step three questions should be addressed in order to plan a classroom test: (1) What knowledge such as facts, concepts, principles, generalizations, algorithms, etc., are necessary for students? (2) What content domain is necessary for students? and (3) What cognitive skills and processes are planned to be developed to deal with acquired knowledge and content domain? The answers to these questions are found in the table of specifications (content versus process matrix) where, in a two dimensional chart, it is possible to list all the content of the course, and the knowledge and cognitive processes to be developed in students. In the 1970s Bloom's taxonomy of educational objectives was considered as one of the pioneers in categorizing learning outcomes of students in cognitive domains (Bloom et al., 1971). In its broader sense, Bloom's taxonomy of educational

objectives covers knowledge, comprehension, application, analysis, synthesis and evaluation levels. Other taxonomies proposed in the following years have more or less the same idea of the hierarchical structure of human thought. For instance, Williams and Haladyna proposed a taxonomy consisting of recalling, summarizing, predicting, evaluating, and applying steps in developing a thinking schema in line with facts, concepts, and principles (Roid & Haladyna, 1982). However, with the impact of cognitive psychology on teaching and learning, more emphasis was given to complex cognitive skills, and assessment became more process and product oriented rather than tracing individual performances on paper-and-pencil tests (Calfee, 1995). The taxonomy proposed by Royer, Cisero, and Carlo (1993) seems promising and pioneering to deal with higher order thinking skills of students within the framework of cognitive psychology, introducing measures such as: (a) knowledge acquisition, organization and structure; (b) depth of problem representation; (c) mental models; (d) metacognitive skills; (e) automaticity of performance; and (f) efficiency of procedures.

A content versus process matrix serves two important purposes. First, it enhances the content validity of the test to be developed by indicating the weight given to each content area and cognitive processes of instruction; second, it guides teachers to decide the item format to be chosen in measuring each specific learning outcome.

Writing Test Items

The conventional approach in item format classifies the types of questions teachers use as objective versus open-ended. Multiple-choice, true–false, matching, and short answer formats are considered as objective item formats. On the other hand, restricted response and free response questions are considered as open-ended formats.

In this step there are two groups of decisions to be made in writing test items.

In terms of item content, three issues may help teachers to develop defensible and valid questions:

1 Assessment of intended learning outcomes with respect to cognitive processes and subject matter should be accomplished without the influence of other unintended learning outcomes. Measurement of reading ability and/or arithmetic skills rather than basic concepts and principles in a science test may jeopardize validity of classroom assessment. Item content should only emphasize the intended learning outcome depicted in the content versus process matrix.
2 An item format should be used which is congruent with the specifications set at the beginning of the instruction. Ability to develop a personal stance based on written textual information cannot be assessed by a multiple-choice item format. Performance-based assessment seems more suitable to measure this learning outcome. The teacher needs to match the specific learning outcome and the most efficient item format to be used.
3 The item should present a stimulus which is closest to a real life situation. Assessment of computer skills by a paper and pencil test is not a stimulus which is authentic in terms of expected learning outcome. Performance-based assessment in front of a computer is a more appropriate assessment strategy in this respect in terms of modelling a real life situation.

In terms of technical issues in writing test items, teachers need to decide two important things: (1) What difficulty level is ideal for the items to be developed? and (2) What guidelines are to be used in producing the items? For a norm-referenced test, item difficulty should match the ability level of the group; that is to say, for defensible item analysis results, item difficulty and item discrimination indices should be at the desired level. On the other hand, if the purpose of assessment is to make criterion-referenced inferences, the only thing teachers should consider is to question whether the item content represents what is implied in the specifications developed at the very first step of the test development process. Discrimination is important in terms of mastery–non-mastery groups, which is conceptually different than norm-referenced discrimination indices.

There are item writing guidelines proposed by different researchers (Ebel, 1972; Gronlund, 1993; Haladyna, 1994; Thorndike, 1971). The main issue in developing guidelines for item writers is enhancing the quality of the test items and increasing the validity and reliability of the whole

measurement process. Considering different item formats, different suggestions were developed by researchers. In general, the following issues should be considered by classroom teachers for all types of test items to be used for student assessment:

- Items should be congruent with the test purpose and specifications.
- Items should deal with an important aspect of subject matter.
- Items should be free from irrelevant information which is not necessary for the learner.
- Ambiguous statements should be avoided.
- Higher order thinking skills should be emphasized instead of memorized information.
- Language should be clear enough to communicate with the students.
- An answer to one item should not be a condition for solving the next item.
- Item content should be free from contextual information that may create bias against certain groups.
- Item content should be free from negative phrases.

Writing defensible items may be more difficult for teachers in certain formats than others. For instance, writing an item measuring higher order thinking skills is always more difficult than writing items in assessing factual text based information. No matter which item format is to be used, writing defensible test items requires good knowledge of the subject matter, understanding of different item formats, their functions and limitations, and experience in teaching and item writing activities.

Assembling Test Forms

In creating test forms teachers should plan for (1) selecting a representative sample of items which reflects the weights in the table of specifications; (2) grouping items with respect to subject matter, or item formats; (3) ordering items within each group – such as from easier to difficult, or some other logical order; and (4) general direction and directions to be presented at the beginning of each subtest encompassing purpose of the test, number of items, information about item format, time duration, scoring schema, etc.

Administering Tests

For a standard classroom assessment, the following questions should be considered during administration:

- Are physical conditions suitable for the students to take the test?
- Are students motivated for taking the test?
- Are testing day and time suitable for the students?
- Is enough time given for students to attempt all the items of the test?
- Are there any external factors affecting students' performance on the test?

A standard test administration process definitely improves technical quality of the test scores, such as reliability and validity.

Evaluating Test Results

Test results are analysed at the test score level and item score level.

Test score level analysis entails the distributional characteristics of the total scores and subscale scores. Reporting test scores in terms of content specifications such as computation, word problems, geometry subscales in a mathematics test, and cognitive processes such as solving non-routine problems, proposing a hypothesis and making generalizations in a science test will have more value in terms of students' learning progress rather than reporting a total test score. Criterion referenced interpretations of mastery–non-mastery decisions need to clarify the question of, 'What is different between the two students who are above and below the cut off score in terms of knowledge acquired and cognitive skills developed?' This is an issue discussed under the problem of standard setting (Hambleton & Jurgensen, 1990). For instance, if a mathematics teacher wants to define a standard for a summative test, he/she should be able to say that students who are above the cut off score are able to successfully demonstrate the ability to solve a non-routine problem. Having this expected performance defined, the next step should be to determine above which score level students are able to demonstrate that expected skill. Norm referenced interpretations of the scores of an achievement test can be carried out with respect to percentiles or standard score format.

Item level analysis requires obtaining some item statistics and deciding on whether: (a) items function as intended or not, and (b) students have major difficulties with respect to content and cognitive processes assessed by the item.

Types of decisions to be made play an important role in determining the item analysis strategies. If the results will be interpreted as norm-referenced, item difficulty, item discrimination and endorsement of students in each of the alternatives (if the item is multiple choice) must be evaluated.

Criterion-referenced interpretation deals with items which elicit evidence of which students demonstrate a satisfactory level of competence as a result of training. Thus, a couple of different indices are basically comparing (a) performance of two criterion groups on a single test item such as mastery versus non-mastery, instructed versus uninstructed groups, or (b) pre–post test gained scores in the item level to evaluate sensitivity to instructional processes (Crocker & Algina, 1986).

FUTURE PERSPECTIVES

Two mainstreams seem to influence classroom assessment in the future.

These are: (1) restructuring testing practices around performance-based assessment in addition to conventional student assessment procedures, and (2) extensive use of computer technology during test construction processes and student assessment.

There was increased attention to criterion-referenced testing in classroom assessment in the 1970s under the influence of behaviourist approaches to educational processes. Behaviourism affected student assessment because of two reasons. First, behaviourist description of human learning made it possible to define and describe all the student learning outcomes easily, and these enabled test developers to link each question in a testing situation with a clearly defined test specification. Second, the ease of establishing the link between the learning outcome and test question made it possible to trace student progress through instruction with a clearly defined behavioural domain.

Assessment of complex learning processes became more prominent in classroom assessment with the increasing impact of cognitive psychology and multiple intelligence theory on educational practices (Armstrong, 1994; Haladyna, 1997; Snow & Lohman, 1989). Thus, in a classroom assessment, instead of assessing factual and declarative information, more attention is given to assessment of communicating, measuring, investigating skills, as well as organizing, problem solving and decision making processes. Approaches such as performance based, authentic, alternative assessment, and portfolio assessment, are used interchangeably to emphasize any tool to observe students' learning process through which they demonstrate understanding of concepts and principles by performing a task in the same way they would act outside of school. These tasks require use of knowledge and higher order thinking skills as well as habits of mind (Herman et al., 1992). Portfolio assessment, on the other hand, consists of a collection of students' work, such as projects, term papers, compositions, etc., to trace student progress (Kubiszyn & Borich, 1996). Development of performance-based assessment schema is not different than the steps explained in the previous part of this entry, except that testing is integrated into teaching and learning activities more than in the conventional assessment approaches. The critical issue in performance-based assessment is preparation of scoring rubrics. An extensive discussion on types of rubrics may be found in Haladyna (1997).

The role of computers in testing is generally limited to high stake standard test administration. However, during the teaching and learning process, computers are commonly used as a supplementary instructional aid. More frequent use of computers will be indispensable in classroom testing in the future during the processes of test preparation, test administration, and test scoring.

Computer technology helps teachers in the following respects:

1. Provides a large item pool to facilitate a representative sample of the learning domain for a valid content coverage as long as items are coded with respect to content and cognitive domain specifications.
2. Provides the technology for producing high quality authentic test items, which is not possible with a paper and pencil test, with the use of colours, sound, and three-dimensional graphical representations, etc.
3. Facilitates seamless instruction where smooth transition between teaching and assessment is desirable.

4 Provides a base for portfolio assessment by recording students' work in order to monitor individual progress on a given task.
5 Matches examinee ability with the difficulty of test items through the use of adaptive test administration.
6 Improves students' interest during testing and enhances validity of measurement.
7 Increases test security in the classroom environment.
8 Provides opportunities to assess some aspects of important learning outcomes which are not possible by paper-and-pencil tests, such as speaking skills and listening comprehension in learning a foreign language.

CONCLUSIONS

Planning a classroom test is a professional task. The general aim of classroom assessment is to enhance student learning. Within this framework, setting a clearly defined purpose and linking all the assessment attempts with a clearly specified content and cognitive processes domain may help student learning progress. In the last decade, performance-based assessment gained more importance than any other classroom assessment. Therefore, teachers need to deal with more complex learning outcomes. The use of computer technology with the integration of conventional and performance-based approaches might increase the quality of assessment every classroom teacher aspires to accomplish.

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Giray Berberoğlu

RELATED ENTRIES

Applied Fields: Education, Achievement Testing, Criterion-Referenced Testing: Methods and Procedures, Planning

POST-OCCUPANCY EVALUATION FOR THE BUILT ENVIRONMENT

INTRODUCTION

Post-Occupancy Evaluation (POE) refers to studies that assess the operation, status, and usability of a physical setting at some point after construction is completed and users move in. These studies are typically undertaken to assess the success of the design in meeting stated goals, identify problems needing attention, or provide 'lessons learned' for the design of another facility. POEs can be qualitative or quantitative in approach, involving a variety of data gathering techniques, including surveys, behavioural observations, behavioural trace or archival data. They range from brief and inexpensive individual studies to large scale, longitudinal, multi-site efforts. POEs are conducted by facility owners, particularly those seeking to improve repeatedly built settings, designers trying to inform their practice, and researchers looking to understand human–environment relations.

DEFINITION OF POST-OCCUPANCY EVALUATION

A Post-Occupancy Evaluation (POE) is an assessment of a designed environment after it has been constructed and occupied to see how well it operates in terms of criteria that address function, efficiency and comfort of its intended uses and users. POE makes use of the research methods, instruments and data analysis techniques of the social sciences to provide a systematic evaluation of the setting. Zimring (2002) defines POE as:

> *... the systematic assessment of the process of delivering buildings or other designed settings or of the performance of those settings as they are actually used, or both, as compared to a set of implicit or explicit standards, with the intention of improving the process or settings.* (Zimring, 2002)

POE has been compared to programme evaluation in providing an opportunity to 'pause and reflect on the impact ... to assess concept, implications and utility, and to judge and improve planning, effectiveness and efficiency...' (Rossi & Freeman, 1985). Shibley (1982) notes that design without evaluation is like 'action without reflection'. As such, POEs can serve not only to modify a specific building or setting type, but to improve design practice.

POE can include technical assessments of engineering systems (lighting, HVAC, etc.). It is distinctive, however, in its 'focus on building occupants and their needs ... [providing] insights into design consequences of past design decisions and the resulting building performance' (Preiser, Rabinowitz & White, 1988). Anderson and Butterfield (1980) make a distinction between POE as the study of functional use (social and behavioural issues) versus Post-Construction Evaluation studies of engineering systems.

POE is the last stage of Zeisel's (1981) oft-cited design cycle, which describes the evolution of a design project from concept, through programming, design, and construction, concluding with the POE. In Zeisel's model, the prime value of a POE is to provide information that informs the next iteration of the design cycle, and adds to the general base of information about that building type and environment–behaviour relations.

BRIEF HISTORY OF POST-OCCUPANCY EVALUATION

Bechtel (1997) notes that POEs have been conducted for decades, not as formal studies but in reviews and assessments of buildings done by architecture professors and their students. POE as a self-conscious and rigorous activity, however, began in the 1960s as social scientists worked to create methodologies that could

Table 1. Some dimensions of Post-Occupancy Evaluations

Evaluator	Researchers, Designers, or Clients		
Scale	Single Site versus Multi-Site One point in time versus Longitudinal or Multi-generational		
Depth	Level 1 Benchmarking	Level 2 Detailed case study	Level 3 Diagnostic study of issue or space
Purpose	Comparative versus Generative		
Methods	Quantitative versus Qualitative Standardized versus Individually developed Generic versus Setting specific Single source of data versus Multi-method for convergence of data		
Content/Process	Focus on information versus Focus on user involvement and participation		

provide support for designers who were trying to provide socially responsive facilities (see Zimring, 2002; Friedmann, Zimring & Zube, 1978; Preiser, Rabinowitz & White, 1988; Shibley, 1982). The settings studied in many early POEs were those readily available to the university-based researchers (e.g. university dormitories), or sites of special interest to behavioural and social scientists (e.g. psychiatric settings, etc.).

Designers have looked to POEs for design-decision support, particularly when pressured to make choices among a set of uncertain options (Kantrowitz & Farbstein, 1996). Significant support for the use of POE in the United States was provided by its inclusion in the Senate Public Buildings Act of 1980, section 108, which required the use of POE to 'determine and improve effectiveness of existing and planned public buildings providing a safe, healthful, economical, conveniently located, energy-efficient and architecturally distinguished accommodations for federal agency offices'.

Early studies were often of one site at one point in time (such as the POEs of psychiatric facilities by Osmond [1959], or Ittleson et al. [1970]. The exception is Wheeler and Miller's evaluation of four generations of college dormitories (Wheeler, 1985). While 'one-off' evaluations remain the most common there have been a number of significant efforts at creating more broad-based studies that look across a range of settings, such as POEs of a range of government buildings for the California DGS (DGS, 2001), of United States Postal Service facilities (Kantrowitz & Farbstein, 1996), of jails and prisons (Wener et al., 1996) and of office settings (Brill et al., 1984). Zimring (2002) notes that increasingly POEs are becoming proprietorial and are addressing more diverse types of settings.

CATEGORIES

Preiser et al. (1988) have described three levels of POEs: (1) brief indicative studies; (2) more detailed investigative POEs; and (3) diagnostic studies aimed at correlating environmental measures with subjective user responses (see Table 1). Level one 'brief indicative' studies, according to this categorization, are benchmarking studies – broad but shallow – gathering comparative data across a potentially large number of sites. They provide baseline data on a variety of issues and spaces across facilities so that exceptionally good or poor settings can be identified for closer study.

This closer look comes in level 2 or level 3 POEs. Level 2 investigations provide in-depth studies of individual sites, either to find and fix problems or to note and promulgate particularly effective solutions. Level 3 diagnostic studies look more closely at specific issues or spaces rather than a particular facility. If, for instance, a level 1 benchmarking should indicate that wayfinding in corridors is a pervasive problem, or that nursing home kitchens are rated poorly, a level 3 POE

might be initiated to look at that issue or space more closely across a variety of institutions.

POEs have also been classified as being either comparative or generative in purpose (Wener, 1989). Comparative studies (like level 1 and in some cases level 3 POEs) have the purpose of comparing a setting to another setting or to itself at a different point in time. They are undertaken to test a hypothesis or to assess the success of a design programme. Generative POEs, on the other hand, are undertaken to develop ideas and provide information that can directly support the creative design process.

ASSESSMENT INSTRUMENTS AND TECHNIQUES

As in other areas, POE assessment techniques and instruments have evolved over time, with experience and changing needs. User self-report of satisfaction via questionnaire or interview remains the most common type of data in use, because of the relative ease and cost of collecting, analysing and reporting survey data (e.g. Wheeler, 1985; Anderson & Weidemann, 1997). Comparative POEs, whose primary purpose is to assess satisfaction within or across sites, commonly use objective survey instruments, such as questionnaires with Likert-like scales (such as in studies of office workers by Brill et al., 1984 or Picasso, 1987).

Generative studies, however, which seek to provide programming information for designers, are more likely to use open-ended instruments that ask questions like 'how well does this space work for you' and 'how would you change it?'. A good example is the 'walk-through' evaluation (Gray et al., 1985) in which researchers tour a space, accompanied by users, asking questions from a structured interview schedule as they go to develop an understanding of user needs and concerns.

Some survey instruments are generic and meant for a broad range of settings (Vischer, 1989 and Preiser et al., 1988 provide useful examples of such assessment forms), while others are highly specific, tailored to a particular setting type, like hospitals (Cantor & Kenny, 1977) or jails (Wener et al., 1993). In either case, there has been a trend toward standardization, developing statistical baselines and norms to aid in comparisons and understanding of relative well-being. Zimring (2002) notes that Heerwagen has recommended using a 'balanced scorecard' approach that addresses issues such as financial performance, impact of the building on the business process, growth and satisfaction of employees and impact on other stakeholders (Heerwagen, 2001).

Bechtel (1997) and Zimring (2002) discuss the benefits of using multiple methods to increase confidence in results through convergence of information from various sources. Multi-method POEs can make use of archival data, trace data, and behavioural observations, in addition to self-report surveys (see Zeisel, 1981, for a discussion and examples of these methods).

POEs can be used as part of a broader organizational change process. If a goal of the evaluation is to give users greater participation in and ownership of the design, there is likely to be an emphasis on group process and methods, such as focus group interviews, in gathering information (Schneekloth & Shibley, 1995).

EXAMPLES OF POST-OCCUPANCY EVALUATION

There are, by various estimates, thousands or tens of thousands of POEs, mostly individual case studies, many of which are unpublished or otherwise proprietorial. Bakos et al.'s (1980) evaluation of a geriatric facility is unusual as a quasi-experimental study with observations of resident social behaviour at four points in time over several years, before and after group design process meetings and spatial re-design. Their data demonstrated the positive impacts both of being involved in the design process and of the design interventions.

There is a growing list of examples of POE systems developed for institutional clients. Rosenheck et al. (1997) conducted eight POEs to assess technical issues and user satisfaction of embassies for the US State Department, addressing issues such as aesthetics, circulation, security and maintainability. They also developed an online database to make the results easily accessible.

Wener, Farbstein and Knapel (1993) developed a package of POE instruments for the National Institute of Corrections to assess jail environments, including a physical setting checklist, survey forms for administrators, facility

managers, and programme staff, questionnaires for officers and inmates, and forms and instructions for conducting behaviour observations. This package was used in new facilities in Florida, California and Massachusetts.

Underhill (1999) describes his evaluations of the impact of store design on customer behaviour, mostly using behavioural observations and photography, in many kinds of retail settings. These studies have led to modifications of design that have demonstrably improved sales.

Kantrowitz and Farbstein (1996) conducted POEs of post office facilities for the United States Postal Service that have been important in the development of design standards for the USPS operation. (See Preiser et al., 1988, Zimring, 2002, and Wener, 1989 for more examples of evaluations.)

FUTURE PERSPECTIVES AND CONCLUSIONS

Individual POEs will inevitably continue to be a useful source of information to assess the success of settings and provide recommendations for future design. It seems likely, however, that the trend will continue toward increased development of standardized POE packages for use within or even across facility types. Even places as diverse as schools, offices and jails, for instance, have spaces and characteristics in common (e.g. maintenance, kitchens, workstations). Standardization allows for useful comparisons across time and place, improving the ability of POEs to provide general lessons and make theoretical contributions, although possibly at the cost of loss of information on the unique characteristics of a facility.

Information technology can help improve the availability of having POE data when and where needed. It is undoubtedly true that mistakes have been made because a designer or client was unaware of, or had no access to, relevant POE results. The development of online databases can make such information handy and accessible (see Zimring, 2002, for an example).

Gawande (2000) makes a case that critical incident studies by systems engineers were able to identify systematic problems in medical systems and eventually led to improved hospital practices and reduced death rates. A set of critical incident studies of the environmental design process, through a focused set of POEs, might also be able to identify systematic problems, and could improve design practice to reduce mistakes.

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Richard Wener

RELATED ENTRIES

Observational Methods (General), Person/Situation (Environment) Assessment, Unobtrusive Measures

PRACTICAL INTELLIGENCE: CONCEPTUAL ASPECTS

INTRODUCTION

Practical intelligence has been one of the fastest growing areas of the field of intelligence over the past two decades. In a *Handbook of Human Intelligence* (Sternberg, 1982) published almost 20 years ago, the term practical intelligence did not even merit an entry in the index. In the more recent *Handbook of Intelligence* (Sternberg, 2000), the term practical intelligence has multiple entries in the index, and indeed, an entire chapter is devoted to the topic (Wagner, 2000). Because practical intelligence is a relatively new and evolving construct, this entry addresses issues concerning the nature of practical intelligence and its relations with other kinds of intelligence, in addition to the issue of how practical intelligence can best be measured.

THE NATURE OF PRACTICAL INTELLIGENCE

The merits of defining intelligence of any sort are not obvious. No particular definition of intelligence has become dominant, nor has defining intelligence proved to be a useful endeavour. In 1921, the editor of the *Journal of*

Educational Psychology asked 17 leading researchers to define intelligence. Their responses consisted of 14 different definitions and three non-replies. When leading researchers were given the same task 65 years later, the most notable characteristic of their replies was their variability (Sternberg & Detterman, 1986). Despite these limitations, examining working definitions of practical intelligence provides insight into what appears to be meant by the concept. Four working definitions will be considered briefly.

Exclusionary Definitions

An exclusionary definition defines something by characterizing what it is not. Frederiksen (1986) defined practical intelligence as cognitive responses to just about anything encountered outside the classroom setting. Although it is true that academic knowledge is useful in some everyday contexts, and practical knowledge can be important to aspects of school performance, there do appear to be differences between the typical problems found in the classroom and those encountered in everyday contexts beyond the classroom. Problems found in the classroom and on IQ-type tests tend to (a) be well defined, (b) be formulated by others, (c) come with all information required, (d) have a single answer, (e) have a single method of obtaining the correct answer, and (f) be unrelated to everyday experience. In contrast, the more practical problems of everyday life often are (a) poorly defined, (b) unformulated, (c) missing essential information, (d) characterized by having multiple solutions – each with liabilities as well as assets, (e) characterized by having multiple methods of obtaining each solution, and (f) related to everyday experience (Neisser, 1976; Wagner & Sternberg, 1985). Given the difficulties that arise from the ill-defined nature of practical problems relative to academic problems, it is fortunate that lessons learned over the years from everyday experience turn out to be applicable to solving the practical problems we encounter.

Practical Know-How

Studies of cultures that have been characterized as 'primitive' by Western societies produced interesting examples of practical know-how. In third world countries that have automobiles, considerable practical know-how can be required to keep them running in the absence of sophisticated test equipment and replacement parts. Automobile repair often involves adapting an object at hand to fix the problem (Berry & Irvine, 1986). Gladwin (1970) studied how the Puluwat people of Micronesia do ocean navigation without modern navigation instruments. They rely on a sophisticated system that is based on the idea that it is the islands that move rather than the canoe they are in. An initial course is set when leaving the harbour of origin by drawing imaginary lines from the canoe to known landmarks on the island they are departing. This course is maintained in a variety of ways, including making reference to the stars at night and the sun during the day. The destination island is found by looking for birds that are known to roost on land, odours and sounds associated with land, and changes in wind patterns or velocity that can indicate a land mass.

Wagner and Sternberg (Sternberg, Forsythe, Hedlund, Horvath, Wagner, Williams, Snook & Grigorenko, 2000; Sternberg, Wagner, Williams & Horvath, 1995; Wagner, 1987, 1997; Wagner & Sternberg, 1985) have studied practical know-how in the form of tacit knowledge. Tacit knowledge refers to practical know-how that rarely is formally described or taught directly (Wagner, 1987). According to this view, practical intelligence can be measured in a manner analogous to that used to measure academic intelligence. An IQ test is not a direct measure of academic intelligence. Rather, it represents a sample of academic knowledge that could have been learned over recent years. After making assumptions such as equal opportunity to learn the material, the inference is made that individuals who have learned the most have the most academic intelligence. Wagner and Sternberg developed samples of tacit knowledge for a variety of career domains. Using the logic of IQ tests, they assumed that individuals with more tacit knowledge had more practical intelligence.

Social Judgement

Given the important role played by others in our environment, and that intelligence often is conceptualized as the ability to adapt to and shape one's environment, it is not surprising that social judgement plays a central role in some conceptions of practical intelligence. For example,

Ford (1986) and Mercer, Gomez-Palacio, and Padilla (1986) describe practical intelligence as synonymous with social competence.

Practical Intelligence as a Prototype

Neisser (1976) suggested that it is impossible to define intelligence as any one thing. The most we can do is agree on a prototype that represents the ideal exemplar of intelligence. According to this view, the amount of practical intelligence that a given individual has is determined by the extent to which he or she resembles the prototype. Sternberg, Conway, Ketron, and Bernstein (1981) adopted this approach by asking laypersons as well as experts to rate how characteristic 250 descriptions were of an (a) ideally intelligent person, (b) academically intelligent person, and (c) everyday intelligent person. The ratings of laypersons characterized practical intelligence in terms of practical problem-solving ability, social competence, character, and interest in learning. The ratings of experts characterized practical intelligence in terms of practical problem-solving ability, adaptive behaviour, and social competence.

RELATIONS BETWEEN PRACTICAL INTELLIGENCE AND OTHER KINDS OF INTELLIGENCE

Most of the research relating practical intelligence to other kinds of intelligence was motivated by a desire to determine if practical intelligence was distinct from the kind of intelligence measured by the ubiquitous IQ test. The majority of these studies indicate that practical intelligence (a) is at best weakly related to academic intelligence, (b) is often a good predictor of real-world performance, and (c) consequently, the contributions of practical and academic intelligence to prediction are largely independent as opposed to overlapping (Sternberg, Wagner, Williams & Horvath, 1995).

Although it was important to show that practical intelligence was different than the kind of academic intelligence measured by IQ tests, this falls short of the larger goal of providing a comprehensive framework that integrates and relates practical and academic intelligence. Several promising frameworks will be described briefly.

Fluid and Crystallized Abilities

Horn and Cattell (1966) categorized intelligence into two different forms that have different lifespan developmental functions. Fluid abilities are abilities that are required for dealing with novelty in a situation. Fluid abilities reach their peak in the late teens and slowly decline thereafter. Crystallized abilities are conceptualized as acculturated knowledge. They may be maintained at high levels throughout adulthood. The distinction between fluid and crystallized abilities is sometimes described as that between the processes and products of learning. The different lifespan trajectories of fluid and crystallized intelligence fit the different lifespan trajectories noted for academic and practical intelligence. Performance on measures of academic intelligence peaks and declines much earlier than performance on measures of practical intelligence does.

Pragmatics and Mechanics of Intelligence

A view that is related to the distinction between fluid and crystallized intelligence is that of Baltes, Dittmann-Kohli, and Kliegl (1984). Intellectual functioning is divided into mechanics and pragmatics. The mechanics of intelligence refers to the content-free architecture of information processing and problem solving. The mechanics of intelligence corresponds to fluid intelligence. The pragmatics of intelligence includes accumulated knowledge and skill, similar to the concept of crystallized abilities.

Multiple Kinds of Intelligence

Conceptualizations that describe different kinds of intelligence routinely include practical intelligence. An example is provided by Sternberg's (1985) triarchic theory of human intelligence, in which practical intelligence is viewed as a kind of intelligence that is different from both analytic and creative intelligence. Another example is provided by Gardner's (1983) multiple intelligences theory, in which practical intelligence is

reflected in both intrapersonal and interpersonal intelligence.

MEASURING PRACTICAL INTELLIGENCE

Compared to the study of traditional IQ, the study of practical intelligence is in its infancy. It should not be surprising therefore that measures of practical intelligence are just being developed.

Sampling Tacit Knowledge

The most extensive effort to measure practical intelligence has involved sampling tacit knowledge using an approach that is analogous to measuring IQ. IQ tests do not measure 'intelligence' directly. Rather, they do so indirectly by sampling knowledge and skills that an individual has had an opportunity to acquire over recent years. By assuming equal opportunity and motivation for learning the information and skills, the *inference* is made that an individual who has learned more has more learning ability or intelligence. Evidence of this view of IQ testing is provided by the facts that simple vocabulary is the single best predictor of IQ, and IQ tests are virtually indistinguishable from achievement tests.

Measures of practical intelligence based on sampling tacit knowledge are constructed by interviewing individuals to identify domain relevant tacit knowledge. Scenarios are then constructed that describe situations or problems to be solved involving relevant tacit knowledge. Performance typically is scored by comparing an individual's responses to the responses of an expert panel. See Sternberg et al. (2000) and Wagner (1987, 2000) for detailed descriptions and examples of this methodology.

Other Approaches

In addition to sampling tacit knowledge, a variety of other approaches have been used to quantify practical intelligence. These range from obtaining ratings of an individual's characteristics to assess his or her similarity to an ideal prototype of practical intelligence, to work sample approaches in which individuals are given practical problems and their actual performance is scored or rated. See Sternberg and Wagner (1986, 1994) for examples of these other approaches.

FUTURE PERSPECTIVES AND CONCLUSIONS

Formal assessment of practical intelligence has largely been done in the context of researchers carrying out studies as opposed to actually being applied to make real-world decisions in the context of selection or training. Established procedures and measures used for selection are entrenched. Measures used today look much like measures used decades ago. Inclusion of measures of practical intelligence in real-world selection and training contexts is the next great challenge, one that will be achieved gradually over a long period of time. Examples are beginning to emerge. The University of Michigan is beginning to use a measure of practical intelligence for making admission decisions in their business school. The United States Defense Department has supported research into tacit knowledge measures for selection and training in military contexts. The success or failure of these early efforts will play an important role in the speed with which measures of practical intelligence become widely available and used.

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Richard K. Wagner

RELATED ENTRIES

Intelligence Assessment (General), Practical Intelligence: Its Measurement, Cognitive Ability: Multiple Cognitive Abilities

PRACTICAL INTELLIGENCE: ITS MEASUREMENT

INTRODUCTION

Practical intelligence is one among various multiple intelligences that have been proposed in recent years. Sternberg and his research team (Sternberg et al., 2000: xi–xii) are the only researchers, however, to have undertaken a systemic programme to measure practical intelligence and to assess its criterion-related validity. They claim to have shown that it is not only independent of the well-documented general intelligence factor, *g* (Carroll, 1993; Jensen, 1998), but also 'arguably ... a better predictor of success' in life.

CONSTRUCTS ASSESSED

Sternberg and his colleagues do not actually measure practical intelligence, but what they refer to as its 'important aspect', tacit knowledge.

Practical Intelligence

Sternberg and his colleagues define practical intelligence as 'the ability to solve real-world everyday problems' and, most broadly, 'the ability to adapt to, shape, and select everyday environments'. It is 'what most people call common sense' (Sternberg et al., 2000: xi, 97–98).

Although *g* is known to be a very general ability (Carroll, 1993), Sternberg and his colleagues argue that there exists a second, separate general intelligence – a practical intelligence – because adapting to the real-world requires practical action but IQ tests measure only an 'inert', 'academic' ability. More specifically, they argue that there are two distinct spheres of human activity. The 'academic' sphere of activity is said to pose problems that are formulated by other people, well-defined, and complete; possess only a single correct answer and method of obtaining that answer; and are disembedded from ordinary experience and are of little or no intrinsic interest – in other words, the stereotype of an IQ test. In contrast, 'practical' problems require problem recognition and formulation; are ill-defined; require information seeking; possess multiple acceptable solutions; allow multiple paths to solution; are embedded in and require prior everyday experience; and require motivation and personal involvement.

This academic–practical distinction in the kinds of *tasks* that people confront in life is meant to establish a prima facie case that *g* is not really a general ability, because there must be different intelligences for the two kinds of tasks. Although this distinction among tasks may be useful for some purposes, it cannot moot a century of research showing that higher levels of *g* actually do provide individuals big practical advantages in everyday life, from level of job and income attained to health and longevity (Gottfredson, 2002, in press b; Schmidt & Hunter, 1998). In fact, higher levels of *g* are especially advantageous when tasks 'require problem recognition and formulation, are ill-defined, and require information seeking', attributes describing the tasks that the Sternberg team assigns to the 'practical' sphere of life.

Sternberg and his colleagues draw a second distinction to support the viability of their practical intelligence construct, namely that there are academic and practical forms of *knowledge*. This is consistent with their 'knowledge-based' view of intelligence. This view minimizes the evidence on *g*'s heritability and portrays the *g* factor mostly as a cultural artefact created by Western schools teaching some skills and knowledge rather than others, presumably to some students and not others (Gottfredson, in press a).

Tacit Knowledge

Sternberg et al.'s (2000) emphasis on distinct forms of knowledge leads directly to the most important construct in their measurement programme – tacit knowledge. In their view, the general intelligence factor *g* reflects the 'facile acquisition of formal *academic* knowledge' whereas practical intelligence reflects the 'facile acquisition and use of *tacit* knowledge' (Sternberg et al., 1995: 916, emphasis added).

Tacit knowledge is 'experience-based knowledge relevant to solving practical problems' (Sternberg et al., 2000: 104–105). It is therefore highly context-specific procedural knowledge: 'tacit knowledge is always wedded to particular uses in particular situations or in classes of situations' (Sternberg et al., 1995: 917). It is acquired on one's own with little support from the social environment, is often not verbalized, and is useful in attaining personal goals. They describe it more colloquially as 'practical know-how', 'knowing the ropes', and 'street smarts'.

Because tacit knowledge is the *untaught* fraction of procedural or 'practical' expertise, it would seem to be much narrower than the construct it is meant to measure – the 'ability to solve real-world everyday problems [and] ... adapt to, shape, and select everyday environments'. Sternberg et al. (2000: xi) justify focusing their measurement programme on tacit knowledge by stating that it is 'one particularly important aspect' of practical intelligence. They do not say what the other aspects might be.

ASSESSMENT INSTRUMENTS

Tests of Tacit Knowledge

Because tacit knowledge is highly specific, separate tests of tacit knowledge are required for every setting. Sternberg and his colleagues have focused on tacit knowledge for jobs, and have developed inventories for academic psychology, management, sales, and three levels of Army officers. The test of Tacit Knowledge in Management (TKIM) was once available from the Psychological Corporation, but no tacit knowledge test is currently available commercially. See Wagner (1987) for examples of items on the academic psychology test and early versions of the management test, appendices in

Sternberg et al. (2000) for copies of the sales (TKIS) and most recent management test (TKIM), and Hedlund et al. (1998) for the tests of military leadership at three levels (TKML-platoon leader, TKML-company commander, and TKML-battalion commander).

Sternberg et al. (2000) mention only one tacit knowledge test for a non-work setting: a test for Kenyan children's knowledge of herbal remedies (Sternberg, Nokes, Geissler, Prince, Okatcha, Bundy & Grigorenko, 2001). There are no criterion-related studies with this test.

Tacit job knowledge tests generally pose 7–19 problem-solving scenarios that job incumbents have verified as important in their occupation (platoon leader and so on). Each scenario lists 6–16 potential actions to take, all of which respondents rate on a 7- or 9-point scale for either quality or importance. For example, one scenario on the inventory for academic psychology asks respondents to rank the likely effectiveness of different strategies for '[becoming] one of the top people in your field and [getting] tenure in your department' – for example, 'improve ... your teaching', 'write a grant proposal', and so on (Wagner & Sternberg, 1985: 440). Each tacit knowledge test generally has several subscales: for example, the academic psychology test contains scales on managing self, others, and career.

Only the sales test is scored for accuracy of response. The others are scored for similarity of respondents' answers to those of incumbents designated as experts. Tacit knowledge tests are therefore scored more like interest inventories than ability tests.

Internal consistency reliabilities are reported for about half the studies (see Table 1). Of those reported, the alphas range from 0.66 to 0.85 for total scores.

Sternberg Triarchic Ability Test (STAT)

Sternberg has also developed a test intended to measure academic, creative, and practical abilities, primarily in academic settings (e.g. Sternberg, Castejon, Prieto, Hautamaki & Grigorenko, in press). I will not discuss it here because it is currently being revised, perhaps because its three scales all appear to measure *g* more than anything else (Brody, in press).

RESEARCH

Table 1 lists all six criterion-related studies that Sternberg et al. (2000) summarize, plus one other (Colonia-Willner, 1998) they bring up only in the context of mental ageing. As shown in Table 1, the seven studies include 12 samples of workers in five moderately high-level occupations.

General Factor of Practical Intelligence

The way to determine whether a general factor of practical intelligence exists is to factor analyse a large diverse set of tacit knowledge tests. Sternberg and his colleagues lack such data because they have administered two tacit knowledge tests to only three samples of Army officers and one sample of Yale undergraduates. Sternberg et al. (2000) nonetheless concluded that tacit knowledge reflects a 'domain-general' ability, based largely on the finding that performance on the psychology and management tests correlated 0.58 in the sample of 66 Yale undergraduates (Wagner, 1987). Table 1 shows that the management and leadership tests correlated only −0.06, 0.32, and 0.36 in the three samples of Army officers. Sternberg et al. (2000) interpreted the latter results as evidence for the 'domain-*specificity*' of tacit knowledge tests.

Independence of Tacit Knowledge and *g*

Because there is no evidence for a general factor of practical intelligence, there can be no evidence yet that any such factor is independent of *g*. The Sternberg team bases its claim for the independence of practical intelligence from *g* on the low correlations of *individual* tacit knowledge tests with scores on some IQ test or subscale (e.g. Shipley Institute for Living Scale; Concept Mastery Test Analogies Subscale). Table 1 presents the correlations for workers (see Gottfredson, in press a, for the results for students). The relevant correlations from the four samples are low (0.09 to 0.30), but interpretation is clouded by the fact that the average IQ in these samples was highly restricted in range (for example, the IQ of the 45 business managers in leadership training averaged IQ 120, which is the 90th percentile).

Table 1. Criterion-related studies of job tacit knowledge

Publication/report	Sample	*N*	Test of tacit knowledge	Alpha reliability	Job outcome criteria	*N*-weighted *r*'s:		
						Criteria &		IQ &
						TK	IQ	TK
Wagner & Sternberg (1985)	Psychology professors (USA)	54	Psychology	0.77	*N* of publications, citations, conferences attended, papers presented; dept. scholarly rank	0.29	–	–
	Business managers (USA)	54	Management	0.68	Level of company prestige, salary, job title; *N* of employees supervised	0.26	–	–
	Bank managers (USA)	29	Management	?	% salary increase; rated performance in personnel, new business, policy, and overall	0.42	–	–
Wagner (1987)	Psychology professors (USA)	91	Psychology	≥0.74	*N* of publications, citations, papers presented; dept. scholarly rank	0.35	–	–
	Business managers (USA)	64	Management	≥0.79	Level of company prestige, salary	0.13	–	–
Wagner & Sternberg (1990)	Business managers (USA)	45	Management	?	2 small-group managerial simulations	0.61	0.38	0.14
Williams & Sternberg (undated)	Business managers (USA)	?	Management	?	Level of position, compensation, age-controlled compensation, satisfaction	0.34	–	–
Wagner et al. (1999)	Life insurance salespeople (USA)	48	Sales	0.82[a]	Sales volume and premiums in two years; quality awards	0.22	–	–
Colonia-Willner (1998)	Bank managers (Brazil)	157	Management	0.85	Salary, *N* of people supervised, rated performance; composite index	0.06	−0.04	0.30
Hedlund et al. (1998)	Platoon leaders (US Army)	368	Platoon leadership	0.69	3 peer and 3 supervisor ratings of leadership	0.10	0.05	0.10
			Management	?	Same	0.02		0.09
	Company commanders (US Army)	163	Company leadership	0.76	3 subordinate, 3 peer, and 3 supervisor ratings of leadership	0.09	−0.09	0.19
			Management	?	Same	−0.09		0.15
	Battalion commanders (US Army)	31	Battalion leadership	0.66	3 subordinate and 3 peer ratings of leadership	0.10	0.13	0.09
			Management	?	Same	0.13		0.16

? = Data not reported.
– = Data not collected.
[a]Data include 48 students.
Note: All tacit knowledge scales have been reflected here so that better scores (smaller deviations from the experts) yield positive correlations.

Criterion-Related Validity of Tacit Knowledge

Table 1 summarizes the criterion-related validities for total scores on the tacit knowledge tests. All are concurrent validities and none is corrected for unreliability or restriction in range. The table reveals a diverse mix of job outcome criteria, ranging from careerist (e.g. salary, job title, job satisfaction) to quality of performance on the job (e.g. sales awards, rated leadership), the former being of interest mostly to workers and the latter mostly to employers. The mean criterion correlations are substantial – generally around 0.3 – for the five civilian studies that Sternberg et al. (2000) highlight (the first five in Table 1), although the results for specific criteria (not shown) often do not replicate across parallel studies (Gottfredson, in press a). More importantly, the criterion validities are near zero in the two studies whose results Sternberg et al. (2000) either do not report (0.06; Colonia-Willner, 1998) or say little about (−0.09, 0.02, 0.09; Hedlund et al., 1998). The former is the largest civilian study, and the latter is the largest, most carefully executed, and least careerist-oriented study of the entire set of seven.

Criterion-Related Validity of Tacit Knowledge versus IQ

Sternberg et al. (2000) base their claim that practical intelligence is arguably a better predictor 'of success' on two facts. The first is that tacit knowledge correlated 0.61 but IQ only 0.38 with (simulated) performance in their study of 45 managers in leadership training. They do not mention the negative results from the Colonia-Willner (1998) study – 0.06 for tacit knowledge versus −0.04 for IQ. Again, they say next to nothing about the results from the unpublished study of Army officers, where mean criterion correlations were low (−0.09 to 0.13) and virtually identical for both IQ and tacit knowledge. The second fact to which they appeal is that the criterion correlations they highlight for tacit knowledge are about twice as large as the average correlation for IQ they say is reported in the job performance literature. As detailed elsewhere, however, they grossly overstated their own results while grossly understating the field's estimates for *g*. A careful accounting shows exactly the opposite pattern (Gottfredson, in press a).

Summary

No assessment has yet been shown to measure a general factor of practical intelligence. Tests of tacit knowledge for specific occupations have yielded moderate correlations with outcome criteria in six samples of incumbents but not in six others. Tests of *g*, which are not targeted to any occupation, correlated equally well (or poorly) with performance outcomes in four samples, worse in one, and better in a sixth sample – all of which were restricted in range on intelligence. There are no data on the value of tacit knowledge in low- to moderate-difficulty occupations or in non-work settings.

FUTURE PERSPECTIVES AND CONCLUSIONS

Considerably more research will be needed to establish whether practical intelligence is a viable construct. Should a general factor of practical intelligence be identified in the future, tests measuring it must be factor analysed together with traditional mental tests in order to determine whether the practical intelligence factor is, in fact, independent of the *g* factor and, if not, where it fits into the *g*-topped hierarchical model of human intelligence.

Although Sternberg and his colleagues describe tacit knowledge as an important aspect of practical intelligence, it seems unlikely that tacit knowledge tests could individually be good measures of any general ability factor because, by design, each is highly setting-specific and experience-based. IQ tests succeed in measuring a context- and content-free general ability by stripping test items of all need for specialized knowledge and experience. Tacit knowledge tests do just the opposite.

The very specificity that makes tacit knowledge tests poor candidates for measuring a general ability might make them good candidates for measuring important but neglected forms of specialized knowledge. Because their items generally have no objectively correct answers, however, research needs to verify that the tests actually do measure knowledge rather than some non-intellectual attribute (say, a zeal for self-promotion).

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Linda S. Gottfredson

RELATED ENTRIES

Intelligence Assessment (General), Cognitive Ability: Multiple Cognitive Abilities, Practical Intelligence: Conceptual Aspects

PREDICTION (GENERAL)

INTRODUCTION

If prediction is a statement about an unknown and uncertain event (Ledolter, 1986) then many activities in the domain of psychological assessment can be characterized and discussed from this perspective. Thus, a nosological classification usually has implications for the values of variables not used for this classification, and leads to expectations of future behaviour of a client. Deciding on an intervention is related to a prediction of success; the selection and use of assessment instruments is equivalent to the choice of predictors.

Assessors rarely face the task to evaluate predictions derived from a well established theory. Usually, to test their assumptions they have to resort to routine statistical prediction procedures like regression and discriminant analysis. Since they quite often cannot refer to a large number of observations on the same person over a long period of time, they cannot use methods of extrapolation in time series called forecasting. Instead, they have to refer to only a few observations on many persons over a short period of time and to consider the single case to be assessed in relation to characteristics of samples of persons.

COMPONENTS OF THE PREDICTION TASK

Criteria

Predicting criteria on the basis of predictors is one of the most important activities in psychological assessment (*cf.* Wiggins, 1973). Criteria in psychological assessment are, in most cases, criteria of success which refer to future behaviour of the persons concerned in situations that are different from those in which the original assessment, i.e. the assessment of the predictors, takes place. Typical problems dealt with in psychological assessment are selecting treatments and interventions, recommending programmes of training, education and exercise. Parents may ask for help when selecting an educational career for their children, adolescents when trying to overcome difficulties at university. In each case, success is the crucial issue: success of a treatment or intervention; success of a training programme, an educational measure, or an exercise. Will the educational career of the child chosen by the parents be successful? Will the adolescent successfully overcome the difficulties at university when a certain kind of intervention is applied? etc.

The *reliability* of a criterion determines an upper bound to its predictability: an unreliable criterion cannot be predicted. Quite often, the instability of replications is due to a lack of replicability of the criterion.

Selection and Characterization of Predictors

The optimum is to derive predictors from a theory which links constructs on the predictor side to constructs on the criterion side – if such a theory exists. Given a set of predictors, reliability of each one is of utmost concern. Some models like linear regression assume that the predictors are measured without error. If the scale level of a variable is high, this variable in general is better suited as a predictor because the higher scale level indicates that the variable may provide more information. Then chances are better to have information available which is useful for prediction.

One reason why more than one predictor should be used is the possibly complex nature of the criterion. If it is composed out of several components, predictors may be related to different subsets of these components. This should lead to a relatively low correlation between predictors. On the other hand, within some prediction models, the predictors may serve like items in classical test theory to increase the reliability of the overall score.

Combination Rules

We may order the combination rules by their *degree of analyticity*, i.e. the degree to which they decompose a pattern or profile of values observed over all predictors for a specific person. Very compact in this respect is Configuration Frequency Analysis (CFA) by Krauth and Lienert (1973), especially in its form as Prediction Configural Frequency Analysis. This model predicts qualitative criteria by means of qualitative predictors. CFA decides for a pattern as a whole whether it constitutes a predictive type; if the occurrence frequency is not significant, the pattern is dismissed as without predictive power.

Classical regression and discriminant analysis show the highest degree of analyticity by treating each variable of the pattern set separately as a single predictor. It may possibly be replaced or not be considered from the very beginning, or even to be eliminated without replacement by a similar one. Somewhere between the extremes of CFA and variants of the general linear model, Feature Pattern Analysis (FPA) is placed (Feger, 1994). This model lets the data determine whether contingencies of the first, second etc. order are needed to reproduce the data sufficiently well.

Another fundamental distinction between prediction rules is introduced by Coombs (1964). He distinguishes between *compensatory*, *conjunctive*,

and *disjunctive rules* in the respective (multidimensional) composition models. In a compensatory rule the same criterion value may be achieved if 'the shortage in one attribute may compensate with an excess of another attribute'. Compensation may occur for weighted or unweighted values, and within an additive, multiplicative or more complex function. A conjunctive rule demands that every variable shows a predefined minimum value to achieve a positive criterion value. In contrast, disjunctive composition 'is that in which successful performance on a task requires a certain minimum on *any one* of the relevant dimensions' (Coombs, 1964: 247).

With the small samples often used in psychology, weighting systems such as the β-weights in regression analysis may be difficult to pass the test of cross-validation. Equal weights are sometimes less affected by the peculiarities of the sample used. Once relevant variables are included in the prediction equation, the specific method of predictor weighting may be unimportant (*cf.* Dawes, 1979).

PREDICTION MODELS

Actuarial Systems

Predictors and criteria may be dichotomous or polytomous. Their relationship quite often is expressed in the form of a *contingency* or *actuarial table* with conditional probabilities as elements, and a statement derived from such a table may be, for example, 'Given the marital status "divorced" and the sex "male", the probability that an individual will achieve a given criterion status is higher than 0.50.' For the statistical background of actuarial systems see von Eye (1991). In psychological assessment, systems for actuarial prediction were, first and foremost, developed on the basis of the MMPI. Especially in the 1970s, several competing actuarial systems built upon MMPI-scales as predictors. For an introduction to the systems of Gilberstadt and Duker, of Marks and Seeman, and of Sines see Wiggins (1973).

Regression

Regression in its most popular form, i.e. multiple linear regression, combines additively several weighted predictors $X_1, \ldots, X_k$ to derive a predicted value Y'. A quadratic loss function is used to determine the weights β_0, $\beta_1, \ldots, \beta_k$ and thus to minimize the expectation $E[(Y - Y')]$, with Y as the criterion. The fundamental equation may be written as

$$Y \cong Y' = \beta_0 + \beta_1 X_1, \ldots, \beta_k X_k.$$

Predictors and the criterion are assumed to be interval scaled, and the measurement of the predictors is assumed to be free from errors. Whether the estimates of the weights are optimal depends on the quality, especially the size and representativeness, of the sample used. A cross-validation is indicated in general.

The basic ideas of classical regression have since the 1950s been supplemented by the concepts of moderator variable and suppressor variable. A *moderator variable* (Saunders, 1956) divides the population into homogeneous subgroups like women and men. Within every subgroup the predictors–criterion relations are valid to a different degree or even in a different kind. This can be expressed by extending the regression equation by a *linear joint function* with X_k as the hypothesized moderator:

$$Y \cong Y' = \beta_0 + \beta_1 X_1, \ldots, \beta_k X_k + \beta_l X_i X_k.$$

The last term of this equation is also called the multiplicative model.

Instead of finding an optimal prediction for all persons simultaneously – as regression analysis intends – Ghiselli (1956) differentiates among persons. Some are, at least in terms of their deviation from a regression line, more predictable than others. Knowing in advance a (moderator) variable which correlates with predictability would allow very accurate predictions for the more predictable persons, and perhaps lead to an assignment of the less predictable persons to a different prediction procedure.

A *suppressor variable* is defined by a low correlation with the criterion but a high correlation with some other predictor(s). The idea is that a suppressor variable correlates with variability in the predictors that does not contribute to the relationship between criterion and predictor. Typical suppressor variables in psychological assessment are response sets.

In psychology, the assumptions of multivariate linear regression rarely are satisfied, neither the interval scale level, nor the error-free measurement of the predictors, nor the multivariate normal distribution of the values of these variables. Furthermore, some assumptions like the additive combination of the predictors are in conflict with the researcher's knowledge of the substantive area. Therefore, several alternatives to classical regression have been developed (*cf.* Myers, 1990) which should get much more attention in psychological assessment than they got in the past.

Discriminant Analysis

Discriminant analysis replaces the continuous criterion of regression analysis by a polytomous criterion. One starts the analysis with a set of observations indicating which vectors of predictor values co-occur with a specific group membership. If the criterion comprises two groups, the forms of the general linear model of the two approaches are identical. For more than two criterion groups, more than one discriminant function exists in general. These functions are so constructed that differences between the groups are as large as possible, and differences within the groups as small as possible (Krauth, 1983a).

The assumptions of this well-known variant of the general linear model are the same as with regression analysis, plus some specifics, to mention interval scale level, multivariate normality of the predictors, correct classification of the base samples and equal covariances of the different groups. Since some of these assumptions are usually violated in psychological applications, alternatives have been proposed, e.g. the construction of non-parametric classification rules, the use of qualitative predictors, or predictors with ordered categories (*cf.* McLachlan, 1992).

EVALUATION OF PREDICTION

A first step of an evaluation could be a thorough test of the model fit because the trust in the model and the estimation of its predictive success depends on the appropriateness of this model. There exists ample knowledge on how to evaluate a regression study, e.g. the graphical approach by Cook and Weisberg (1994) or the sensitivity analysis in linear regression by Chatterjee and Hadi (1988). More specifically, the evaluation of a predictive system '... concerns the optimal selection of predictors, the construction of suited measures of the prediction error and the predictive power, the robustness of predictions, the comparison of clinical with statistical predictions, the evaluation by cross-validation, etc.' (Krauth, 1983b 143). A prelude to these sophisticated measures may be the test whether the system predicts better than chance, and – if a good estimate is available – better than base rate.

Cross-validation is a necessity. The *cross-validity* of a prediction system is usually determined by splitting the total available sample into two subsamples. Then the regression equation computed in one subsample (the estimation sample) is applied to the data of the other subsample, and the predictive success in this second, the cross-validation sample, is taken as an indicator of the system's validity.

FUTURE PERSPECTIVES AND CONCLUSIONS

As shown in this entry, there exists a large qualitative variety of prediction methods for psychological assessment. One may expect that – as these procedures become better known and convincing pioneer applications are published – the various tasks of prediction will be solved in better agreement between the data at hand and the prediction model to be used. As an example, the latest version of SPSS provides almost a dozen models of regression analysis, including one with optimal scaling. Conceptualizing prediction in psychological assessment as decision-making under uncertainty may lead to probabilistic models, especially to Bayesian analyses of dynamic models (for a sophisticated introduction, see West & Harrison, 1989). Their broad use in psychological assessment may be seen in the future.

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Hubert Feger

RELATED ENTRY

Prediction: Clinical vs. Statistical

PREDICTION: CLINICAL VS. STATISTICAL

INTRODUCTION

In psychological assessment, an important step in the process of assessment is the prediction of criteria on the basis of assessment data, the so-called predictors. The processing of assessment data, which yields a prognosis, can follow two different methods of data combination: the *statistical method* and the *clinical method*. In the case of the statistical method, the combination of predictors is determined entirely on the basis of known empirical relationships between the predictors and the criteria; that is, on *intersubjective knowledge* as it arises from well-designed empirical investigations. In the case of the clinical method, no such empirical relationships are available or used; the combination of predictors is done in an 'intuitive' way based upon the *subjective knowledge* of the assessor which arises from his or her personal and professional experience.

The term 'clinical' in clinical prediction should not be misunderstood. It does not mean that this method of data combination occurs only in clinical psychology. The reasons for the choice of this term are historical and not systematic ones; and they reflect a long-standing controversy in psychological assessment between the advocates of intersubjective ways of information processing on the one side and the advocates of subjective ways on the other. Wiggins (1973) gives the best available reconstruction of this controversy, which has its origin in clinical psychology, but is in no way confined to this field of application of psychological assessment. Wherever, inside or outside of clinical psychology, criteria are predicted (only) on the basis of subjective knowledge, it is an instance of clinical prediction. And wherever criteria are predicted (only) on the basis of well-confirmed empirical knowledge, it is an instance of statistical prediction, regardless of the concrete statistical procedures used, e.g.

actuarial tables, or linear or non-linear regression equations.

THEORETICAL ISSUES

The most important issue in the controversy between advocates of clinical and statistical methods of data combination was and is the question: 'Which method to combine assessment data in the course of predicting criteria is better: the clinical or the statistical one?' This issue can be treated from a theoretical and an empirical point of view. Meehl (1954) considered both points in his famous book *Clinical versus Statistical Prediction: A Theoretical Analysis and a Review of the Evidence*. From a theoretical point of view, the central question is: 'Are there any a priori reasons why one method of data combination should be superior to the other?'

At the beginning of the controversy, the adherents to the statistical approach thought that their method must be better than the clinical one, because their method could be considered as mathematically optimal. The regression weights in a linear regression equation, for example, are determined in such a way that the (sum of squared) deviations of the observed criterion scores from the predicted ones are minimized. Therefore, it is impossible – that was the argument – that clinical prediction could beat statistical prediction. Only in those highly improbable cases where the intuitive estimation of regression weights by an assessor who uses the clinical method comes to the same results as the application of the statistical method will the clinical method be equal to the statistical method; in all other cases, it will be inferior.

Meehl pointed out that this argument is not really convincing. It mingles two contexts, which should be kept apart: the *context of discovery* and the *context of justification* of a prediction. The context of discovery refers to how a prediction comes about; the context of justification refers to the validity or accuracy of a prediction independent from its origin. The advocates of the statistical method who preferred linear regression methods presupposed in their argumentation that there is only one way to come to a prediction: the explicit (in the case of statistical prediction) or implicit (in the case of clinical prediction) computation and application of regression equations. Meehl showed that this presupposition is wrong. There are other ways, which could be utilized by the advocates of the clinical method.

Imagine an assessor who does not base his or her predictions on characteristics of samples of persons but who invents an *idiographic theory* for each single case to be assessed and infers the to be predicted criterion scores of the respective person from this theory and appropriate assessment data. The case-related invention of structural-dynamic hypotheses, which make up an idiographic theory, is a quite different kind of activity compared to the computation of a linear regression equation in the case of the statistical method. This shows that there are alternatives to the statistical method in the context of discovery, which might be utilized by the advocates of the clinical method of prediction. And it is possible, from a theoretical point of view, that predictions based upon idiographic theories are more accurate and valid than predictions based upon the statistical method. Statistical regression methods, for example, build upon sample data and cannot avoid more or less pronounced deviations of the individual criterion scores from the average scores represented by the regression line. If the assessor should be successful in his or her efforts to construct accurate case-related idiographic theories, he or she might be able to hit the individual criterion scores much better than any statistical method of prediction.

Meehl (1954) made it very clear that this is, so far, only a theoretical discussion. Whether the alternative ways of data combination he considered are really utilized in clinical prediction, and whether they lead to predictions that are superior to those made within the statistical approach, are completely empirical questions.

EMPIRICAL RESULTS

Clinical Prediction

The most important approach to the study of the clinical prediction process makes use of Brunswik's lens model. This model allows a *paramorphic representation* of clinical prediction, i.e. a representation based upon an input–output analysis of clinical prediction. An adequate paramorphic model of an assessor who uses the clinical method of data combination in the course of predicting

a criterion is a model that yields more or less the same criterion scores as those predicted by the assessor when both, assessor and his or her model, base their predictions on the same input data (*cf.* Wiggins, 1973, for more details).

Various models have been tried out in investigations of this issue. The simplest one is, of course, the *linear regression model*. Other models are the result of an enrichment of this simple model by quadratic, cubic, or other even more complex terms, which turn the linear model into *non-linear regression models*. One of the more recent proposals of non-linear models of clinical prediction are the sophisticated *scatter models* of Ganzach (1995). His study, as well as all other studies of this issue done before, shows the remarkable success of the simple linear regression model in any attempt to represent the clinical prediction process in a paramorphic way. More complex non-linear models might be better in some cases, but the fit for these models is only slightly better than for the simple linear model.

This does not mean that the assumption made by the early advocates of the statistical method that the assessor who follows the clinical method of data combination implicitly computes and applies a linear regression equation when predicting criterion scores is already well proven, but this assumption has become much more plausible than it was in those days.

Comparison of Clinical and Statistical Prediction

In situations in which a criterion is to be predicted on the basis of a set of predictors and data about the actual criterion scores are available, clinical and statistical methods of data combination can be compared. The validity of the clinical method, i.e. the correlation between the clinically predicted and the actual criterion scores, is compared with the validity of the statistical method, i.e. the correlation between the statistically predicted and the actual criterion scores. Three outcomes of such a comparison are possible: (1) the clinical method is superior, (2) the statistical method is superior, (3) both methods are equally effective. Meehl (1954) in the empirical part of his famous book reviewed some 16 to 20 studies that were relevant to the issue and found 11 studies in which the statistical method was superior to the clinical method, 8 studies in which both methods were equally effective, and 1 study in which the clinical methods seemed to be superior. Later, it turned out that the last mentioned study was based on a faulty statistical analysis. It had to be counted as a tie in later tabulations. In 1965, after a lot of empirical work, the balance was even more impressive: in 33 studies the statistical method was superior, in 17 studies equally efficient, and only in 1 study inferior to the clinical method (Meehl, 1965). Again, this study had to be reclassified as a tie after further inspection.

Only one year later, Sawyer (1966) published a reanalysis of these data introducing another important aspect. Whereas Meehl considered only the combination of assessment data, Sawyer added the collection of assessment data as another aspect. He differentiated between *judgemental* and *mechanical* modes of data collection with a free interview as an example of the judgemental and a standardized test as an example of the mechanical mode. The analysis of the empirical studies of clinical versus statistical prediction done so far showed that four cases occur: (1) studies with assessment data only collected in the judgemental mode, (2) studies with assessment data only collected in the mechanical mode, (3) studies with assessment data collected in both modes, (4) studies with assessment data collected either in the judgemental or in the mechanical or in both modes. Combining this differentiation with the clinical versus statistical differentiation with regard to the aspect of data combination, Sawyer obtained an eight-fold classification system of prediction methods. Instead of comparing only the statistical method with the clinical method, Sawyer could compare the eight prediction methods with one another. Nevertheless, the results confirmed Meehl's conclusion: for each mode of data collection, the statistical method of data combination turned out to be superior to the clinical method. The best results were obtained with a prediction method called *mechanical composite*, i.e. the statistical combination of judgemental and mechanical data.

Comparison of Clinical and Mechanical Prediction

Grove et al. (2000) in their most recent meta-analysis of prediction studies introduced another differentiation: clinical versus mechanical

prediction. The term 'clinical prediction' is used in the somewhat narrower sense of 'prediction by an assessor without a precise specification of the way the assessment data are combined'. Automated clinical prediction, prediction by an expert system without an empirical validation of the system, and prediction by applying the linear or non-linear paramorphic model of an assessor who used the clinical method (*cf.* Wiggins, 1973) are no longer instances of clinical prediction, but instances of mechanical prediction. The decisive feature of *mechanical prediction* is that the data combination follows precisely formulated rules and is 100% reproducible in its results. A successful empirical test of the combination rules, the decisive feature of statistical prediction, is no longer required.

Even under these weaker conditions, the meta-analysis of 136 studies showed that, on an average, the mechanical prediction techniques were about 10% more accurate than clinical predictions. In many cases, they substantially outperformed clinical predictions. Only in a few studies were clinical prediction methods substantially more accurate (Grove et al., 2000: 19).

FUTURE PERSPECTIVES AND CONCLUSIONS

After decades of research, the question 'Which method to combine assessment data in the course of predicting criteria is better: the clinical or the statistical one?' can be answered in an unequivocal way: the statistical method (*cf.* Meehl, 1986). And if a paramorphic model is wanted which helps to understand what is going on in clinical prediction, the simple linear regression equation is still an excellent choice. These conclusions may disappoint persons who tend to mystify 'intuitive' processes wherever they occur. In psychological assessment as in other areas of psychology, it is time to break the spell of these myths (*cf.* Dawes, 1994). That means, in the case of psychological assessment, that the assessor should construe the assessment process as a well-ordered, regulated process that has to refer to the knowledge base, provided by psychology as a science, whenever possible. If there were well-confirmed empirical results concerning the relation between predictors and criteria available, not to use them in a prediction task would be a serious lapse. To avoid errors like this one in the course of an assessment process, the assessor should observe the Guidelines for the Assessment Process already proposed by a Task Force of the European Association of Psychological Assessment (*cf.* Fernandez-Ballesteros et al., 2001).

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RELATED ENTRIES

PREDICTION (GENERAL), ASSESSMENT PROCESS, INTELLIGENCE ASSESSMENT (GENERAL), THEORETICAL PERSPECTIVE: COGNITIVE

PRE-SCHOOL CHILDREN

INTRODUCTION

The purpose of assessment with pre-school children typically is two-fold: the first focus is on screening groups of children and the second is on programme planning for identified children, both with the overall goal of improving developmental outcomes. Developmental progress is a primary concern in the assessment of young children and includes a focus on cognitive, motor, and social development. While assessment of specific areas of concern are important, our focus here is on a general area of concern relevant for the broader population of pre-schoolers – the skills and knowledge essential to early school success: specifically, basic developmental skills and social behaviour. Assessment of these skills can be conducted at the screening level and at the programme planning level.

BASIC SKILLS AND KNOWLEDGE

Contemporary approaches to assessment with pre-school children emphasize the use of a convergent model in which assessment is a process of collecting information in a variety of ways, from a variety of sources, and in reference to a variety of domains (Bagnato, Neisworth & Munson, 1997). Global assessment typically involves a broad range of basic skills and knowledge, promoting a comprehensive evaluation of a child's functioning. Assessments may be conducted through observation, direct assessment, and informant reports. The three global assessment tools reviewed here demonstrate adequate technical characteristics, promote family involvement, and meet the unique needs of assessment with young children (see Table 1).

American Guidance Service's Early Screening Profiles

American Guidance Service's Early Screening Profiles (Harrison et al., 1990) is an individually administered screening tool intended to identify children who may warrant further assessment. While not specifically linked to a curriculum, the skills and knowledge assessed are consistent with basic concepts essential to early school success. The tool consists of three profile measures and four surveys. Some measures are administered directly to the child; others are questionnaires completed by parents and/or teachers. Administration of component measures is flexible and determined by the assessment purpose.

The Cognitive/Language Profile consists of four sub-tests: Verbal Concepts, Visual Discrimination, Logical Relations, and Basic School Skills. The Motor Profile assesses gross and fine motor skills. The Self Help/Social Profile provides a measure of the child's communication, daily living skills, socialization, and motor skills. The Articulation Survey assesses quality of speech production. The Home Survey and the Health History Survey provide information about the child's home environment, parent–child interactions, and health problems. Finally, the Behaviour Survey rates a child's behaviour during the test administration.

The Early Screening Profiles provide two levels of scoring. The first level yields six 'screening indexes' and three descriptive categories. Screening index scores are matched to a normative distribution. Professional judgement is used to determine criteria for referral based on Screening Indices. Level II scoring consists of standard scores, percentile ranks, and age equivalents and allows for a range of interpretations for broad sub-scales and total scale as well as for more detailed analysis of patterns.

Bracken Basic Concept Scale – Revised (BBCS-R)

The Bracken Basic Concept Scale – Revised, BBCS-R (Bracken, 1998), is an individually administered, norm-referenced tool that measures foundational educational concepts and receptive language.

Table 1. Pre-school assessment tools

Assessment tool	Purposes	Age/focus group	Domain/content	Of note
Assessment, Evaluation, and Programming System	Assessment, programme planning, progress monitoring, evaluation	Children of ages 3–6 at risk for or presenting with developmental disabilities	Fine motor, gross motor, adaptive, cognitive, social-communication, and social	Uses curriculum-embedded naturalistic assessment and activity-based intervention approach. Strong family component
AGS Early Screening Profiles	Screening	Children of ages 2.0–6.11	Cognitive/language, motor, self-help/social, articulation, home, health, and behaviour	Includes family component for convergent approach
Bracken Basic Concept Scale – Revised	Speech–language assessment, cognitive screening, school readiness screening, curriculum-based assessment	Children of ages 2.6 to 8.0	Colours, letters, numbers–counting, sizes, comparisons, shapes, direction–position, self–social awareness, texture–material, quantity, and time–sequence	Has Spanish version for criterion referenced assessment only. Links directly to the Bracken Concept Development Program. Assesses receptive language only
Early Screening Project	Screening, programme planning, and evaluation	Children of ages 3–5 in a group setting	Adaptive, maladaptive, aggressive, and social interaction behaviour	Multi-gated procedure that includes direct observation and parent ratings. Includes assessment of internalizing behaviours.
Preschool and Kindergarten Behaviour Scales	Screening, identification, assessment, and programme planning and evaluation	Children of ages 3.0–6.0	Social skills, problem behaviour	Includes parent form for parallel assessment. Normative comparison is not separated for boys and girls
Social Skills Rating System	Screening, identification, programme development	Children of ages 3.0–4.11	Social skills, problem behaviour	Includes parent form. Rates importance of behaviour as well as frequency. Links directly to intervention planning

Stated uses of the BBCS-R include speech–language assessment, cognitive screening, school readiness screening, curriculum-based assessment, and clinic and school research. The BBCS-R is directly linked to the Bracken Concept Development Program, increasing its utility as a criterion-referenced and curriculum-based measure.

The scale is comprised of 11 sub-tests: Colours, Letters, Numbers/Counting, Comparisons, Sizes, Shapes, Direction/Position, Self/Social Awareness, Texture/Material, Quantity, and Time/Sequence. The first six sub-tests comprise the School Readiness Composite, which can be administered alone as a screening measure. In each sub-test the child is asked to respond to a stimulus containing the correct response and several distractors by pointing to the correct response; no verbal responses are required. For example, in Texture/Material, the child is presented with four pictures and asked to indicate which one is cold. Administration of the BBCS-R is relatively brief and easy and can be completed in approximately 30 minutes.

The BBCS-R yields scaled and standard scores, percentile ranks, confidence intervals, classifications, and concept age equivalents. Classifications

are assigned to ranges of standard scores and scaled scores, representing a continuum from Very Advanced to Very Delayed. To facilitate programme planning, scores are used with a Parent/Teacher Conference Form and a Percent Mastery Table. The Percent Mastery information assists in identifying areas of weakness, targeting intervention where per cent mastery is low.

Assessment, Evaluation, and Programming System for Infants and Children (AEPS)

Assessment, Evaluation, and Programming System for Infants and Children, AEPS (Bricker, Pretti-Frontczak & Waddell, 1996), is dedicated to measurement and curriculum issues for children with or at risk of developing developmental disabilities. It is a curriculum-based assessment system intended to promote naturalistic assessment and intervention practices. Volumes 1 and 2 focus on children from birth to three years of age, Volumes 3 and 4 focus on children from three to six years of age.

Families are included in the assessment process through the Family Report and the Family Interest Survey. The report promotes parallel assessment between parents and teachers and the survey helps families to prioritize interests related to programming for their child. The Child Progress Record provides a flow chart depicting progress towards identified goals and objectives, a visual summary indicating areas of mastery and areas for continued intervention.

The AEPS can be used in the home or in a small group, is a centre-based programme and assesses six domains of development: (1) fine motor; (2) gross motor; (3) adaptive; (4) cognitive; (5) social communication; and (6) social. Assessment is curriculum embedded, conducted while the child is engaged in naturally occurring activities, and based on observation of authentic skills. Each domain contains a list of strands, goals, and objectives to guide assessment. For example, the Adaptive domain includes strands of eating, dressing, and personal hygiene. Items are scored on a 3-point system and qualifying notes indicate whether assistance was provided or modifications were made. Additionally, each record includes space for three assessments – a visual cue that assessment should be ongoing.

SOCIAL BEHAVIOUR

Social behaviour is particularly important as children enter group situations, or structured learning environments. As many as 50% of toddlers and pre-schoolers identified as difficult to manage by their parents have been shown to have continued difficulties when they enter school. A number of instruments evaluate social behaviour at a screening level with groups of children and at a more specific assessment level with individual children. Three tools are reviewed briefly. The first tool is primarily for screening purposes; the second and third tools are for more focused assessment and intervention planning.

Early Screening Project (ESP)

The Early Screening Project, ESP (Walker, Severson & Feil, 1995), is a multi-gated screening tool to identify young children at risk of developing externalizing and internalizing behaviour problems. It can be used also for programme eligibility determination, intervention planning, and evaluation of intervention outcomes. Although not linked directly to a curriculum, the behaviours of focus are consistent with general social skills goals and the manual provides references for appropriate social skills programmes.

The first two stages of the ESP rely on teacher judgement. Teachers rank children in a classroom on externalizing and internalizing dimensions of behaviour. Externalizing items include not 'listening to the teacher, disturbing others, being hyperactive' (p. 9). Internalizing items include 'low activity levels, not talking with other children, being shy, timid, and/or unassertive' (p. 10). Teachers then rate the top three identified children on measures of adaptive behaviour, maladaptive behaviour, aggressive behaviour, and social interactions.

The third stage of the ESP consists of direct observation and a parent questionnaire. Social Behaviour Observations conducted during free play or unstructured activities focus on antisocial behaviour, non-social behaviour, and pro-social behaviour. The Parent Questionnaire contains items adapted from forms used in Stage Two and asks parents to evaluate the extent to which their child exhibits adaptive and maladaptive behaviours.

Scoring of the ESP is relatively simple. Teacher ratings are added, yielding a score to be used in normative comparisons. 'At risk' status is determined separately for boys and girls for each measure through normative comparison. Scores also are converted to T-scores, % of population, and corresponding percentile score.

Preschool and Kindergarten Behaviour Scales (PKBS)

The Preschool and Kindergarten Behaviour Scales, PKBS (Merrell, 1994), is a norm referenced, standardized measure to assess social behaviour. The scales consist of social skills and problem behaviour. The social skills domain is divided into cooperation, interaction, and independence. The problem behaviour domain includes sub-scales of self-centred/explosive, attention problems/overactive, antisocial/aggressive, social withdrawal, and anxiety/somatic problems. The manual states the PKBS can be used for screening, classification, programme development, and research.

The PKBS consists of seventy-six items describing a child's social and problem behaviour. Social skills items include 'is cooperative, invites other children to play, plays independently'. Behaviour problem items include 'will not share, disrupts ongoing activities, is physically aggressive'. Individuals who have known the child for at least 3 months rate the child on each item. The scales can be used in a variety of settings by teachers, caregivers, and parents. Parents and early childhood professionals use the same form and normative structure, allowing for direct comparison of ratings across settings.

Scoring of the scales is brief and simple. Raw scores in each domain are summed and converted to standard scores, percentile ranks, and functional levels. Standard scores can be used in normative comparisons and are divided by age, but not gender. Functional levels for social skills range from high functioning to significant deficit. Levels for problem behaviour range from no problem to significant problem.

Social Skills Rating System (SSRS)

The Social Skills Rating System, SSRS (Gresham & Elliott, 1990), is an individually administered, standardized, norm referenced system for evaluating social skills, problem behaviour, and academic competence of children. The stated purpose of the SSRS is to screen and classify children suspected of having social problems and to assist in developing appropriate interventions. The pre-school version of the SSRS consists of the Parent Form, the Teacher Form, and the Assessment–Intervention Record (AIR), and assesses social skills and problem behaviours. Cooperation, assertion, responsibility, empathy, and self-control are included in the social skills domain; externalizing, internalizing, and hyperactive behaviours are included in the problem behaviour domain. Child behaviour is assessed through direct observation and experience with the child.

The Parent Form consists of 49 items. Parents rate the frequency of specific behaviours from 'never' to 'very often' and the importance of the behaviour from 'not important' to 'critical'. The Teacher Form is completed by a teacher who has known and observed the child for at least 2 months. The teacher is asked to rate the child on 40 items using the same frequency and importance scales as in the Parent Form. Both forms yield scores in the two primary domains and scores for sub-scales in each domain. The Assessment–Intervention Record (AIR) integrates information obtained from the Parent and Teacher forms, facilitating analysis of child behaviour and development of appropriate intervention. Frequency and importance information is used to prioritize skills and areas for intervention.

Scoring of the SSRS is completed by summing the raw scores within each sub-scale. Sub-scale raw scores are summed to yield a total domain score. Raw scores can be converted into standard scores, percentile ranks, and descriptive behaviour levels. Interpretation and comparison is completed separately for boys and girls.

FUTURE PERSPECTIVES AND CONCLUSIONS

Assessment of basic skills and knowledge and social behaviour in pre-schoolers is essential to efforts at prevention and early intervention as well as in efforts to promote early school success. Assessment should be convergent and use data from multiple sources to guide decision making for programme planning, and other types of educational decisions. It should be focused on

functional and authentic skills and knowledge, and it should be linked to intervention design and programme planning. Care should be exercised in choosing assessment tools to ensure that they are adequate for the intended purpose, demonstrate technical adequacy, and meet the needs of assessment with young children. These needs in particular include accurate screening of children in need of further assessment, accurate identification of children in need of special support programmes, clear linkages to intervention and education strategies, and sensitivity to progress and change over time.

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RELATED ENTRIES

Applied Fields: Education, Child and Adolescent Assessment in Clinical Settings, Development (General)

PROBLEM SOLVING

INTRODUCTION

The question of how people solve problems has traditionally been one of the main areas of research in the psychology of thinking. Duncker (1945) defined a problem as occurring when a living creature has a goal but does not know how to achieve it – there is a 'barrier' to be overcome between the given state and the desired goal state. Dörner (1976) differentiated between various types of barriers in terms of whether or not the goal state on the one hand and the means to achieve it on the other are clear to the problem solver. On the basis of these different types of barriers, the four types of problems in Table 1 can be distinguished (the table includes at least one example for each type of problem).

Interpolation problems are well-defined problems, while the other types of problems are ill defined in the sense used by Simon (1973).

Problem solving research explores aspects such as the cognitive processes involved in problem solving, e.g. typical stages of problem solving, general or specific problem solving strategies (e.g. means–end analysis, Newell & Simon, 1972), typical errors (Greeno, 1978), and differences in the problem solving skills of experts and novices (e.g. Chi, Glaser & Rees, 1982). Research also focuses on the relation between problem solving skills and personality characteristics, as well as the relation between problem solving ability on the one hand and intelligence and knowledge on the other.

In the present entry, some of the tasks used in the context of problem solving assessment will be described, with particular emphasis being placed on complex problems embedded in computer-simulated scenarios.

Table 1. Four types of problems according to Dörner (1976). See the following text for the explanations of the examples given

Goal state	Means	
	Known	Unknown
Known	Interpolation problem Examples: chess; 'tower of Hanoi'; anagram tasks	Synthetic problem Example: 'radiation problem'
Unknown	Dialectic problem Example: producing as many different words as possible from a given set of letters	Dialectic and synthetic problem Example: 'Lohhausen'

PROBLEM SOLVING ASSESSMENT

The tasks used in problem solving assessment can be classified according to the four different types of barriers mentioned above. At the beginning of the twentieth century a group of German psychologists, the so called 'Gestalt' psychologists, first investigated problem solving using 'insight problems', where the solution – the overcoming of an interpolation barrier – was restricted to a few decisive steps. Examples include the radiation problem (rays converge to destroy a tumour without destroying the surrounding healthy tissue), the candle problem (supporting a candle on a door, using only the candle, a box of matches, and tacks: the solution required using the box as a platform to support the candle) and the water jug problem. In later research, problems required the application of several steps, with no single step being 'decisive'. Classic problem solving research focused primarily on 'transformation problems'. Problem solvers were presented with a clear given state, a clear goal state, and a precisely defined set of allowable transformations – the task thus again consisted in overcoming an interpolation barrier. The 'tower of Hanoi' is probably the most well-researched problem of this kind; the Chinese 'tangram' puzzle is an everyday example.

To give an example, one version of the 'tower of Hanoi' problem can be stated as follows (see Figure 1): there are three pegs and three rings, each with a different diameter. The goal is to move the stack of rings from the left peg to the right, with the restriction that a larger ring must never be moved on top of a smaller one. You are permitted to move only one ring at a time from one peg to another.

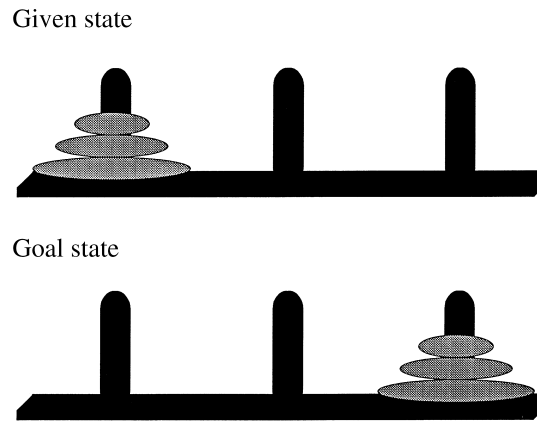

Figure 1. The 'tower of Hanoi' problem.

These kinds of 'move problems' or 'puzzle problems' have, in result-oriented form, found application in the context of practical diagnostics – the 'block design' and 'object assembly' subtests of the Wechsler Adult Intelligence Scale (WAIS), for instance.

Dialectic problems are used in contexts such as creativity research. A typical task with a dialectic barrier would, for example, involve producing as many different words as possible from a given set of letters.

Complex Problems

In the 1980s, divergent approaches were adopted in North American and European problem solving research. North American psychologists placed particular emphasis on domain-specific problems such as physics problems and algebra word problems, and on questions of expertise in specific domains such as chess.

In contrast, European research conducted over the past decades – particularly in England and Germany – has focused on problems with synthetic or synthetic-dialectic barriers rather than interpolation barriers. Such tasks have been termed 'complex' problems. The European approaches have been summarized in a volume edited by Frensch and Funke (1995). Reasons cited for the shift in focus to complex problem solving include the argument that interpolation problems have little in common with 'real life' problems. Above all, the fact that most interpolation problems are largely independent of (prior) knowledge was perceived as a serious limitation (Chi et al., 1982).

According to Dörner, Kreuzig, Reither and Stäudel (1983), complex problems can be described and simulated as systems of interconnected variables. These problems have the following characteristics:

- *Complexity:* Numerous aspects of a situation have to be taken into account at the same time.
- *Interconnectivity:* The various aspects of a situation are not independent and cannot, therefore, be independently influenced. Interconnectivity also includes the important role of feedback loops and side effects.
- *Dynamics:* Changes in the system conditions also occur without intervention from the problem solver.
- *Intransparency:* A situation is labelled intransparent when only a part of the relevant information is made available to the problem solver.
- *Polytely:* Sometimes the problem solver must simultaneously pursue multiple and even contradictory goals.

Computer-simulated scenarios are used as a way of translating such complex problems into an assessment context. Subjects have to run a city 'transportation system' (Broadbent, 1977) or manage a small factory. Funke (1991) provides an overview on the various scenarios. The most prominent example is the simulation called 'Lohhausen', where subjects have to act as the mayor of a small simulated town with the name 'Lohhausen' (Dörner et al., 1983). Subjects are able to manipulate taxes, influence production and sales policies of the city factory or the housing policy and so on. They are simply told to take care of the future prosperity of the town over a simulated ten year period within eight two-hour experimental sessions.

Advantages and Disadvantages of Using Computer-Based Scenarios for Diagnostic Purposes

In Europe, and especially in the German-speaking countries, computer-based scenarios are used as assessment tools in both research and practice. Some of the complex problem solving scenarios used in the context of personnel selection are presented by Funke (1995), and a discussion of the advantages and disadvantages of this form of application can be found in Funke (1998).

The main advantages of using computer-based scenarios as diagnostic tools are that the tasks (1) are highly motivating and (2) involve novel demands which (3) are deemed to have higher face validity than intelligence tests, and (4) that testtakers enjoy working with the simulations (see Kersting, 1999).

However, the diagnostic use of computer-based scenarios also entails serious difficulties that have yet to be overcome.

1. The central question of appropriate approaches to the operationalization of problem solving quality remains largely unanswered.
2. The reliability of the measurements obtained with some of the computer-based scenarios is less than satisfactory.
3. The existence of a task-independent and thus generalizable problem solving ability has not yet been substantiated. This indicates that the ability to direct the system is dependent not only on the skills of the problem solver him- or herself, but evidently also on the nature of the task in question.
4. The main problem is that of construct validity. It is still unclear which skills are actually measured by means of the computer-based scenarios. Either the measurement is interpreted as an indicator for an independent *ability construct* (as suggested by newly coined terms such as 'networked thinking', 'heuristic competence', 'operative intelligence', etc.), or the scenarios are regarded as a new *measurement method*

which, in a certain respect, is better able to measure established constructs such as intelligence than has previously been the case (e.g. in a more differentiated manner or with a higher level of acceptance). Beckmann and Guthke (1995) have summarized the European research dealing with the controversial relation between traditional measures of intelligence and problem solving skills.

5 Evidence for the criterion validity of the measures used is also urgently needed. Thus far, only a single study (Kersting, 1999) has directly compared the predictive criterion validity of computer-based scenarios with the validity of existing procedures deemed to have overlapping coverage.

FUTURE PERSPECTIVES

Significant progress in the domain of problem solving assessment cannot be expected until both the operationalization of problem solving quality and the psychometric quality of the diagnostic instruments have been improved. Above all, it is essential to classify the ability tapped by the performance measures within the existing nomological network. Studies are required in which sufficiently reliable measurements are implemented by means of *different* computer-based scenarios, and differentiated measures of intelligence are administered in sufficiently large samples. At the same time, tests of other theoretically relevant constructs such as knowledge also need to be administered. In investigations of this kind – for instance, the study conducted by Wittmann and Süß (1999) – it has emerged that the systematic variance captured by problem solving scenarios can be attributed to intelligence and prior knowledge, and that there is no empirical evidence for the existence of problem solving ability as an independent construct.

CONCLUSIONS

Tasks have been constructed with the objective of providing insights into problem solving behaviour since the times of Gestalt psychology. In recent decades, the computer has opened up new diagnostic possibilities to this effect. The new types of task are associated with new problems, however. For most problem solving tasks, further insights into aspects such as the reliable measurement of problem solving ability and construct and criterion validity are required before the tasks can be responsibly used in diagnostic practice.

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RELATED ENTRIES

Intelligence Assessment (General), Theoretical Perspective: Cognitive, Cognitive Processes: Current Status, Cognitive Processes: Historical Perspectives

Martin Kersting

PROJECTIVE TECHNIQUES

INTRODUCTION

In the presentation of *projective techniques* four steps will be taken:

1 The first step focuses on the definition, general characteristics, classification and dominant theoretical perspectives on projective techniques.
2 Given the high number and diversity of these techniques it was decided to elect the one most known and used among them, the Rorschach Inkblot Method, for a larger appreciation of its development. Particular emphasis will also be given here to the Exner Comprehensive System that was gradually developed as from the late 1960s.
3 The third step considers the impact of and reactions to the Comprehensive System in the scope of projective techniques and psychological measurement.
4 The final step includes some comments about the future of projective techniques.

DEFINITION AND GENERAL CHARACTERISTICS

Projective techniques designate a set of instruments whose main objective is to describe and characterize personality.

The adjective *projective* is a derivative of 'projection', a concept introduced by Freud in the vocabulary of psychology to describe the design of a defence mechanism leading the subject to transfer to another person, or thing, his urges, feelings, etc., that he cannot accept as belonging to him. However, this concept is not commonly used in the field of projective techniques. Rather, another concept with a less restrictive and specific meaning is used. This means that, in responding to the stimulus-situation, the subject reveals or externalizes aspects of his own personal life, such as motives, interests, feelings, emotions, conflicts and the like.

To a large extent, the characteristics of the stimuli of the projectives are responsible for this externalization and have an important effect on the nature and content of the subject's responses. Two such characteristics are the structure and ambiguity of stimuli. The structure refers to the degree of organization of the stimulus: incompleteness, nearly an organized whole or fully divided, close to or far from being a real representation, etc. The ambiguity concerns the number and variability of responses each stimulus elicits.

Due to the different nature of the material and response modalities that these techniques involve, they have been classified in many ways. Table 1 presents Fernández-Ballesteros' classification, and includes the most representative examples of each class. For many years, they have been controversial in the sphere of assessment and measurement in Psychology.

Multiple factors of intrinsic and extrinsic nature have contributed to this state of affairs. Where the extrinsic factors are concerned, they are integrated

Table 1. Projective techniques: classification and examples (Fernández-Ballesteros, 1980)

Structural	Thematic	Expressive	Associative	Constructive
Rorschach Inkblots	Thematic Apperception Test	Drawing of the human figure	Free Association Test	Town Test
Holtzman Inkblot Technique	Children Apperception Test (CAT-A; CAT-H)	House–Tree–Person (H-T-P) Test	The Incomplete Sentences Test	Test du Village Imaginaire

into the vast group of measuring instruments, globally known as psychological tests. They have mainly been applied in pathological or clinical psychology. Here, the idiographic perspective has either been prevalent or has tended to be exclusive in contrast with the nomothetic nature of the tests. As far as the intrinsic factors go, the lack of structure and the ambiguity of stimuli are only some of the most important features which have previously been pointed out.

The only things in common between the projective techniques and the tests are the standardized character of the stimulus and the method of administration. Since there are no right or wrong answers, the record is generally not subject to correction or classification in the clinical context of its use, but mainly to analysis and interpretation.

The first important study on this subject was by Frank, in 1939: as article 'Projective Methods for the Study of Personality' (Frank, 1939). It was decisive in defining the status of the projective techniques and their future course as a target for support and dedication or rejection and hostility. In the projective methods, Frank saw suitable instruments for studying the individual as such, since by answering, he organized the unstructured field (the stimulus) according to his skills and projected personal life experiences. Owing to kind of observation and assessment, on the one hand, the aim was to exclude the presence of the examiner, in designing the stimulus intentionality, and, on the other, it was supposed to suppress the comparative judgemental element between individuals, implicit upon consulting normative tables.

In effect neither was the subject excluded as he continued to be an important part of the situation, nor were the norms dispensable, because without them it would not have been possible to identify the degree of individuality conveyed. Little by little, it was acknowledged that as instruments of assessment, the projective techniques were not able to side step the requirements of reliability and validity inherent in them.

Normative studies were not the rule. Rosenzweig and Fleming (1949) and Eron (1950) respectively developed apperceptive and thematic norms for the TAT. Murstein enhanced the importance of the stimulus (1963), made clear the difference of structure and ambiguity of the stimulus. Bearing in mind the need to meet the measuring requirements of psychological tests, Holtzman conceived a tool composed of 45 inkblot cards, called the Holtzman Inkblot Technique (HIT) (1961). By asking his subject to give only one answer per card, he was able to control the number of responses, considered to be a real pitfall in the Rorschach.

With respect to reliability and validity, it was seen that studies frequently suffered from difficulties and methodological inaccuracies. In Europe, the scenario was not encouraging for several reasons to do with historical, ideological and social factors. The concern for reliability and validity of the projective techniques scarcely mattered. It can be said that normative studies involving projective techniques were rare and of limited scope in Europe.

A factor that largely influenced the critical profile attributed to the projective techniques was its association with the psychoanalytical theory of personality, so much so that a co-dependent relationship seemed to exist between them. There is no doubt about the fact that psychoanalytic theory has been the basis for a great number of projective techniques, or that it has been the dominant perspective of interpretation. To a great extent, this position corresponded to the development of the psychoanalytical theory of the time.

THE RORSCHACH AND EXNER CONTRIBUTION

Herman Rorschach, born in 1884, was a Swiss psychiatrist who administered a set of inkblots made up by himself, to his patients. He would

ask them to say what they saw in the inkblots or what might they represent. This practice later came to constitute a 'psychological experiment' whose nature, aims, and results were the subject matter of a monograph entitled *Psychodiagnostics: A Diagnostic Test Based on Perception* (1921/1942). H. Rorschach's premature death in 1922 prevented him from further developing his work and its theoretical basis, which he regarded in the short *Introduction* to his book (1921) as still 'embryonic'. The latter has become the object of the study and research of many scientists throughout the years.

Rorschach presented his test as an essentially perceptive task. Responses to the instructions – W*hat might this be?* – were codified according to three main dimensions: location (where the subject saw the designed object), determinants (what led up to the view of this object) and content (what the object is). His work, study and observation of patients allowed him to find or identify several conceptual meanings for his new variables. On this basis, he elaborated guidelines for interpreting the patient's records which allowed him to draw up a statement of personality characteristics.

The core of Rorschach's test has essentially been passed down from one author to another, without undergoing any radical changes. As the fruit of clinical practice and/or research, here and there several new variables have been introduced by different authors.

Exner's contribution. Several factors have contributed to the fact that the Rorschach was somewhat discredited throughout the 1960s. In confronting this situation, Exner took it upon himself to provide the Rorschach with the kind of characteristics a test should have: reliability and validity. Method was his main weapon.

From the revision, analysis, and comparison of the five Rorschach systems effective in the USA – the Beck, Hertz, Klopfer, Piotrowsky and the Rapaport-Schafer – Exner retained what seemed to him to be the most consistent parts in order to build what he called the Comprehensive System (CS) (Exner, 1974). His guiding criterion was objectivity, present throughout each of the steps to standardize the test's whole administration procedure in order to make sure that the record constituted a valid sample of the subject's behaviour, a mediator of his personality. Defining and establishing precise criteria of coding which attempted to preserve the answer as it was given, without submitting it to subjective decisions, allowed for high levels of interscorer reliability.

The interpretative process was fully delineated; it was adjusted to different records according to specific characteristics, and was organized so as the records could be analysed and considered as a whole and not only partially.

Reliability studies. In projective techniques coding or scoring reliability is the *sine qua non* condition of test reliability.

Reliability studies in projective techniques have their own limitations due to their very nature. With the exception of studies based on Exner's CS, studies concerning most of the projective instruments are rare. The kind of study adopted resulted from reflection upon and knowledge about the nature of the materials, the answers and the variables. Using this approach in a reliability study brings to light the following three considerations: (a) when examining reliability in the Rorschach, what is at stake are the variables, mainly the determinants, and not the contents; (b) even though personality may change, it is generally acceptable that it will not change considerably over short or long periods of time, in accordance with the different ageing periods; (c) with reference to memory effect, it is important to realize the fact that the subject's response is only one among several he might have given.

Two implications of considerable interest deriving from temporal consistency studies should be mentioned. The first was the fact that several variables presented various low levels of reliability, on par with others that reached medium or high levels. It was thus possible to identify some variables which resembled state variables in terms of temporal consistency; at times, some variables had the appearance of state variables while at others, they seemed to be trait variables; yet other variables attested to the enduring characteristics of personality. The second implication referred to short records of less than 14 answers and were considered as lacking reliability. Consequently, as a rule, their interpretation was not valid.

Validity studies. As with reliability, it is also clear that not all modalities of test validating are suitable for projective techniques, namely the Rorschach. Mary Ainsworth, in a chapter entitled *Problems of Validation* (1954), believes that the

study of validity of the Rorschach does not have the same characteristics as personality tests. In regarding the Rorschach as an observation method and not as a test, Ainsworth believes that the hypothetical constructs connected to the several variables should be the object of validation (Ainsworth, 1954: 405–406).

There were numerous validation studies undertaken as the CS was being developed. They are referred to in Exner's three volumes (1991, 1993, 1995) although they were obviously unfinished at the time of writing. On the other hand, the last few decades have seen the emergence of a considerable number of validity studies not only connected to the Rorschach but also to different scales and indices deriving from it and designed to assess specific aspects.

A concept which became very important in the CS, dating from the publication of Volume 1 in 1993, had to do with *personality styles*. They were defined as '... features that give rise to psychological and behavioural response tendencies, sometimes only in specific situations, but more often as a general preference for a particular approach to problem solving or decision making' (Exner, 1993: 404). This new concept lay behind the decision to publish different normative tables according to different styles. In the same volume, norms were published for three coping styles: the introversive, the extratensive and the ambitent. In the most recent edition of *A Rorschach Workbook for the Comprehensive System* (Exner, 2001), a fourth table was introduced that referred to the high lambda style. This style is characterized by the fact that a half or more than a half of the responses given in subjects' records have a *Pure F* determinant.

IMPACT OF AND REACTIONS TO THE COMPREHENSIVE SYSTEM

After more than thirty years' work, study and research, the Rorschach seems to have gained its rightful scientific status. Some events in the field of projective techniques, which are seemingly linked to the success achieved by the CS, are underlined as follows:

- the appearance of normative studies on the Rorschach and other projective techniques here and there all over the world;
- the publication of a valuable work on research methodology;
- the integration of an empirical and psychoanalytic approach;
- extending the CS so as to integrate, within the interpretation process, some aspects like card pull, thematic content, test behaviours and sequence analysis that were formerly considered in well-known systems;
- attending to teaching personality assessment, namely projectives.

Some points should be stressed concerning the field of reactions. One of them has to do with the results of recent new studies on normative data coming from the USA. Reacting against the idea that the CS norms were adapted to both American and non-American citizens, the results obtained distinctly showed that the same could not be said at least with regard to Belgium, Chile, Denmark, Finland, Portugal, Spain and Venezuela.

Another point that should be emphasized is Weiner's conceptual approach to the Rorschach. He prefers seeing it not as a test but rather as a method – the Rorschach Inkblot Method (RIM): 'a method of generating data' (1995: 29). As current kinds of behaviour, these data can be interpreted from any theoretical perspective on personality. These two main ideas – there is no theoretical ownership of the Rorschach and the Rorschach is a method, not a test – contain two important aspects: firstly, the Rorschach is now a reliable and valid method, one which is confirmed by the CS; secondly, its data may be analysed and interpreted according to any theoretical approach. This perspective preserves both the empirical and objective qualities of the instrument and the idiographic dimension required by personality assessment and clinical practice.

Several articles presenting reviews of research related with projective techniques, namely the CS, have been published in the last few years, their comments and conclusions not always heading in the same direction.

In spite of intermittent publications of critical reviews throughout the years, projective techniques have endured and have actually benefited from the criticism. Once in a while, an author asks why projective techniques continue being used after so much evidence has been produced

condemning their lack of quality as assessment tools. One of the main reasons for their persistence and survival hinges on the fact that common personality tests do not supply the clinician with the holistic nature of their products and access to the idiographic. The proponents of projective techniques are confident that they are working in a suitable way and they are generally convinced that they will improve. It is a question of time, intelligence, study and research.

All the work and research using the Rorschach and carried out by Exner and his colleagues reveal very important information that holds true for every other projective technique. Given the nature of their stimuli, we do not exactly know what they measure. To learn this and understand why they measure what they do, we always have to question both the stimulus and the theory, or go from one to another and come back again. Theory gives meaning to the response but a response is determined by the stimulus that elicits it.

FUTURE PERSPECTIVES

In the light of Weiner's formulation, we can say that all projective techniques are methods that generate structural, thematic and behavioural data (1997: 6). Until now, psychologists have centred their attention on analysing and interpreting data according to their theories. They have been much less concerned about the source of the data and their nomothetic dimension. Because nomothetic and idiographic approaches condition each other up to a point, on the basis of past research we can easily predict that something which advances in one direction may correct the way or reveal new fields in the other. There is no reason to assume that an exclusive relationship exists between these two approaches.

From this point of view, an extensive working agenda now faces projectivists. As a matter of fact, empirical studies on projective techniques are clearly insufficient and frequently of an elementary level. If the study of stimulus properties is necessary, then experimental or quasi-experimental designs must be on the horizon of their research. This is also the way to validate theories.

An important aspect that should be the focus of attention for the future study and research of projective techniques lies in the relationship frequently established between certain variables and concepts. It frequently happens that there is no clear explanation for such a relationship. On the other hand, projective techniques are very often used with diagnostic aims. Although this is feasible, we should previously know which of the personality characteristics give rise to or are the effect of the diagnosed disorder. In following this up, we need to learn whether this characteristic may be identified by using a projective technique. Only then may a diagnosis be made (Weiner, 1997: 11). A large source of work is to be found here.

In a conference in Lisbon, in 2000, Exner referred to a number of positive human qualities like affection, consideration, optimism and so on, whose expression in projectives is unknown, thus indicating that a greater number of variables need to be studied. From the perspective of new fields of assessment, where the contribution of projective techniques may be required – health psychology, forensic psychology, treatment planning and evaluation, cross-cultural and multicultural psychology – it is easy to perceive that widening the scope is both pertinent and important.

CONCLUSIONS

Projective techniques, as methods of assessing and describing personality, are alive and well, and do not seem to have been relegated to second place in favour of the so-called objective assessment methods. They continue to be preferred and used by a large number of psychologists in both the former and the new fields of psychological assessment. Among the different theoretical approaches on projective data, there are still two predominant currents: the psychoanalytical perspective according to its current theory of object relation which leads to an intuitive interpretation that is largely dependent on the interpreter; the perspective that aims to endow these instruments with psychometric qualities of reliability and validity, whereby the data may be interpreted in the light of any personality theory including psychoanalysis.

CS has had the merit of giving the Rorschach a suitable methodology of use, study and research that, when adjusted, may be applied to other projective devices whenever it is needed. It has also been shown that teaching and training in this area is urgent and of primary importance.

Nevertheless, from what has been said here, we are still able to confirm the fact that seeing the projective techniques in action is almost unknown. However, if this state of affairs is true, then the pathways leading to their study and research promise to be wide and fruitful.

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Danilo R. Silva

RELATED ENTRIES

APPLIED FIELDS: CLINICAL, THEORETICAL PERSPECTIVE: PSYCHOANALYTIC, QUALITATIVE METHODS

PROSOCIAL BEHAVIOUR

INTRODUCTION

Prosocial behaviour refers to voluntary behaviour aimed to benefit other persons, regardless of the benefactor's motives. It includes a variety of behaviours like sharing, donating, caring, comforting and helping and is often associated with altruism because both concepts involve the pursuit of another's good and may imply common components such as empathy and sympathy (Batson, 1998; Eisenberg & Fabes, 1998; Schroeder, Penner, Dovidio & Piliavin, 1995). In this entry, a number of issues related to the determinants and functions of prosocial behaviour are described, drawing from main directions of research and from recent findings.

DETERMINANTS AND FUNCTIONS OF PROSOCIAL BEHAVIOUR

Although the importance of being able to benefit others is quite obvious for the quality of social interactions between individuals and among

groups, the determinants of prosocial behaviour – that is, the mechanism through which it operates and the functions that are ultimately served – remain problematic. On the one hand, it is a matter of debate the extent to which most prosocial behaviour reflects intrinsic altruistic inclinations or motives, or is ultimately instrumental to the satisfaction of egoistic needs like social approval and self-acceptance. Indeed, one may be led to benefit others and even to sacrifice one's own interests and safety for the good of others because of other self-oriented reasons, including feeling good, impressing others, serving an ideal or fulfilling a prophecy. Thus, one may argue that the helper's intentions and expected rewards qualify the nature of prosocial behaviour as either altruistic or egoistic, or a mixture.

On the other hand, the extent to which prosocial behaviour is adaptive for individuals versus society is not clear. Early philosophers addressed these issues as part of their speculation on human nature, reason, and morality. Some, like Thomas Hobbes, conceptualized egoism and self-love as essential traits of human nature and viewed prosocial conduct as an instrumental act that is acquired only to preserve society. Others, like Jean Jacques Rousseau, conceived benevolence and sensitivity towards others as innate propensities that may be corrupted by society. Early personality psychologists echoed these philosophical assumptions when they addressed prosocial and related behaviours, mostly in the context of their reflections on personality development and adjustment. Whereas Sigmund Freud focused on the defensive aspects of prosocial motives, Abraham Maslow advocated the capacity to love, to care, and to transcend contingent self-interest.

Over recent decades, several arguments have been proposed in support of the biological value of altruistic prosocial behaviour on the assumption that evolutionary selection operates mostly through groups other than through individuals. Individual sacrifices are often required to preserve the pool of genes that maximizes the capacity of the species to adapt to the changing environments (Wilson, 1975, 1978). Furthermore, because the potential costs of giving aid to others are often compensated by receiving help from others, reciprocal altruism has gained survival value in predisposing individuals to behave altruistically and to expect that others will perform altruistically toward them (Trivers, 1971). Both heritability and stability coefficients offer some support for the hypothesis that the tendency to behave prosocially is part of our genetic endowment. However, most evolutionary hypotheses are difficult to prove, and the processes and mechanisms through which heredity shapes altruistic motives and behaviour remain highly controversial.

In contrast, there is an abundance of evidence that culture, socialization practices and experience play critical roles in setting the conditions and in predisposing individuals to prosocial behaviour, as well as in qualifying its different forms. Indeed, the ways that another's well being is given meaning and is pursued reflect systems of values, norms, and habits that vary significantly across cultures and social contexts.

ASSESSMENT ON SELECTED RESEARCH AREAS

Because systematic research on prosocial behaviour has been conducted mostly in western culture, unavoidably it reflects the basic assumptions of that culture about the self in relation to others and society, namely the role assigned to personal agency and to individual responsibility in moral reasoning and action. Thus one should generalize with caution findings from one context to another. Nor can one generalize from one domain of research to another without due caution.

Social Psychology

Social psychologists have focused on the role of situations in fostering or discouraging helping behaviour, as well as on the role of social norms related to reciprocity and responsibility (Taylor, Peplau & Sears, 2000). Previous exposure to helping models, emergency situations in which persons are suddenly and unexpectedly under threat, similarity with persons in need, explicit requests for help, and the absence of others who could help the victim are all contingencies that have been found to raise the probability that one will take supportive action. Being in a good mood also may foster helping behaviour, and feelings of guilt may induce one to engage in prosocial behaviour when it may relieve the guilt and restore self-approval. Social norms of reciprocity,

responsibility, and justice largely prescribe when, how, and whom one will help.

Most of the findings of social psychologists derive from laboratory studies and quasi experiments, which have limited generality across persons and situations and problematic representativeness of real life helping contingencies. Assessment methods include observation of behaviour in situational tasks and self-reports.

Developmental Psychology

Developmental psychologists have focused first on the influences that learning, cognitive development, and moral development exert on the development of prosocial behaviour and, more recently, on the influences that emotions and interpersonal relations exert on prosocial behaviour in order to develop stable representations of oneself, positive attitudes towards others, and motives and habits to benefit others (Eisenberg & Fabes, 1998; Mussen & Eisenberg, 2001). Models, preaching, instructions, and reinforcements are no less important than the experience of being nurtured, cared for, and valued, although the evidence for a direct link between parental warmth and a child's prosocial tendencies are not as strong as object relations and attachment theorists would suggest.

Likely, the degree of association between parental nurturance and prosocial responding by a child varies across development, across behaviours, and across situations, and is moderated by temperamental and personality characteristics of children and parents, as well as by other contingencies, such as the presence of siblings and socialization practices related to management of emotions. Empathy, as reflected either in the capacity to take the perspective of others or in the capacity to sympathize with another's feelings, is crucial in setting the individual conditions that promote prosocial behaviour toward others. Direct experiences of having been helped by others as well as of helping others are both critical to being able to appreciate the consequences of prosocial behaviour fully.

Although family relations largely paves the way to all the above factors, the influence of friends and peers is more and more important as children move out of the family to test their perceptions of themselves and others and their strategies to deal with the world. Peer interactions provide further and unique occasions beyond the home to experience prosocial behaviour as both agent and target and, thus, to capture the sense of concepts like fairness, justice, and reciprocity.

Yet another direction has addressed the correlates and functions of prosocial behaviour.

Even though girls are often more prosocial than boys, the inclination to behave prosocially is moderately stable from infancy through to adolescence in both males and females (Caprara, Barbaranelli & Pastorelli, 2001). Prosocial behaviour has proven to be moderately and positively correlated with a variety of favourable individual characteristics, including social competence and well adjustment in children and adolescents (see Eisenberg & Fabes, 1998). Further findings have corroborated the protective role of prosocial behaviour in buffering one from depression and transgressive behaviours and in sustaining scholastic achievement from infancy to early adolescence (Bandura, Barbaranelli, Caprara & Pastorelli, 1996; Bandura, Caprara, Barbaranelli, Pastorelli & Regalia, 2001; Bandura, Pastorelli, Barbaranelli & Caprara, 1999; Caprara, Barbaranelli, Pastorelli, Bandura & Zimbardo, 2000).

Findings of developmental psychologists derive from a variety of sources, including laboratory studies and systematic and prolonged observations within the family and in various natural settings. Assessment methods include ratings of others, peer nominations, and self-reports. Early and subsequent versions of Caprara and Pastorelli's mono-factorial scale (1993), including items for sharing/donating, caring/comforting, and helping, have proven to be valid across several languages for both children and adults.

FUTURE PERSPECTIVES

As research addresses the psychological processes and mechanisms that underlie prosocial behaviour and begins to explain its stability across time and situations, the developmental psychologist's agenda converges with that of the personality psychologist to focus on the cognitive-motivational systems and structures that constitute the core of personality as a whole, coherent agentic system. One joint current direction concerns the dynamics of prosocial behaviour, namely the processes and mechanisms that underlie the intentions of an actor

and the act of benefiting another, and the transactions of influence between the two. Because prosocial behaviour implies first a decision to help, which turns into an intention and then the act of pursuing this intention, the study of the dynamics of prosocial behaviour leads one to focus on the cognitive-motivational structures that guide the decision and grant its achievement, including self-beliefs, outcome expectations, values, and personal standards.

Because most findings derive from children and adolescents, one can only guess the extent to which the positive function that prosocial behaviour has proven to exert in childhood and adolescence will also extend over the course of life, namely through seasons of life in which the greater need to be helped by others can be well compensated by individuals' capacity to help others.

CONCLUSIONS

As recently stated by Eisenberg and Fabes, 'the study of prosocial development is still in its adolescence; much work has been conducted since 1970, but both relevant theory and conceptual integration of existing empirical findings are in need of further development' (1998: 702). Other areas of study, such as aggression and hostility, have received more attention than prosociality and altruism, likely because of their interference with even basic social functioning. This research has led to a focus on prevention and repression of undesirable social behaviours. However, it may be that a focus on the development of prosocial behaviour will turn out to be the most effective strategy for preventing aggressive behaviour.

Although most research has been conducted on children and adolescents and continues to target early development, the advantages of prosocial behaviour are likely no less important for the achievement of excellence and in the pursuit of happiness over the course of life.

In this regard, the study of prosocial behaviour is a critical step towards its promotion.

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RELATED ENTRIES

Personality Assessment (General), Emotional Intelligence, Social Competence

PSYCHOEDUCATIONAL TEST BATTERIES

INTRODUCTION

Psychoeducational test batteries are designed to provide a comprehensive assessment of an individual's strengths and weaknesses across a wide range of skills and abilities. Unlike standardized diagnostic testing which is used primarily to assess mastery of specific goals and objectives or areas of deficit (e.g. a commercially available norm-referenced test of mathematics), comprehensive test batteries are more general in focus, sampling from a broad array of skills within a particular domain. To date, the domains most typically represented are those of (a) cognitive or intellectual abilities, and (b) broad-based academic achievement. Each of these domains is then represented by a variety of subtests that are designed to assess the specific features of their respective domains. That is, the cognitive or intellectual portion of the psychoeducational test battery would contain a number and variety of subtests purported to assess specific features of intellectual development (e.g. short- and long-term memory, fluid and crystallized reasoning), and the academic achievement portion of the battery would be organized tasks associated with the process of schooling (e.g. reading, spelling, mathematics, written expression).

The use of psychoeducational test batteries offer two major advantages in clinical use (Salvia & Ysseldyke, 1995). First, from a technical adequacy standpoint the use of the same normative sample provides derived scores across domains that are logically linked. Simply, observed scores across domains (i.e. cognitive and achievement) are directly comparable since they were derived from the same normative sample. This helps alleviate the problems brought about by the indiscriminate practice of comparing observed scores obtained from tests with different normative samples. For example, if a student obtains a score of 100 (mean = 100, standard deviation = 15) on a test of cognitive or intellectual development and a score of 92 on a test of academic achievement it is difficult, if possible, to determine if such a difference is indeed true or a result of differences in the norms of the two tests brought about as a function of the two different normative samples.

Second, psychoeducational test batteries provide psychologists and clinicians a convenient method for assessing a broad array of skills across multiple domains with one test. In doing so, the assessor avoids redundancies in assessment that may come about as a result of combining tests that are not co-developed and share similar assessment features. Because psychoeducational test batteries are developed from a uniform theoretical perspective, they are less likely to assess the same underlying specific abilities across subtests and domains. Doing so reduces repetitious assessment and facilitates interpretation.

SPECIFIC PSYCHOEDUCATIONAL TEST BATTERIES: WECHSLER INTELLIGENCE SCALE FOR CHILDREN – THIRD EDITION AND THE WECHSLER INDIVIDUAL ACHIEVEMENT TEST

The *Wechsler Intelligence Scale for Children – Third Edition* (WISC-III; Wechsler, 1991) is the most recent version of the Wechsler scales for children ages 6 through to 16 years old. The WISC-III is made up of 13 subtests that comprise a Verbal Scale IQ, a Performance Scale IQ, and a Full Scale IQ. By design, the Verbal Scale attempts to measure verbal comprehension and includes the application of verbal skills and information to the solution of new problems, the ability to process verbal information, and the ability to think with words. Comparatively, the Performance Scale is designed to measure perceptual organization and involves visual processing, planning and organizational ability, and non-verbal learning and memory.

Although marketed a year later, *the Wechsler Individual Achievement Test* (WIAT; The Psychological Corporation, 1992) is the companion achievement test to the WISC-III. Like the WISC-III, it is individually administered and covers the areas of reading, mathematics,

language skills, and writing. It is designed for use with children and young adults between the ages of 5 and 19 years. Following is a brief description of the subtests that comprise each instrument.

WISC-III Verbal Scale

- *Information*. Requires the child to answer factual questions presented by the examiner.
- *Similarities*. Requires the child to answer questions about how objects or concepts are alike.
- *Arithmetic*. Requires the child to answer simple to complex arithmetic problems involving concepts and numerical reasoning.
- *Vocabulary*. Requires the child to orally define words presented by the examiner.
- *Comprehension*. Requires the child to respond orally to questions posed by the examiner involving interpersonal relations and social mores.
- *Digit Span*. Requires the child to repeat a series of numbers that are dictated by the examiner.

WISC-III Performance Scale

- *Picture Completion*. Requires the child to identify an important missing element from a picture.
- *Coding*. Requires the child to copy symbols according to a specified pattern as quickly as possible.
- *Picture Arrangement*. Requires the child to place a series of pictures depicting a scene in a logical order.
- *Block Design*. Requires the child to reproduce designs using three-dimensional blocks.
- *Object Assembly*. Requires the child to put puzzles of common objects together.
- *Symbol Search*. A supplementary subtest that requires the child to look at a symbol and then decide if it is present in an array of symbols.
- *Mazes*. A supplementary subtest that requires the child to solve paper-and-pencil mazes of increasing complexity.

WIAT

- *Basic Reading*. Requires the child to identify letters and read words in isolation.
- *Reading Comprehension*. Requires the child to read passages of increasing length and difficulty and answer questions.
- *Mathematics Reasoning*. Requires the child to respond to a broad range of mathematics skills including counting, number recognition, and word problems.
- *Numerical Operations*. Requires the child to solve computation problems.
- *Listening Comprehension*. Requires the child to demonstrate knowledge of vocabulary, following directions, and general listening comprehension.
- *Oral Expression*. Requires the child to demonstrate knowledge of expressive vocabulary, given directions, and providing oral accounts of actions.
- *Spelling*. Requires the child to write individual letters and words that are dictated.
- *Written Expression*. Requires the child to express ideas in a written fashion.

Technical Data

Standardization

The WISC-III was standardized on 2,200 children stratified by age, race/ethnicity, geographic region, and parental education. One-hundred boys and girls constitute each of 11 age groups ranging from 6 through to 16 years. The WIAT standardization sample was similarly stratified and consisted of 4,252 students in 13 age groups, ranging in age from 5 to 19. To link the WIAT to the WISC-III, a subset of 1,284 students were administered both the WISC-III and the WIAT during the standardization process.

Reliability

The WISC-III has very good reliability. Average internal consistency reliability coefficients are 0.96 for the Full Scale IQ, 0.95 for the Verbal Scale IQ, and 0.91 for the Performance Scale IQ. Similarly, median stability coefficients are 0.94, 0.94, and 0.87 for the Full, Verbal, and Performance Scales, respectively. Likewise, the WIAT exhibits median internal reliability coefficients of 0.88 across the eight subtests. Test–retest coefficients over a 17-day period range from 0.61 to 0.96 ($Mdn\ r_{tt} = 0.85$) for the subtests and from 0.65 to 0.97 ($Mdn\ r_{tt} = 0.93$) for composite scores.

Validity

Correlations between the WISC-III and other cognitive ability tests are high. Concurrent validity studies report that the WISC-III Full Scale IQ correlates 0.89 with the previous version of the test, and 0.86 and 0.85 with the preschool and adult versions of the test, respectively. Predictive validity coefficients with school achievement are in the range of 0.50 to 0.65 with the Verbal Scale more highly correlated with academic achievement than the Performance Scale. Correlations between WIAT scores and Full Scale IQs range from 0.30 to 0.84 (*Mdn* $r = 0.58$). In addition, criterion-related validity is adequate as noted by high correlations ($7 = 0.68$ to 0.88; *Mdn* $r = 0.81$) between the WIAT and the *Basic Achievement Skills Individual Screener*, *Kaufman Test of Educational Achievement*, and the *Wide Range Achievement Test – Revised*.

KAUFMAN ASSESSMENT BATTERY FOR CHILDREN

The *Kaufman Assessment Battery for Children* (K-ABC; Kaufman & Kaufman, 1983a, b) is an individually administered norm-referenced battery intended to provide a comprehensive assessment of cognitive and intellectual abilities and academic achievement for children ages 2-6 to 12-5. Sixteen subtests are combined into three regularly administered scales and one supplementary scale. Cognitive intellectual abilities are assessed across ten subtests yielding two factor or scale scores: (a) Simultaneous Processing Scale, and (b) Simultaneous Processing Scale; and one combined or total score referred to as a Mental Processing Composite. According to the authors, simultaneous processing refers to the ability to integrate input all at once to solve a problem correctly; while sequential processing emphasizes problem solving where correct responding rests on the ability to arrange stimuli in a sequential or serial order. In addition to the Mental Processing subtests, six Achievement subtests are administered intended to assess factual knowledge and skills usually acquired through interactions with the environment or the process of schooling. Finally, a Nonverbal Scale is available which combines subtests across the simultaneous and sequential scales and is intended to be an estimate of intellectual functioning for children who are deaf, hearing-impaired, speech or language-impaired, or non-English speaking. Following is a brief description of the subtests that make up each scale.

Sequential Processing Scale

- *Hand Movements*. Requires the child to imitate a series of hand movements in the same sequence as the examiner performed them.
- *Number Recall*. Requires the child to repeat a series of numbers presented aurally by the examiner.
- *Word Order*. Task which requires the child to touch a series of pictures in the same sequence as they were named by the examiner.

Simultaneous Processing Scale

- *Magic Window*. Requires the child to identify a picture that is progressively presented by the examiner through a narrow slit or a window.
- *Face Recognition*. Requires the child to select from a group photograph faces of people who were shown briefly in a preceding photograph.
- *Gestalt Closure*. Requires the child to name an object or scene that is only partially pictured in an inkblot type drawing.
- *Triangles*. Requires the child to assemble triangles to match an abstract design modelled on a card.
- *Matrix Analogies*. Requires the child to select a picture or design that completes a visual analogy.
- *Spatial Memory*. Requires the child to recall the placement of pictures on a page that was exposed for a 5-second interval.
- *Photo Series*. Requires the child to place photographs that illustrate an event in chronological order.

Achievement Scale

- *Expressive Vocabulary*. Requires the child to name objects that are pictured in photographs.
- *Faces and Places*. Requires the child to identify well-known people, fictional

characters, or places pictured in a photograph or illustration.
- *Arithmetic*. Requires the child to answer questions that assess knowledge of maths concepts or the manipulation of numbers.
- *Riddles*. Requires the child to name an object or concept that is described by a list of three of its characteristics.
- *Reading/Decoding*. Requires the child to name letters and read words in isolation.
- *Reading/Understanding*. Requires the child to act out commands that are given in words or sentences.

Technical Data

Standardization

The K-ABC was standardized on 2,000 children ages 2-6 to 12-5 with 100 students sampled at each half-year age range. The sample was stratified by age, gender, geographic region, race/ethnicity group, parental educational attainment, community size, student educational placement, and disability category according to the 1980 US Census and the National Center for Education Statistics. In addition, sociocultural norms are provided for comparison of a child to others of similar racial and ethnic background and socioeconomic status on the Mental Processing Scale and the Achievement subtests.

Reliability

Internal consistency reliabilities for the Mental Processing Composite and the Achievement Scales are excellent for both preschool ($r_{xx} = 0.91$ and 0.93, respectively) and school-age children ($r_{xx} = 0.94$ and 0.97). Stability of the K-ABC measured over a retest interval of 2 to 4 weeks is adequate, with a median coefficient of 0.88 for the Mental Processing Composite and 0.95 for the Achievement Scale.

Validity

Evidence of construct validity is presented in the form of increases in subtest raw scores as a function of age. Criterion-related validity has also been examined correlating the K-ABC with other similar measures. Correlation between the Mental Processing Composite and the Full Scale IQ of the WISC-R is reported to be 0.70. Predictive validity has been examined by correlating the K-ABC with other measures of achievement. Overall, the K-ABC has demonstrated adequate predictive validity for both group ($r_{xy} = 0.65$) and individually administered ($r_{xy} = 0.79$) tests of achievement.

FUTURE PERSPECTIVES AND CONCLUSIONS

As can be seen, the main advantage of psychoeducational test batteries is that one standardization sample is used for all domains. Therefore, differences between domains within a particular test battery do not result from differences in standardization samples, and the clinician can be confident in knowing that the differences were not a result of uncontrolled error brought about by different samples. In addition, their construction allows clinicians to sample from a wide variety of constructs and behaviours with a minimal amount of assessment time. Psychometrically, most commercially available batteries demonstrate adequate levels of reliability and validity and are well researched with respect to their technical adequacy.

Be that as it may, psychoeducational test batteries are not without their shortcomings. First, from a content validity perspective, the extent to which the batteries tap into the two main constructs of interest (i.e. cognitive/intellectual abilities, academic achievement) is speculative. On the cognitive ability side, each of the measures are developed from differing theoretical perspectives, each of which purports to measure cognitive/intellectual growth. Debates regarding intellectual development are largely unsettled and assessing the accuracy of various measures proves difficult. On the achievement side as well, the extent to which the tests overlap with that which is found in common school curricula is low. Simply, the extent to which the tests sample from the larger domain of academic achievement is dubious at best. These issues are compounded by a response format that does not mirror the behaviour as it is performed in the natural environment, as well as an overall lack of treatment utility. Clearly, such tests have limited use in planning instruction.

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John M. Hintze

RELATED ENTRIES

DEVELOPMENT (GENERAL), APPLIED FIELDS: EDUCATION

PSYCHONEUROIMMUNOLOGY

INTRODUCTION

Psychoneuroimmunology (PNI) is an interdisciplinary field which studies the relationships between neural and endocrine function, and immune processes. More specifically, PNI attempts to elucidate the relations among behavioural and psychosocial factors, nervous, endocrine and immune systems, and health (Ader & Cohen, 1993; Bachen, Cohen & Marsland, 1997).

PNI is a relatively young discipline, though speculations about relationships between mind and body have recurrently been part of Western thought over the centuries. However, it was in the beginning of the last century that several precedents to the scientific study of the interactions between behaviour and immune function began to appear. Particularly, two Soviet researchers, Metalnikov and Chorine, in the 1920s, produced a Pavlovian conditioning of a variety of non-specific defence responses and antibody production in rabbits in response to heat and tactile stimulation as conditioned stimulus (see Ader, 1981 for an historical review of conditioned immunobiological responses). Furthermore, in the 1960s Solomon and Moos (1964) published their paper 'Emotions, Immunity, and Disease' which synthesizes the relations of stress, emotions, immunological dysfunction (especially autoimmunity), and physical and mental disease.

Nevertheless, it was in the late 1970s and the beginning of the 1980s, after Ader and Cohen's (1975) seminal work on conditioned modulation of immunity (a great example of scientific serendipity), when PNI was founded.

PSYCHOLOGICAL STRESS AND IMMUNITY

One of the most fruitful as well as promising issues in PNI research has been the relationships between stress and immunity. The possible link between neural, endocrine and immune systems deserves particular interest in view of its potential relevance for health maintenance and to its aetiopathogenetic implication in several diseases (Bayés & Borrás, 1999).

A review of the studies which have been carried out on this topic shows that they can be divided into several categories according to different criteria. On the one hand, regarding the population, animal versus human studies. Among human studies, healthy versus non-healthy human subject studies.

On the other hand, regarding the type of stress subjects have to cope with, those which explore the effect of chronic stress such as major life events (divorce, bereavement) versus acute stress, such as short-term laboratory stressors (loud noise, unsolvable puzzles) or academic examinations.

Focusing on studies in human beings, the PNI assessment depends on the role of the variables used and the character of the studies. As an interdisciplinary field, as PNI is, it uses assessment instruments and procedures from other disciplines rather than develops its own methods. Generally speaking, it might be distinguished between the procedures for directly assessing the immune function and those for measuring the health status and disease. The first of them are especially useful for healthy population research even though they give some doubts about the clinical relevance of findings. The second offer an approach to disease research though those parameters might be less reliable and present several methodological problems.

THE ASSESSMENT OF IMMUNE FUNCTION

The assessment of immune function is made by immunological assays. There are two different types of immunological assays: enumerative and functional assays.

Enumerative Assays

Enumerative assays provide information about percentages or number of cells. Usually, they quantify lymphocyte subsets using monoclonal antibodies with fluorescent dye which are directed at specific surface antigens. After lymphocyte incubation, it is able to count the number of cells of the specific subset. Parameters such as T-cell account, helper/inducer T-cells ratio, B-cells number, NK number, serum IgE levels and salivary IgA (sIgA) are commonly used in PNI studies.

However, some of these parameters have been criticized as unreliable measures of the 'immunocompetence' for PNI studies (Schulz & Schulz, 1992). For instance, global accounts such as T-cell account would not be sensitive to changes because of the adaptive equilibrium among the different subsets. Similarly, salivary measures such as sIgA are related to the salivary flow. The flow changes in response to stressors so those measures instead of blood samples add another methodological problem to the PNI studies that must be controlled. Otherwise data interpretation might be biased.

Furthermore, enumerative assays provide no information about the functional efficacy of the cells so that type of assays is not very useful, particularly with healthy subjects.

Functional Assays

Functional assays provide information about the 'performance' (Kiecolt-Glaser & Glaser, 1995: 216) of the immune cells. As several authors have pointed out, functional assays are much more informative than enumerative and provide more reliable measures for PNI studies, especially for stress studies. They might be divided into *in vitro* and *in vivo* assays. Among *in vitro* assays, blastogenesis, NK cell activity and latent herpesvirus antibody titres are common. Other *in vitro* assays are viral vaccine antibody titres and cytokine production.

Blastogenesis

Consists of the proliferative response of both T- and B-lymphocytes to stimulation by mitogens such as phytohemagglutinin (PHA) which stimulates T-cell proliferation, pokeweed mitogen (PWM) which stimulates both T- and B-cell division, lipopolysaccharide (LPS) which stimulates B-cells, and concanavalin A (ConA), another T-cell mitogen. These mitogens have the ability to stimulate lymphocytes so that the procedure provides a model of the body's response to challenge by infectious agents. As Kiecolt-Glaser and Glaser (1995) wrote, blastogenesis is one of the few immunological assays reliably associated with relevant health parameters, such as immunodeficiency conditions including AIDS and other illnesses. Lymphocyte proliferation in response to mitogens has been used as a dependent variable in many PNI studies which have tested the effects of stress.

NK Cell Activity

NK cells play a crucial role in tumour vigilance. The efficacy of these cells to lyse or destroy target cells is another way of measuring immune function.

Latent Herpesvirus Antibody Titres

The immune system has 'memory', so once the organism has been exposed to an infectious agent it is able to quickly respond and destroy the pathogen in successive reexposures. However, several viruses are able to hide in a latent state within certain host cells. Herpesvirus is one of them. They have also a very high prevalence (particularly HSV1). The competence of the cellular immune system is thought to be critical in controlling the virus latency. Thus, the increase of herpesvirus antibody titres suggests a less competent control over the virus by the immune system.

T-Cell Responses to a Viral Vaccine

Similar to above, the antibody response to specific infectious challenges such as viral vaccine might be a measure of the competence of the immune system. Counts of antibody titres for viral vaccines such as flu vaccine, common cold, HbsAg, and a novel antigen has been used for that purpose.

Production of Cytokines

Even though only a few studies have used this kind of measure (see Biondi, 2001 for a review), the production of cytokines (particularly IL-4 and IL-6) is another measure of the immune function.

Natural Immune Activity

Non-specific mechanisms against pathogens such as phagocytosis can also be measured as an estimation of immune function. Particularly, two groups of measures can be obtained: functionality of granulocytes (such as adherence, chemotaxis, attachment, and lysis), and phagocytic activity of monocytes and macrophages.

For obvious reasons, *in vivo* assays are infrequent in PNI human studies. Nevertheless, a few of them have used this kind of measure, particularly skin tests.

Skin Tests

The delayed hypersensitivity response to an antigen (usually, tuberculin administered by subcutaneous injection) can be used as an estimation of the functioning of the immune system. In such cases the decrease of the skin reaction (in terms of oedema and skin swelling) shows a decrease in the immune competence.

THE ASSESSMENT OF HEALTH STATUS AND DISEASE

Measures of health status and disease in this context can be separated, at least, into two categories: signs and symptoms (Cohen & Williamson, 1991). Signs are observable. For instance, lesions, fever, rashes and swelling. Symptoms are not observable but reported by the patients. For example, headache or stomach ache. A third group can be added, which is related to the use of health care services, the school and/or job absenteeism, and so on.

Signs

At the present state of knowledge, main areas of potential clinical interest in PNI are cancer, infectious autoimmune diseases, inflammatory bowel disease, multiple sclerosis and wound healing (Biondi, 2001). All these cases allow trained clinicians (using technological aids if needed) to register parameters such as the length of a tumour in cancer, the joint inflammation in rheumatoid arthritis or the occurrence of oral lesions in infection due to HSV.

Symptoms

Non-observable but self-reported variables such as joint pain in rheumatoid arthritis or weakness and malaise under influenza infection have also been used in PNI studies. Nevertheless, although these reports may reflect underlying disease conditions, they may also reflect influences of stress on cognitive processes and self-perceptions that are not associated with the disease. Thus, it is methodologically crucial to avoid unverified self-reported symptom protocols as the only criterion for disease and to validate them.

Seeking for Health Care and Other Outcomes

The number of hospitalization days, the number of medical attendances, the number of absenteeism days, the pharmacological compliance and so on

have been used as a measure of the health and disease status in several PNI pieces of research.

FUTURE PERSPECTIVES AND CONCLUSIONS

In summary, PNI assessment combines objective measures about immune function with health and disease outcomes. These assessment instruments and methods has been mainly imported from other disciplines and they have allowed a steady improvement of the methodological quality of PNI studies.

As an interdisciplinary field, PNI is fed by the related disciplines and its growth in the last years has been spectacular. Further developments in PNI will probably improve the knowledge about immune–neuroendocrine interactions. Therefore, some of the objective measures mentioned above (particularly, cytokines) will increase their importance and some others will arise. Likewise, a better understanding of the illness behaviour as well as the technological development would improve health and disease measures.

Nevertheless, we can predict some constraints in this field which will not be easily overcome. On the one hand, the problem of the 'very best' immunological assay research paradigms many editorials and international meetings have advocated; probably, as Keller, Schiflett, Schleifer and Bartlett (1994) have pointed out, the appropriateness of a measure depends on the experimental design. Moreover, factors such as availability, convenience, or costs will determine the election of one or another assessment method.

On the other hand, the ethical limitations human studies have; regarding humans, in most of the cases the only tissue PNI studies sample is peripheral blood. Secretions such as urine or saliva are available as well. But these allow the study of a very small fraction of the immune system; one of its characteristics is the complexity of its interactions. Furthermore, people's lives go by in natural context in which they rest and argue, smoke and exercise. That is, far from the control such studies try to carry out. According to Keller et al. (1994: 228), 'understanding the product [psychoimmunology] of these two domains [immune system and behaviours and emotions] is likely to be complex'.

Perhaps, as Biondi (2001: 190) wrote, 'one might also wonder if, at this phase in the evolution of PNI, redundant methodological rigour could in some instances, restrain further developments and downplay serendipitous findings, inhibiting innovative and divergent views, while permitting only refinements of already established paradigms'.

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Víctor J. Rubio

RELATED ENTRIES

Applied Fields: Health, Applied Fields: Neuropsychology, Stress

PSYCHOPHYSIOLOGICAL EQUIPMENT AND MEASUREMENTS

INTRODUCTION

Psychophysiology is the scientific discipline devoted to the study of the interrelationships between the physiological and psychological aspects of behaviour. Such relationships have preoccupied philosophers and scientists throughout history. The different debates about the soul–body, spirit–matter, or mind–brain relationships are all variations on a single theme: the connection between behaviour – our acts, thoughts and feelings – and its sustaining biological body.

The scientific study of the physiological and psychological aspects of behaviour can be approached through different perspectives. The psychophysiological perspective emphasizes the use of physiological measurements to understand the psychological processes underlying behaviour (Turpin, 1989). The focus of psychophysiology is the non-invasive recording of peripheral and central physiological changes while subjects behave under controlled conditions. This approach has mainly used, although not exclusively, humans as research subjects.

The basic assumption of psychophysiology is that the psychological processes of perception, attention, memory, learning, motivation, emotion, and so on are reflected in the efferent physiological changes – the logistic and instrumental precursors of behaviour – as well as in the physiological brain activity. The psychophysiological methods, therefore, are like windows over the living body – muscles, glands and brain – allowing the knowledge of the complex mechanisms controlling human behaviour.

THE ELECTRONIC AND COMPUTER REVOLUTION

Almost all physiological recording methods are based on the bioelectrical nature of the living tissue activity. Therefore, since the discovery of electricity and its basic principles by the end of the 18th century, physiological recording has evolved in parallel with technological evolution. The first psychophysiological instruments were based on the *galvanometer*: a moving coil suspended in the magnetic field of a permanent magnet that rotates when an electric current flows through the coil. This device, used with any writing system mounted on the moving coil, is the basis of the traditional polygraphs. It allows the detection and measurement of changes in small currents as a function of time.

The moving coil galvanometer was instrumental for the discovery of the main psychophysiological variables: electromyography by Matteucci and Du-Bois Reymond in the middle of the 19th century, electrodermal activity by Vigoroux and Ferè in 1888, electrocardiography by Einthoven in 1900, and human electroencephalography by Berger in 1929. The first electronic circuits used valve condensers, diodes and triodes to filter and amplify the bioelectrical signals. These electronic components were too big, not very precise, and used a lot of energy. In the 1940s a new electronic age began with the discovery of *semiconductors* and the *transistors* – solid state electronic components – opening the race for miniaturization and speed. In the 1970s the *integrated circuits* added the possibility of bringing together complex electronic circuits, equivalent to many condensers, diodes and transistors, into a single unit: the chip.

Psychophysiological instruments have benefited from this electronic revolution in three basic aspects. Firstly, by increasing precision and reducing size and weight of the amplifiers. Secondly, by improving the traditional recording systems using the digital computers to represent, store and analyse the psychophysiological signals. This is done through analogue-to-digital converters interfacing the physiological recording output to the computer. And finally, by permitting the discovery of new psychophysiological variables, only available after complex computerized systems

have been applied to detect and extract the biological signals. This is the case of the new psychophysiological techniques for recording brain activity: event-related potentials, brain electrical activity mapping, magnetoencephalography, positron emission tomography, and functional magnetic resonance imaging.

PERIPHERAL INSTRUMENTS AND MEASUREMENTS

Psychophysiological techniques are commonly classified as peripheral and central ones according to the type of neurophysiological mechanisms directly controlling the physiological activity recorded (see Table 1). Peripheral techniques include those variables directly controlled by the somatosensory nervous system and the autonomic nervous system. Central techniques include those variables directly controlled by the central nervous system. In this section we summarize the main psychophysiological technique belonging to the peripheral somatosensory system – surface electromiography – and concentrate on the main technique belonging to the peripheral autonomic nervous system – cardiovascular activity. The reader interested in other peripheral techniques – electrodermal activity, pupillary system, respiration, eye movements, gastrointestinal system, sexual response system – can consult any of the following handbooks of psychophysiology: Coles, Donchin and Porges (1986), Cacioppo, Tassinary and Berntson (2000), Greenfield and Sternbach (1972).

Surface Electromiography

The biological basis of electromiography is the electrical activity of the striated muscle, the type of muscle responsible for skeletomotor activity and made up of a large number of parallel cells or fibres. This electrical activity is due to the depolarization of the fibre's membrane: changing from positive outside to negative and returning to positive. Such activity is triggered by the activation of the motoneuron which innervates the fibre at the end plate location. The depolarization of the membrane, called action potential, makes the fibre contract by sliding the fibre's inner filaments. Each motoneuron innervates a number of fibres within a muscle, and

Table 1. Classification of psychophysiological techniques with examples of assessment applications

Neurophysiological mechanism	Psychophysiological techniques	Assessment applications
Somatic Nervous System	Surface Electromiography (EMG):	Arousal
	Direct EMG	Facial expression
	Integrated EMG	Motor reflexes
		Relaxation
		Biofeedback
Autonomic Nervous System	Cardiovascular Activity:	Attention
	Electrocardiogram (EKG)	Emotion
	Impedance cardiography	Defence
	Photoplethysmography	Stress
	Blood Pressure recording	Anxiety
	Electrodermal Activity	Stress related illnesses
	Pupillary Activity	Biofeedback
	Gastrointestinal Activity	
	Others	
Central Nervous System	Electromagnetic Techniques:	Arousal
	EEG	Wakefulness
	Event Related Potentials (ERP)	Sensory processes
	Brain Electrical Activity Mapping (BEAM)	Cognitive processes
	Magnetoencephalography (MEG)	Movement preparation
	Metabolic Techniques:	Brain mechanisms
	Positron Emission Tomography (PET)	Brain reorganization
	Functional Magnetic Resonance Imaging (fMRI)	Psychopathology

each muscle fibre is usually innervated by only one motoneuron (Tassinary & Cacioppo, 2000). This functional physiological entity, made up of a single motoneuron and the individual muscle fibres innervated by the motoneuron, is called the *motor unit*.

Recording of the action potentials of the striated muscles from the surface of the skin receives the name of surface, electromiography (EMG). This EMG signal represents the ensemble of action potentials produced by the muscle at a given moment. The aggregate signal is characterized by a frequency range – between 20 and 1000 Hz – and an amplitude range – between 2 and 2000 microvolts – such that a direct relationship between frequency and amplitude exists: the greater the frequency the greater the amplitude. Accurate recording of the surface EMG requires careful attention to electrode site preparation and placement, grounding, noise reduction, and differential preamplification (see Tassinary & Cacioppo, 2000).

In psychophysiological studies it is common to transform the direct surface EMG into integrated EMG. The integrated EMG signal is the arithmetic average of the rectified and smoothed EMG signal. This is normally done by electronic circuits within the preamplifiers, although a similar transformation can be obtained by digital filtering. The integration procedure implies, firstly, rectification of the signal – elimination of the negative mirror part of the signal – and, secondly, smoothing of the remaining signal by a low-pass filter. This produces a contour following integration: a varying voltage proportional to the envelope of the direct EMG signal.

Measurement of the integrated EMG gives a simple index of total energy in the muscle at a given moment. This type of index has been used in many psychological research contexts: to measure activation or arousal, facial expressions, somatic correlates of thought and imagery, motor reflexes, etc. The technique has also been useful in many applied contexts: relaxation and stress reduction, physical rehabilitation, ergonomics, detection of deception, and polysomnography, among others. An example of integrated EMG measurement is the startle probe paradigm. Startle is a motor reflex elicited by abrupt stimulation. In human beings, rapid eye closure is one of the most reliable component of the behavioural reactions that constitute the startle reflex (Bradley, 2000). Measurement of the reflex magnitude is done by recording the integrated EMG of the orbicularis oculi, the muscle around the eye, and by scoring its EMG response amplitude. The startle probe paradigm is used to study the modulatory effects of psychological processes on the reflex magnitude: emotional and attentional priming or inhibitory effects.

Cardiovascular Activity

The cardiovascular system consists of a pump – the heart – and a network of vessels – arteries, arterioles, capillaries, venules and veins – for distribution, exchange and return of the blood throughout the body. This system fulfils the main vital function of the organism: to guarantee the necessary energy supply to all body cells in order to keep them alive and efficient in their activity. The cardiovascular system reacts rapidly to physical and psychological demands. Such reactivity is mainly controlled by neural and humoral pathways.

The *neural pathway* to the heart involves the two branches of the autonomic nervous system: the sympathetic and the parasympathetic. When the sympathetic nerves are activated the heart rate accelerates and the heart contraction becomes stronger, resulting in a greater blood volume discharge and greater blood pressure in the vessels. When the parasympathetic nerves are activated the heart decelerates, reducing the blood volume discharge and the blood pressure. The neural pathway to the vessels mainly involves the sympathetic nerves, its activation producing either vasoconstriction or vasodilation depending on the type of sympathetic receptors in the vessels: sympathetic receptors predominant in skin and viscera vessels produce vasoconstriction whereas sympathetic receptors predominant in skeletomotor vessels produce vasodilation. The *humoral pathway* involves the neural sympathetic activation of the endocrine system, resulting in the secretion by the adrenal glands of various hormones into the bloodstream. One of these hormones, or adrenaline/epinephrine, when it reaches the heart and the vessel receptors, has similar effect as the direct sympathetic activation: it increases the heart rate, the stroke volume, and the vasomotor activity constriction or dilation depending on the vessels. Other adrenal hormones, like cortisol, facilitate the transfer of

lipids and glucose into the bloodstream. The humoral effects on the cardiovascular system are slower than the neural ones but they last longer, contributing to maintaining cardiovascular reactivity during prolonged periods.

To examine the impact of psychological processes on cardiovascular reactivity requires reliable non-invasive measurements of the different components of cardiovascular activity. Cardiac function is assessed through three indices: *heart rate* – number of ventricular contractions per minute – *stroke volume* – the amount of blood pumped from the left ventricule in each contraction – and *cardiac output* – the product of stroke volume × heart rate. Vascular function is assessed through two indices: *blood pressure* – the force of the circulating blood in the arteries – and *blood flow* – amount of circulating blood in a particular area.

In psychophysiological studies, heart rate is the main index to assess cardiac function. Heart rate is measured in terms of beat-by-beat heart rate changes derived from the *electrocardiogram*. The cardiac period – interval in milliseconds between consecutive R waves of the electrocardiogram – is detected by the computer and transformed into heart rate: heart rate = reciprocal of cardiac period × 60,000. Using a weighted averaging method, heart rate is then transformed into second-by-second – or any other time epoch – heart rate. Other indices of cardiac function – as stroke volume or respiratory synus arrhythmia – are normally used to differentiate sympathetic versus parasympathetic influences on the heart rate. As regards vascular function, one of the most frequently used indices is blood volume amplitude. A relative measure of vasomotor activity – constriction and dilation – can be easily obtained through *plethysmography*, a device to measure limb changes in blood volume. Photoplethysmography is a simple method to record blood volume amplitude on a beat-by-beat basis that can also provide information on heart rate similar to the electrocardiogram.

The central nervous system controls cardiovascular functioning through a complex network that includes cortical structures – prefrontal cortex, anterior cingulate – subcortical structures – amygdala, hypothalamus – and hindbrain structures – ventrolateral medulla, nucleus ambiguus, nucleus tractus solitarius. Through this network, cardiovascular reactivity plays an important role in cognitive and emotional processes, as well as in stress and cardiovascular-related illnesses. Several psychophysiological paradigms have been used to assess these normal and pathological processes: the orienting-defence (Sokolov, 1963; Graham, 1979), the intake-rejection (Lacey & Lacey, 1970), and the active–passive coping (Obrist, 1981) paradigms. They measure phasic and/or tonic cardiovascular responses during psychological tasks. The heart rate response and heart rate variability have been the two cardiac parameters most frequently used. The heart rate response to moderate/intense stimulation – for example, a brief white noise – or to affective pictures shows a complex pattern of accelerative/decelerative changes interpreted as indicative of attentional and/or emotional processing. Heart rate variability, on the other hand, is an index of parasympathetically mediated cardiovascular control that serves to inhibit sympathetic influences. A relative reduction in cardiac variability has been interpreted as indicative of increased mental stress and ineffective emotional regulation and has been found associated with symptoms of cardiac and emotional disorders.

CENTRAL INSTRUMENTS AND MEASUREMENTS

Technological advancements have been fundamental for the development of the new brain activity recording methods: the functional neuroimaging techniques. The instruments to measure central nervous system activity are classified into two general categories: electromagnetic and metabolic techniques (see Table 1). The electromagnetic techniques are based on the electrical activity of the brain tissue: the neurons' action potential. This electrical activity can be detected non-invasively either in the skull in the form of voltage changes, using surface electrodes, or around the skull in the form of magnetic field changes, using electromagnetic sensors. The metabolic techniques are based on the differential distribution of blood elements – mainly oxygen and hydrogen – in the brain. Since neurons require these elements to produce their action potentials, the differential blood concentration in the brain is assumed to be an indirect index of the brain activity.

Electromagnetic Techniques

Electroencephalography (EEG) was the first electromagnetic technique developed. Since Berger's first report in 1929, EEG recording improved during the 1930s and 1940s. In 1949 the launching of the journal *Electroencephalography and Clinical Neurophysiology* resulted in the full recognition of EEG as a reliable technology for recording brain electrical activity as an integrated neurophysiological phenomenon relevant to assess psychological processes such as arousal or wakefulness. EEG recording requires, as all psychophysiological techniques, careful attention to electrode location, minimum number of electrodes needed, choice of electrode reference, grounding, proper filtering and artefact control. A good EEG recording is characterized by changes in voltage as a function of time with two basic descriptive parameters: frequency and amplitude. These two parameters are inversely related: the greater the amplitude the lower the frequency. The lowest frequency band (0–4 Hz) – called delta range – has the greatest amplitude (20–200 microvolts), and the highest frequency band (36–44 Hz) – the gamma range – has the lowest amplitude (2–20 microvolts). The intermediate frequency bands – theta (5–7 Hz), alfa (8–12 Hz), and beta (13–30 Hz) ranges – have a progressively decreasing amplitude.

An important technological development based on the EEG occurred in the 1960s with the advent of digital computers. EEG recording focuses on spontaneous rhythmic fluctuations in voltage: the frequency ranges. Specific EEG responses to events are obscured by the larger background EEG fluctuations. Digital computers enabled the extraction of the event-related brain activity from the background EEG by applying the averaging procedure: to repeat a particular event and average the digital samples of the EEG that are time-locked to that event. This procedure increases the discrimination of the 'signal' (the ERP = Event Related Potential) from the 'noise' (the background EEG). The resulting signal contains a number of positive and negative peaks identified by the letters P or N with a numeric subscript (1, 2, 3, 4 or 100, 200, 300, 400) which indicates, respectively, the order or time in milliseconds of the peak. Once extracted, ERPs are interpreted as manifestations of the specific psychological processes activated by the event.

In the 1990s new technological advances allowed new recording techniques of electromagnetic brain activity: dense electrode array, brain electrical activity mapping, and magnetoencephalography. Traditional EEG and ERP techniques were limited to a reduced number of channels (up to 32). The recent increase in the number of recording channels (up to 256) has facilitated the study of the spatial distribution of ERP activity across the scalp, allowing the construction of accurate maps of the surface brain electrical activity. In addition, dense electrode array has allowed the generation of mathematical models for three-dimensional location, within the brain, of the source of the surface ERP activity. This has been supplemented with the advent of the latest technological development: the magnetoencephalography (MEG). This technique records the small magnetic fields generated around the scalp as a consequence of the electrical brain activity. It can provide similar information to ERP techniques but, in addition, allows precise identification of the brain generators of the surface ERP activity by means of identification of magnetic dipoles: two equal but opposite magnetic fields separated by a small distance.

The electromagnetic techniques are, at present, one of the best methods, in terms of temporal resolution, among non-invasive neuroimaging techniques. The advantage of these techniques is the time course of the signal which permits resolution in the millisecond domain. As psychological processes change dynamically over short periods of time, the electromagnetic signal is ideal for linking ongoing changes in neuronal activation with ongoing changes in behaviour.

Metabolic Techniques

The main limitation of the electromagnetic techniques is their poor spacial resolution: inability to examine brain function in an anatomically precise way. The electronic and computer revolution of the past few decades has permitted the development of more precise techniques for visualization of brain function based on metabolic changes. These techniques are, in some way, similar to traditional radiological techniques, like X-ray and Computerized Tomography (CT). The image construction is based on the recording of radiological signals emitted by moving blood particles in

the brain – oxygen and hydrogen – necessary for neuronal activity.

The first metabolic neuroimaging techniques developed were the radiotracer techniques. *Positron Emission Tomography* (PET) is one of them. The radiotracer commonly used in PET is a pharmacological compound labelled with a positron emitting radioisotope – O^{15} – of short life – around 4 to 10 minutes. Once administered to the subject, either intravenously or by inhalation, the radiotracer is distributed through the blood to all parts of the body, including the brain. The radiotracer starts decaying inmediately due to the emission of positrons: subatomic particles within the nucleus with positive charge. The number of emitted positrons detected from outside the head reflects the amount of oxygen demand in the different brain areas, indicative of their neuronal activity. Using computerized tomographic methods, the PET system can produce bi-dimensional sliced images of brain activity in any inner plane of the brain.

The main problem with PET and other radiotracer techniques is the possible risk of lesions due to radiation. The most promising alternative to date, also based on neuronal metabolism, is *functional Magnetic Resonace Imaging* (fMRI). The physical foundations of fMRI are the magnetic properties of certain subatomic particles – the spinning protons within the nucleus – that behave as small magnetic needles. The technique uses this magnetic property of the hydrogen nucleus, an element abundant in the body. When the body is placed within the magnetic field of a potent external magnet, all hydrogen protons line up along the axis of the external magnet. The orientated spinning protons, in addition to spinning around their own axis, also rotate or *precess* about the axis of the external magnetic field with a rotating frequency that is within the range of radiofrequency waves. The MRI technique then introduces, using a transmit–receive coil, a momentary external radiofrequency wave perpendicular to the magnet axis and identical to the precessional frequency of the spinning hydrogen protons to produce the resonance phenomenon: the axes of the spinning protons change their alignment, returning slowly to their original position when the external radiofrequency is turned off. This slow return of the spinning protons to the direction of the external magnetic field generates a decaying electromagnetic signal that is detected by the receive coil. This is the signal used by the fMRI system to create the image, since the magnitude of the received signal is directly proportional to the amount of hydrogen atoms in the tissue: the greater the signal the greater the metabolic neuronal activity.

FUTURE PERSPECTIVES AND CONCLUSIONS

The new psychophysiological techniques of brain activity have opened up new possibilities for psychological research and application, including psychological assessment. Indeed, almost all areas of psychology have started to introduce these new variables either as substitutes or complements of more traditional dependent variables, such as reaction time or percentage of hits and errors. They provide on-line information of the internal mechanisms mediating stimulus–response relationships confirming or disconfirming the many inferences made by psychology on the inner processes that regulate and direct behaviour. But the new technologies have also brought in new problems that future developments will have to solve. One of these problems is incompatibility among psychophysiological techniques. Functional Magnetic Resonance Imaging, for example, is currently incompatible with electromagnetic and peripheral techniques, due to the interfering external magnet. Another problem is the poor temporal resolution of the metabolic neuroimaging techniques and the poor spatial resolution of the electromagnetic techniques. These problems point to the need for future technological improvements to allow convergence and complementarity between different psychophysiological methods, as well as between psychophysiological and behavioural measurements.

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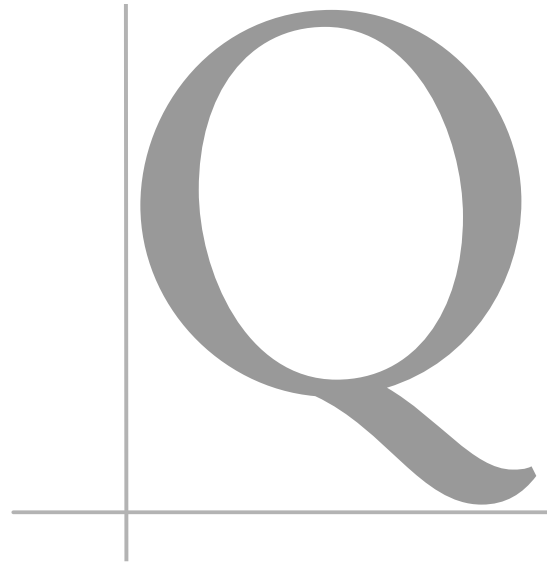
RELATED ENTRIES

Applied Fields: Psychophysiology, Brain Activity Measurement, Equipment for Assessing Basic Processes, Ambulatory Assessment



QUALITATIVE METHODS

INTRODUCTION

Qualitative assessment represents a particular methodological paradigm. A paradigm can be viewed as a system of inquiry marked by distinctive epistemological foundations, corresponding conceptual assumptions, and characteristic methods and modes of procedural practice. This entry discusses those ideological foundations, considers their assumptions, and traces their translation into the procedures and practices that jointly constitute qualitative assessment.

Qualitative methods (summarized in Table 1) are frequently described in contrast with quantitative methods. This distinction simultaneously sharpens and blurs distinctive features of each. By drawing attention to the preference of the former to attend to *qualities* of experience that extend beyond, or transcend, the *numerical indexing* that predominates in the latter, this distinction highlights their differences at the level of operations or outcomes. But this distinction has limitations, and the line is not always clearly drawn between them. For example, Jessor has observed that 'qualitative data lend themselves to be quantified and quantitative data can be interpreted' (1996: 6). Given this qualification, however, a number of distinctive features have been associated with qualitative forms of assessment, and these features follow from its distinctive epistemological commitments (Denzin and Lincoln, 2000).

FOUNDATIONS AND FEATURES

Key differences between quantitative and qualitative approaches follow from fundamental epistemological differences that, in turn, translate into different approaches to the development, utilization, and interpretation of data derived from these methods.

Foundations

The social sciences are broadly regarded as multiparadigmatic. This amounts to acknowledging that there is no single agreed-upon set of theories or methods that define them. Psychology, in particular, enjoys a range of approaches derived from the natural, social, and human sciences. In drawing a distinction between *quantitative* and *qualitative* methods, researchers and practitioners highlight a dimension that distinguishes methods on the basis of their epistemological assumptions. Quantitative approaches subscribe to the epistemological assumptions of the natural sciences. This view, that the objective study of observable variables is adequate to produce knowledge

Table 1. Examples of qualitative assessment techniques, instruments or methods

Technique, instrument or method (creator, when known)	Description	Main purpose(s)	Applications	Advantages	Disadvantages or limitations	References
Observation	A systematic description of events, behaviours, speech and artefacts in the naturally occurring setting.	Depends on the setting: it is the most popular technique in everyday life and the first step in inductive methods.	Some forms or elements of observation are always present in any research method.	• Applicable in ecological settings (naturalistic observation) • Flexible and adaptable to different situations • Open-ended and propositional • Can be used with other techniques, taking into account several variables • Can accommodate possible technological devices • Access to information that is usually hidden, as non-verbal cues	• Its use may bring ethical issues • Differently from most of the other qualitative approaches, 'findings' can be divorced from the experiential knowledge of those being observed • In naturalistic settings the observer affects the observed, changing behaviours in subjects of study (see 'Participant observation') • Sometimes difficult to interpret • Time-consuming	Bannister, P. et al. (1994), Chapter 2; Angrosino, M.V. & Mays de Pérez, A. (2000)
Participant observation (Malinowski, 1922)	Observation in which the researcher also occupies a role or part in the setting, in addition to observing. It combines: document analysis, interviewing of respondent and informants, direct participation and observation, and introspection. Three phases: 1 Descriptive observation 2 Focused observation 3 Selective observation	Understanding natural interactions and interpretations.	The same domain of application in observation (above). Mainly used in ethnography, education and research on social issues.	• Focus on meanings, interactions and understanding • Here and now of the everyday life situations • Open-ended, flexible, opportunistic • Adaptable to on-going, ever changing processes	• Limitation in the observer's observational perspective • Ethical issues • Need to 'go native': researcher's personal insights on the subject of study • Need for familiarity, psychological contact to and understanding of the subject	Flick, U. (1998); Jorgensen, D.L. (1989)

Ethnography	A multi-method form of research that involves participant observation, interviewing, narrative analysis, among others. Based on the sympathetic understanding and interpretation of a particular social phenomenon ('to go native'). It works primarily with unstructured data.	Social scientific description of people and the cultural bases of their personhood. Study of natural settings ('field research'), cultures, meanings and values.	Anthropology, sociology, social psychology, education.	• Multi-method approach • Attempt to understand the effects of the active participation of the researcher in the study • In-depth study of meanings in order to sympathize with the subject of study • Adaptable to different circumstances (open and flexible)	Investigation is limited to a reduced number of cases, usually one or two. Limited possibility of planning the research. Dependent upon the researcher's skills in each situation.	Bannister, P. et al. (1994, Chapter 3); Jessor, R. et al. (1996); Tedlock, B. (2000)
Focusing (Gendlin, 1978)	Technique for directing person's attention towards bodily targets, in order to increase feelings of personal wholeness, linking bodily sensations to personal experiences.	Overcome the split between body and mind.	Humanistic, experiential psychology and psychotherapy.	Helping clients access their experience by having them attend to and symbolize their bodily felt sense.	• Enhances emotional awareness • May amplify distress or dissociation • Requires minimal levels of cognitive and emotional processing	Gendlin (1978)
Repertory Grid (Kelly, 1955)	Elicitation and analysis of personal constructs (rows) applied to elements (columns).	Better knowledge of system organization through construct placement and relationships in the psychological space.	Clinical, counselling and personality psychology. Wherever it is important to identify and clarify the idiosyncratic dynamics of values and meanings.	Constructs can be either personally elicited or provided, permitting the comparision of different repgrids. Repertory grids can be analysed using software program.	The elicitation procedure can seem complicated. There is the risk for constructs and their relationships to be reified by the analyser, therefore forgetting the original constructivist conception of constructs as idiosyncratic, contextualized, inter-related, and dynamic descriptions of the person's 'invented' reality.	Fransella, F. & Bannister, D. (1977)

(*continued*)

Table 1. Continued

Technique, instrument or method (creator, when known)	Description	Main purpose(s)	Applications	Advantages	Disadvantages or limitations	References
Self-characterization (Kelly, 1955)	Self-description of the individual as the protagonist of a play. The draft is written in the third person by the individual as if s/he were being described by a hypothetical other who knows him/her very well.	To obtain the narrative description of the way the person is presenting her/himself.	Counselling and personality psychology, adult development and education, vocational psychology.	Easy to obtain. It allows clients to go beyond their initial concerns, describing themselves in a broader way.	• Generates a 'perspective shift' on part of the user • Engaging and informative • Can invite self-reflection and (re)construction	Fransella, F. & Dalton, P. (1990)
Vocational Card Sort (VCS) (Tyler, 1961; Dewey, 1974)	Semi-projective method: individuals project onto a set of cards with occupational titles their idiosyncratic classifications of occupations	Exploring idiosyncratic work interests, values, needs and goals for groups and/or individuals.	Vocational counselling, education.	• Can be used both for individuals and groups • Simple to administer • Categories produced are idiosyncratic and therefore individuals are not forced into a present limited framework • Flexibility • Multicultural applicability and adaptation • Individuals are full participants in the assessment process	• Requires individuals who are able to abstract and generalize • Is most useful in groups with very different work goals and different interests and needs	Goldman, L. (1983, 1992)
Friendship Inventory	On a sheet, the individual writes the name of each friend and for each, the person's age, ethnic identity, skin colour, marital status, religion, occupation, how long known, and other categories that the assessor wants to add.	To highlight major narratives in one's life, regarding social aspects and personal identities.	Counselling, education.	• Flexible and adaptable to the particular individual or group • Usable with people from different ethnicities and/or cultures	It is most useful with heterogeneous groups	Goldman, L. (1996)

				• Highlights cultural and social diversity • Great stimulus for group discussions • Easy to translate in other languages		
Certificate of Accomplishment	Participants are asked to place themselves at some point in the future and to assume that they have been selected as a recipient of a very special and important achievement. Individuals are asked to write the statement in the certificate.	Stimulate people to fantasize and project their important values and goals.	Individual and group counselling, education.	• It offers a special opportunity to reveal personal cultural differences about ambitions, expectations, perceived barriers, biases or racism	• Some cultures (i.e. Asian or Native American) may consider it is inappropriate to focus on one's personal accomplishments or ambition	Goldman, L. (1996)
The Life Line	The individual displays graphically on a sheet of paper the major events in her or his own life, with an indication of their effects on the person's current and future condition, feelings or status.	To help people to review their life histories and personal narratives. Increase awareness of their values, needs and factors that have contributed to their development and current status.	Individual and group counselling.	• Provides a development framework of the person • Enhances self-awareness and growth • Adaptable to almost every cultural or ethnic group • People provide their own structure, selections and categorization of events	• It risks giving events a linear causality, but helps to identify trends, themes or overall developmental trajectory for the person	Goldman, L. (1992, 1996)
The indescribable moment (Neimeyer, G.J., 2000)	A constructivist assessment technique involving interaction among two or more individuals that is designed to access a client's distinctive emotional and linguistic representational abilities.	• Identifying emotional and linguistic representational abilities • Encouraging reflection and reconsideration of powerful emotional experiences	Mainly used in group therapy, clinical training, and adult education and development contexts.	• Applicable in individual, couple, family, or group therapy contexts • Flexible and adaptable; invitation to 'consider any important experience that you have had that is hard to put into words for you', has broad range of applicability	• Relies on a capacity and context that assures trust • Requires willingness to suspend 'interpretation' in the interest of promoting 'discovery'	Neimeyer, G.J. (2000)

(*continued*)

Table 1. Continued

Technique, instrument or method (creator, when known)	Description	Main purpose(s)	Applications	Advantages	Disadvantages or limitations	References
		• Highlighting the dialogical nature of the construction of meaning. Allows for the identification of primary modes of representation (linguistic, metaphorical, etc.) and invites experiential deepening beyond currently available cognitive constructions.		• Enhances cohesion, emotional deepening, and effective working alliance in individual, family or group contexts • Accesses aspects of emotional experience not otherwise available in 'cognitive' accounts, and reveals idiosyncratic forms of representing them	• Careful description of experience can re-invoke that experience; for traumatic experiences this 'revivification' can be powerful and potentially threatening, even as it yields new possibilities for the deconstruction or reconstruction of the experience	
Interview	Characteristics that are common to different kinds of interview: • Emphasis on subjective meanings of the participants according to the topic of the interview • Investigating complex meanings and their relationships • Focus on specific areas of concern	Through a certain level of personal involvement and through interactions with interviewee(s), interviewers identify idiosyncratic meanings or world views that describe the individual or the group experiences.	Some forms or elements of interview are present in any research method	• Flexible • Attention to personal and specific issues raised by the interviewee • Do not tend implicitly to reduce or simplify meanings • Permits the understanding of views that may be inconsistent, incoherent or illogical to the interviewer	• Dependent upon the interviewer's skill and expertise • Risk for the interviewer to play a powerful role in the research relationship. As a consequence, there is a clear need for reflexivity: researchers have to reflect on the purposes of the interview and on a set of power relations such as class, race, ethnicity, gender, age, etc.	Kuale (1996)

					• It may not be suited to interviewees who belong to or identify with cultures that do not consider verbal language as a primary tool of communication	
1	Structured interview: the interviewer asks all respondents the same series of pre-established questions, often with specific rules about the order and the selection of the questions, which depends on the person's response to previous questions.	Broad type of contents	Marketing research, telephone interviews, interviews associated with survey research.	• It is not necessary to establish a relationship or to be involved with the interviewee(s). Being the most quantitative kind of interview, researchers may be attracted by specific features, as the possibility of studying single variables, the causal and logical model, the goal of controlling, predicting and confirming hypothesis, the deduction by statistical methods.	• Limited room for variation. Little flexibility and improvisation • Responses are coded according to already established criteria • Attempt to limit personal variation and interpretation related to the research relationship • Risk of response effects or non-sampling errors • Usually does not assess the emotional and more idiosyncratic dimensions	Fontana, A. & Frey, J.H. (2000)
2	Focused interview (Merton, R.K. & Kendall, P.L., 1946): interview about the impact of a specific topic that works as stimulus.	Analysis of subjective meanings.	Media research, counselling.	Its initial non-directivity enables personal expressions, and it reduces the imposition of the interviewer's frame of reference.	It is assumed that the features of the stimulus are objectively known.	Flick, U. (1998)

(*continued*)

Table 1. Continued

Technique, instrument or method (creator, when known)	Description	Main purpose(s)	Applications	Advantages	Disadvantages or limitations	References
	3 Semi-structured interview: the interviewer is guided by a schedule of questions or topics, which gives some order and direction to the interviewee's answers. The interviewer is partially free to modify the questions and follow up the person's responses.	Reconstructing and taking into awareness subjective assumptions, knowledge, and interpretation about a specific topic or area.	Counselling, psychotherapy.	Interviewers can tailor their questions to the interviewees' position, issues and comments.	• Deeply based for its implementation and interpretation on the relationship between the interviewee and the interviewer • Difficult mediation between the course of the interview and the interviewer's interests	Bannister, P. et al. (1994)
	4 Unstructured (open) interview: very close to participant observation. In a specific setting, the interviewer interacts with the interviewee with as little direction as possible. The interviewer is free to modify the questions and to follow up on the answers.	To understand complex behaviours and meanings without imposing any a priori categorization.	Ethnography, counselling, psychotherapy, social research.	• Very adaptable to different contexts and cultures, and to unexpected situations • Provides a great breadth of data • Transmits to the interviewee the feeling of deep and genuine acceptance by the interviewer	• It may be difficult or lengthy to have significant information about the topic of interest • It may not be suitable for less-verbal people	Fontana, A. & Frey, J.H. (2000)
	5 Narrative interview: the individual is asked to present the history of an area of interest, in which the interviewee participated, in an extemporaneous narrative.	• To expand or increase the consistency of the personal story about an identified area, from its beginning to its end • To highlight subjective development and coherence	Biographical research, counselling, life review in adult development.	• Allows the researcher to approach the interviewee's experiential world in the way the person presents it • Highlights the structure, the progression and the development of the person's history	• Generates substantial textual material in the transcripts of narrative interviews • The lack of structure may make the recognition of main narratives difficult	Polkinghorne, D.E. (1988); Flick, U. (1998)

6	Group discussion: systematic questioning of several individuals simultaneously in a formal or informal setting, with emphasis on group dynamics.	• Studying of group dynamics in their natural setting, and observing the production, expression, exchange, and negotiation of opinions among members • Analysis of common processes of problem solving in the group	Marketing research, group counselling and therapy.	• Has been used as an alternative to open interviews, with considerable time and money saving • Group discussions provide validating statements and views • A breadth of information from various points of view, with an anticipation of the potential dynamics that may be linked to specific topics or arguments • It may reveal how opinions are created and above all changed, asserted or suppressed in social exchange	• Difficulties in defining what is an optimal group (e.g. natural vs. artificial groups; homogeneous vs. heterogeneous; determining the role of the moderator) • Unpredictable dynamics and outcomes • As for semi-structured interviews, the mediation between the course of the discussion and the research topic may be difficult • Potentially, there may be difficulties in facilitating the development of group dynamics, and the integration of all the participants • Difficulties in comparing data from different groups	Fontana, A. & Frey, J.H. (2000); Flick, U. (1998)
7	Focus group (Merton, R.K., Fiske, M. & Kendall, P.L., 1956). A limited number of homogeneous members discuss a specific topic, within a permissive and non-threatening milieu. Inclusion and use of group interaction.	Data generation from participants' interaction and insights on experiences and beliefs.	Group counselling; marketing and media research; research on social issues (health, sexual abuse, etc.) and multiculturalism;	• Applicable in natural and social settings, typical of everyday life	• Its use is not always appropriate (i.e. when it is necessary to share confidential information). Participants may not feel comfortable with each other.	Morgan, D.L. (1998); Madriz, E. (2000)

(*continued*)

Table 1. Continued

Technique, instrument or method (creator, when known)	Description	Main purpose(s)	Applications	Advantages	Disadvantages or limitations	References
		Development of alternative interpretations through meaning discussion and negotiation with other members. Generation of hypothesis.	programme evaluation; development of survey instruments; alternative to test validation (use of the group for finding alternative interpretations of data obtained from other methodological procedures).	• Accentuates empathy, commonality of experience and fosters self-disclosure and self-validation among participants and in that part of the population that can identify with the group. At the same time it emphasizes diversity and differences from discussions and negotiations. Generates awareness and consciousness by developing interactive data and by contributing to the social construction of meaning. • Easy to use with other methods (i.e. observation, personal interviews)	• Difficult to generalize from the research results	Kvale (1996)
	8 In depth interview: the conversation does not use present questions, but is shaped by a defined set of topics or dynamics between the assessor and the interviewee.	Exploring personal and deep issues or topics in detail.	Counselling psychology, psychotherapy.	It allows the exploration of deep idiosyncratic meanings that play a significant and ordering role in the person's system, both psychological and social.	• It requires a good relationship between the interviewer and the interviewee in order to reach a satisfactory depth • Requires expertise by the assessor	

about the structure of reality, remains the predominant one in the behavioural sciences today. In contrast, qualitative methods assume that knowledge is an interactive and emergent phenomena, necessarily grounded in the context, and bounded by the perspectives that gives rise to it. This latter perspective has developed in relation to conceptual shifts within the philosophy of science over the course of the last century.

Nearly a century ago, for example, Max Weber (1906/1949) criticized the positivistic aspiration towards absolute knowledge by situating objectivity in the method(s) of inquiry rather than in the properties of the object or events being studied. By articulating the tacit agreement among 19th century scientists that the object imposes or determines the method, Weber drew attention to the alternative viewpoint that the method and the subject both play roles in the construction of the object. In this way Weber presaged much of this century's development in relation to qualitative assessment. Fundamental to this assessment is a blurring of the boundaries between subject and object, between the knower and the known, highlighting the thorough going interrelationship of each with the other. The focus turns from understanding the independent qualities of an objective, knowable, stable, and universal object, to the contextualized interpretation or co-construction of the events or experience from a particular perspective. According to this viewpoint, scientific inquiry 'is, therefore, no passive copying of reality but is, rather, an active construction or constitution of it' (Madison, 1988: 17).

A number of different typologies have been offered to distinguish among the variety of qualitative paradigms currently in use within the social sciences. Polkinghorne (1984), for example, distinguished among human action inquiry, the systems framework, and qualitative research models as three predominant alternatives to traditional quantitative approaches. Alternatively, Hoshmand (1989) distinguished among phenomenological, naturalistic-ethnographic, and cybernetic paradigms. Specific techniques representative of these qualitative orientations include such strategies as participant-observation, archival research, ethnographic observation, oral history methods, life history or review methods, the qualitative comparative method, or the use of critical incidents or qualitative interviews. Further information concerning these approaches and their distinctive epistemological positions can be found in the work of Madison (1988), Hoshmand (1989), and Taylor, Marienau and Fiddler (2000).

Practical Features

The epistemological foundations of qualitative methods are expressed in a number of common features. These features represent distinctive inflections that are shared, to a greater or lesser extent, by a wide range of qualitative methodologies. These commonalities include similarities in their (a) purpose, (b) roles played by the participants, (c) procedures and processes, (d) data and data analysis and (e) standards of knowledge that are applied to the data generated.

Purpose of Assessment

The purpose of qualitative assessment often centres on an understanding or articulation of meanings. These meanings are understood as co-constructed interpretations that arise out of the interaction between or among participants in the assessment procedure. For this reason many qualitative methods have been called interpretive methods. Their goal is the development of meaningful understandings through the systematic application of personal and social processes that illuminate useful courses of action. By comparison with traditional, quantitative methods, qualitative assessment generally places greater emphasis on description and discovery than on hypothesis testing or verification, per se.

Roles of Participants

The roles of the individuals involved in qualitative assessment can vary widely, but are commonly regarded as more open, reflexive and collaborative than in their quantitative counterparts (Kvale, 1996). Qualitative methodologies place greater emphasis on the researcher as an instrument of inquiry, and encourage the development of a more collaborative, mutual, or dialogical process in relation to the individual being assessed. Participants are regarded as 'co-investigators' in the process of assessment, and they are often consulted regarding the meaning or interpretation of the results. Implicit in this posture is the relative deconstruction of

the power relationship between the participants, and an admission that all outcomes, regardless of the paradigm that yields them, are ultimately human constructions that cannot exist outside of the realm of the interpretive, human process that yields them. In short, there is no 'objectivity', only perspectively embedded interpretations offering varying degrees of consensual validity and/or pragmatic utility. As Polanyi (1958: 3) has noted, 'as human beings, we must inevitably see the universe from a centre lying within ourselves and speak about it in terms of a human language shaped by the exigencies of human intercourse. Any attempt rigorously to eliminate our human perspective from our picture of the world must lead to absurdity.'

Procedures and Processes

The processes and procedures of inquiry are relatively organic or emergent. This process is designed to allow for greater discovery, to encourage unplanned 'backlooping' or re-assessment, and to facilitate decisions to alter the course of the assessment in relation to the data that emerge from it. In short, they entail 'a continuous movement between emerging conceptualizations ... and empirical observations' (Denzin, 1970: 186). Because the process of assessment is continually open to feedback, it discourages premature closure, and instead invites a more mutual and provisional ending to the assessment procedure. Importantly, qualitative procedures can challenge the standardization and uniformity of common quantitative procedures. Because they have a more emergent, unfolding quality, their structure often is more complex, more idiosyncratic, and more fluid. Qualitative procedures place a premium on emergent understandings over procedural uniformity, introducing greater variability into the application or utilization of any given method or assessment technique.

Data and Data Analysis

In contrast to quantitative methods, qualitative methods tend to embrace more contextually 'whole' data, and to adhere less exclusively to a preplanned linear sequence of steps or procedures in their analysis. Many qualitative approaches retain a commitment to holism, preserving the natural categories and context in which the data occurs. One consequence of this commitment is that qualitative data tend to suffer less reduction than their quantitative counterparts which, in turn, invites the intensive study of distinctive features of experience. 'Human psychological phenomena such as anguish, fear, joy, grief, anger, love, sadness, etc' (Ashworth, Giorgi & de Koning, 1986: ix) all become the legitimate object of assessment, as do other phenomena that are not easily reduced to numerical indexing and discrete variables.

Strategies for analysis and interpretation vary widely. Some data analytic techniques are phenomenological and hermeneutic, directed at understanding the intersubjectively shared expressions and/or personal meanings of the participants involved in the assessment. These approaches tend towards what has been called 'thick description' (Geertz, 1973) insofar as they reflect a commitment to inductive observation and rich description. The perspective of the participant receives a position of primacy, and the natural meaning categories used by the participants often replace or expand the predefined theoretical units established by the interviewer or researcher. The *constant comparative method* illustrates one means for analysing this kind of qualitative data. This inductive procedure combines systematic coding with ongoing theoretical formulations. The investigator first codes each bit of data (e.g. sentence, meaning unit, response, etc.) into as many categories as possible. As further categories emerge, the investigator considers possible theoretical properties of the category, its relationships to other categories, and the contexts or conditions under which it is evidenced to a greater or lesser degree. This process requires a continual re-reading of the data and ongoing refinement of the categories and the interrelationship among those categories. The final set of categorization represents a mosaic of meanings, used to construct, support, or revise a theoretical picture of the phenomenon being studied. While 'messy', such thick-descriptive data are likely to be superior to quantitative data in the characteristics that are more important in holistic work than precision and reproducibility (Kvale, 1996).

Criteria of Knowledge

Qualitative strategies share with their quantitative counterparts a commitment to scientific inquiry

and the pursuit of knowledge based on that inquiry. But these methods define this pursuit and its objectives in somewhat different terms. From a quantitative position, truth can be defined according to criteria that address the accuracy of the method in relation to its approximation of reality ('validity'), and its capacity to reproduce its measurement results ('reliability'). The underlying notion is that reality can be approached and revealed through progressive scientific inquiries. Like quantitative methods, qualitative approaches are concerned about making knowledge claims and advances. But, because qualitative methods concede that reality is neither singular nor stable, neither universal nor ahistorical, it must rely on alternative forms of validity for making its knowledge claims. While qualitative methods would reject the notion that there 'is an interpretation which is "correct in itself" ... it is not providing a license for subjectivism, arbitrariness, or irrationality. One is still left with a perfectly good, intersubjectively valid basis for arguing for or against various interpretations. To argue, for instance, that interpretation 2 is more coherent, more comprehensive, and so on, than interpretation 1, is an ample and sufficient reason for deciding to accept it and to take it as "true"' (Madison, 1988: 33).

Elaborating on this concept, Guba and Lincoln (1994) translate the traditional criteria of internal validity, external validity, reliability and objectivity into the corresponding criteria of credibility, transferability, dependability, and confirmability. Kvale (1996) and others consider validity to include communicability, ecological fit, and pragmatic validity. Other scholars have emphasized a variety of alternative criteria for use in adjudicating alternative interpretations and making provisional knowledge claims. These include criteria such as the internal coherence of the interpretation (its harmony with the conceptual whole that it serves), comprehensiveness (its capacity to account for the breadth of available data), contexuality (its ability to retain sensibility within the context from which the work derives), agreement (its articulation with previous knowledge, accounting for, or extending, that which was previously known), and suggestiveness (its 'fertility' in relation to stimulating further inquiry or research). Under these expanded views of regarding the criteria for validity, knowledge claims are understood as socially constituted phenomena; their criteria are derived from and bounded within social and historical contexts. 'The notion that one can "test" interpretations and subject them to scrutiny in the light of the relevant evidence such that objective conclusions can be reached,' observes Madison (1988: 31), 'is a purely utopian notion. This, however, does not mean that interpretation cannot be a rigorous (if not an exact) discipline ... and that one cannot rationally evaluate interpretations.' Qualitative methods satisfy the criteria for knowledge claims through rigorous procedural applications and rational interpretive mechanisms. These methods emphasize the context-bound nature of the conclusions that are drawn, as well as their practical implications for the individuals and cultures involved. Moreover, many qualitative methods impose the additional expectation that the findings must emerge from and be sensibly interpreted within the dialogical relationship between the investigator and his or her participants.

ILLUSTRATIVE METHOD

As an illustration of qualitative assessment in a group therapy context, members might be asked to select and describe their experience of a common, powerful emotion (e.g. depression, anxiety, loneliness). Each member describes his or her experience of the designated emotion in response to open-ended questions from another group member. While one member is serving as the 'teller' and the other is serving as the 'listener', the remaining group members are serving as 'observers'. Members take turns in these roles until everyone has had an opportunity to serve in each role.

The teller's goal is to convey the nature of his or her experience as clearly and fully as possible. The listener's goal is to facilitate the teller's telling in whatever ways(s) she or he can. Open-ended questions, requests for more detail or clarification, or emphasis on particular facets of the feelings may be helpful. Observers' goals include watching for the processes of meaning-making, noting the kinds of interaction that enhance or impede the (co)construction of meaning, and the way(s) in which the experience of emotion is constructed across various tellers.

Neimeyer (2000) describes a number of ways in which data emerge from this kind of interaction, and the value that can be drawn from performing this qualitative assessment. Grounded in their shared roles as listener, teller, and observer, a wide variety of questions can encourage reflection and emotional processing based on this experience. *Role-based* questions (e.g. 'What was the experience of telling/listening/observing like for you, and did it carry or develop any images or feelings?') help deepen the experience and emphasize the co-constructed nature of whatever meanings are ultimately produced or recorded. *Interactive* questions (e.g. 'What was most/least helpful for you as a listener/observer in trying to facilitate the telling?') can highlight the emergent and progressive aspect of meaning-making. And *Emotion-focused questions* (e.g. 'What happened to your feelings as you talked about them; in what ways did they change, move, unfold, or otherwise come to life across the telling?') can highlight idiosyncratic processes associated with emotional expression and transformation.

Common experiences that can emerge from such assessments include:

1. An awareness that the articulation of meaning is an imperfect, effortful and emergent process, both as a teller and a listener.
2. Meaning-making is a developmental process that requires an unfolding across time.
3. Experience is co-constructed. Meaning is made in relation to others; it is an emergent and interactional, rather than stationary and intrapersonal, phenomenon.
4. Describing and experiencing have a dialectical relationship with one another; detailed description of experience can reinvoke aspects of experience, and that experience can yield new possibilities for further description.

Detailed descriptions of a wide range of such qualitative strategies for use in clinical, educational, and developmental contexts can be found in Taylor, Marienau, and Fiddler (2000). All of these strategies share a commitment to the experiential, interpretive, and constructed nature of meaning-making, and for that reason can be understood as falling within phenomenological and constructivist traditions of qualitative assessment.

FUTURE PERSPECTIVES

Among the most prominent developments within qualitative methodologies is the use of computer programs for analysing narrative data. The use of computer programs simplifies the coding, analysis, retrieval, and interpretation of text-based information. As a consequence, these programs help researchers organize and simplify concepts and develop effective models for conceptualizing available data. Overviews of programs for the analysis of qualitative data can be found from the program developer's point of view (Richards & Richards, 1994) and from the user's perspective (Weitzman & Miles, 1995).

Among the most popular programs is NUD*IST (Non-numerical Unstructured Data Indexing Searching Theorizing; Richards & Richards, 1991). Based on the assumptions of grounded theory, it provides a 'tree-structure' of concepts derived from text-based data. An alternative program that creates relational networks from textual data is ATLAS/ti (Muhr, 1991), which provides similar indexing and coding capabilities. While programs such as these facilitate data analysis and interpretation, their use with qualitative data has been questioned in relation to their impact on 'those procedures in the data interpretation which are less or not at all compatible with computer programs' (Flick, 1998: 257).

CONCLUSIONS

The social sciences remain multi-paradigmatic, drawing from the natural, social, and human sciences. The combination of various methodologies in the study of the same phenomenon constitutes a form of 'triangulation', a metaphor borrowed from military strategy where multiple reference points are used to pinpoint an object's exact location. Broadly speaking, convergence between methods enhances our belief that the results are valid and not a methodological artefact.

The joint use of qualitative and quantitative approaches represent a form of methodological triangulation, a common practice in clinical contexts. The triangulation of methods provide an array of data that are useful in their points of divergence, as well as convergence. Convergent data support the nature of the clinical assessment,

whereas points of divergence yield new areas to explore. The combination of various sources of information is consistent with recent shifts within the philosophy of science and re-conceptualizations of the nature of scientific inquiry. In this regard the use of qualitative assessment is designed to diversify, not replace, available forms of quantitative assessment because, as Polkinghorne (1991: 103) has noted, 'only the call for diversity is consistent with contemporary philosophy of science'.

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Greg J. Neimeyer and Marco Gemignani

RELATED ENTRIES

Theoretical Perspective: Constructivism, Autobiography, Idiographic Methods, Subjective Methods, Projective Techniques, Personal Constructs

QUALITY OF LIFE

INTRODUCTION

The pursuit of quality of life (QL) is so central to human existence that the question of what is QL and what variables influence QL has been the focus of intellectual debate and scientific investigation from the time of the early philosophers. Current research on QL encompasses many disciplines and issues, including psychology, sociology, medicine, nursing, pharmaceutics, economics, education, architecture, geography, business marketing, the arts, income, employment, and community and environmental concerns.

In 1976, Campbell, Converse, and Rogers published a book that would become a classic, *The Quality of American Life*. Campbell et al. described QL as a vague and ethereal entity, something that many people talk about, but which nobody has a clear idea of what it is. The work by Campbell et al. inspired researchers to search for an accurate definition of QL and to develop QL measurement instruments. A mere glance at the numerous publications recently dedicated to the study of QL would give the reader a fair idea of how highly influential this subject has become at both the basic and applied levels of scientific inquiry. In 1975, the term 'quality of life' was adopted as a 'key word' by the Medical Subject Headings of the US National Library of Medicine to classify research in their computerized search system, MEDLINE. Since then, numerous books and other publications have been exclusively devoted to the study and measurement of QL. Among the many books that have outlined appropriate steps in developing and testing new QL measures, the following stand out: *Quality of Life Assessment. Key Issues in the 1990s*, edited by Stuart R. Walker and Rachel M. Roser in 1993, *The International Assessment of Health-Related Quality of Life. Theory, Translation, Measurement and Analysis*, edited by Sally A. Shumaker and Richard A. Berzon in 1995, *Cross Cultural Health Outcome Assessment: A User Guide*, edited by A. Hutchinson, N. Bentzen, and C. König-Zahn in 1997, and the *Compendium of Quality of Life Instruments*, 5 vols., compiled by Sam Salek and published in 1998. There are now two QL-specialized journals and one electronic catalogue dedicated to investigation of QL issues. *Quality of Life Research* and the *Journal of Happiness Studies* first appeared in 1992 and 2000, respectively. The On-Line Guide to Quality of Life Assessment is a computerized system of programs and databases in the area of health and quality of life assessment that provides guidance on the choice of assessment techniques for specific clinical trials and research projects. This system complements the many large international electronic databases that are so helpful in facilitating the search of QL publications (MEDLINE, CINAHL,

EMBASE, PSYCLIT, PSYCINFO, CLINPSYCH, SOCIOFILE).

THE CONCEPT OF QUALITY OF LIFE

It is important to re-emphasize that QL does not refer to a clearly defined entity with a universally accepted measurement procedure. It is a complex, multifaceted concept which continues to defy consensual definition (Fernández-Ballesteros, 1998). The term QL represents a broad range of domains or dimensions of human existence, ranging from the procurement of basic needs (e.g. food and shelter) and material necessities and goods in general (e.g. means of transportation) to the achievement of a sense of personal fulfilment and happiness. Although there is no consensus on the definition of QL, experts agree that QL is a universal human concept that encompasses both behavioural functioning and subjective psychological well-being. Interestingly, although people from different cultures may differ with regard to the specific basic conditions they have available to them to strive for a good QL, they do not necessarily differ in their reports of how happy and satisfied they are. That is, a person's subjective perception of QL is not a linear reflection of his/her life conditions. This finding does not imply that societal improvements of life conditions are irrelevant to the betterment of QL but draws attention to the fact that human perception may be the most important common denominator in QL research.

Authors have proposed definitions of QL in terms of satisfaction with different life domains, ranging from the material and financial to the political and other aspects of well-being (see Table 1). To date, the domain that has drawn the most investigation and interest is the subject of 'health'. The two main objectives of health care are to increase longevity and to improve QL in the years before death, with QL defined as level of behavioural functioning or the ability to 'do stuff' (Kaplan, 1994). Thus, it might be important to distinguish between QL in general and *health-related* QL (HrQL) in particular (Kaplan & Bush, 1982; Jenkins, 1992). In contrast with the global term QL, HrQL is more descriptive, focuses on dimensions of health status, and directly links QL

Table 1. Selected definitions of quality of life and health-related quality of life

Quality of Life
The subjective perception of satisfaction or happiness with life in domains of importance to the individual (Oleson, 1990).
The multidimensional evaluation, by both intrapersonal and socionormative criteria, of the person–environment system of an individual in time past, current and anticipated (Lawton, 1991).
A concept encompassing a broad range of physical and psychological characteristics and limitations which describe an individual's ability to function and to derive satisfaction from doing so (Walker & Rosser, 1993).
The ability of the self to build and manage a balance between the body, mind and spirit in searching for a state of well-being and to establish and maintain an harmonious relationship with the environment (Albrecht & Devlieger, 1999).
Individuals' perceptions of their position in life in the context of the culture and value systems in which they live, and in relation to their goals, expectations, standards and concerns (WHOQOL Group, 1995).
The degree to which a person enjoys the important possibilities of his or her life in three main areas (being, belonging, becoming) (Raphael et al., 1999).
What a person does and how the person experiences what he/she does and be (Reig et al., 2001).
Health-related Quality of Life
The value assigned to duration of life as modified by impairments, functional states, perceptions, and social opportunities that are influenced by disease, injury, treatment, or policy (Patrick & Erickson, 1993).
The functional effect of an illness and its consequent therapy upon a patient, as perceived by the patient. Four broad domains contribute to the overall effect: physical and occupational function; psychological state; social interaction; and somatic sensation (Schipper et al., 1990).
Includes three Fs: feelings, functions, and futures; at least five levels at which human life is lived, including biological, psychological, interpersonal-social and economic; and quality of life data should be based as much as possible on observable or specific descriptive phenomena (Jenkins, 1992).
The subjective perception of the impact of health status, including disease and treatment, on physical, psychological, and social functioning and well-being (Leidy et al., 1999).

to the concept of disease or illness (see also Bullinger, 1997). For example, studies have shown that chronically ill patients are interested in their medical-test results (e.g. blood counts) to the extent that the tests predict future survival and behavioural functioning.

Thus a two-dimensional framework that includes behavioural doing (rewarding activities) and subjective well-being may provide the best measure of QL. Health and money can be seen as individual resources that may contribute but are not sufficient to living a life characterized by plenitude and happiness. Like Mihaly Csikszentmihalyi (1997) tries to convince us, the quality of our lives will be much improved simply by learning to love what we do and what we have to do. Other behavioural researchers even avoid talking about 'quality of life' as a single construct. These authors prefer to distinguish between specific *life qualities* that should not be lumped and added up into a single QL measure. For example, Ruut Veenhoven's model focuses on four separate qualities of life: (1) livability of the environment; (2) life-ability of the person; (3) utility of life for the environment; and (4) appreciation of life by the person (Veenhoven, 2000).

Table 2. Some of the quality of life instruments

Sickness Impact Profile (Bergner et al., 1976): measures the impact of illness on the patient's functional behaviour.

Quality of Well-Being Scale (Kaplan et al., 1976): measures performance and preference with regard to limitations in physical, self-care and social activities.

General Health Rating Index (Ware et al., 1978): deals with the patient's perception of health and the impact that disease has on physical activities.

Nottingham Health Profile (Hunt & McEwan, 1980; Hunt et al., 1986): evaluates the symptomatic evidence of sickness and its impact on daily activity.

Sptizer Quality of Life Index (Spitzer et al., 1981): aims to identify the components of quality of life and is primarily intended for monitoring cancer patients before and after therapy.

McMaster Health Index Questionnaire (Chambers et al., 1982): concerned with physical, social and emotional aspects of life without relating them to the symptoms of the patient.

The COOP Function Charts (Dartmouth COOP Functional Health Assessment Charts/WONCA) (Nelson, Landgraf, Hays et al., 1990): measures patient functional status through an overall assessment of biological, physical, emotional and social well-being, and quality of life in order to facilitate communication between patients and clinicians.

The European Quality of Life Scale (EQ-5D) (The EuroQol Group, 1990, 1993): consists of a questionnaire which classifies the individual into one of 243 health states (5 dimensions, each with 3 levels) and a visual analogue scale on which individuals rate their own health between 0 and 100. Provides a simple descriptive profile and an overall numeric estimate of QL which can be used for both clinical and economic evaluations of health care.

Medical Outcome Study 36 Item Short Form Health Survey (Ware & Sherbourne, 1992): designed to survey health status in clinical practice and research by evaluating health-related dysfunctions in eight areas of daily activity.

WHOQOL-100 (WHOQOL-BREF) (The WHOQOL Group, 1994, 1995): a measure of 24 facets relating to QL for use in a diverse range of cultures.

Quality of Life Questionnaire (Ruiz & Baca, 1993): measures the basic issues (social support, general satisfaction, physical/psychological well-being, absence of work overload/free time) that a healthy adult population considered important when quality of life was being evaluated.

Schedule for the Evaluation of Individual Quality of Life (SEIQoL) (McGee et al., 1991; Browne et al., 1994): allows individuals to nominate, weigh, and assess those domains of greatest relevance to their quality of life.

Questions on Life Satisfaction (FLZm) [Fragen zur lebenszufriedenheit Module] (Henrich & Herschbach, 2000): a standardized, economical questionnaire consisting of two modules (general life satisfaction and satisfaction with health) conceived of as measures of general quality of life and health-related quality of life, respectively.

Perceived Quality of Life Item [In general, would you say your *quality of life* is: very good; good; fair; poor; very poor] (Reig et al., 2001): a single-item self-report instrument which uses a single question to measure the concept of interest.

For sources see: Fernández-Ballesteros (1998) and Salek (1998).

THE ASSESSMENT OF QUALITY OF LIFE

The selection of an appropriate tool to measure QL is the most important task in the assessment of QL simply because measurements can only be as reliable and valid as the instruments used to obtain them. Table 2 lists some of the many available QL measures that have been useful in advancing our understanding of QL.

Research results obtained with the instruments listed in Table 2 indicate that outcome evaluations of most healthcare interventions are not valid without the patient's subjective evaluation of the outcome. These results also concur in that QL is a dynamic construct where by a person's attitude toward a particular aspect of QL may change over time through such psychological phenomena as adaptation, coping, or expectation.

This body of research has also contributed to identification of variables that are associated with poor QL (e.g. old age, being female, low educational attainment, living without a partner, and disorder comorbidity). However, researchers have also noted that although physical functioning declines with advancing age and with the development of chronic disease, mental health remains remarkably stable and independent of chronic disease and advancing age. Moreover, perceptions of personal health, well-being, and life satisfaction are often uncorrelated or discordant with medical health status and degree of disability. This phenomenon has been called the 'disability paradox' (Albrecht & Devlieger, 1999).

The disability paradox can be defined in two ways. On the one hand, it seems impossible that people with disabilities can report having a good or excellent QL and at the same time indicate they encounter serious limitations in their performance of daily activities and of social roles, as well as being the target of persistent discrimination. It is also contradictory that while over 50% of individuals with disabilities report enjoying a good or excellent QL, laymen, physicians and healthcare professionals continue to perceive individuals with disabilities as having a poor QL. From either perspective, the point is that instruments that equate QL with health and physical normalcy ignore that individuals can adapt and cope with health and physical restrictions.

If QL measures show that many of those living with health problems are in fact in far-better shape than objective measures would predict, the assumptions underlying the evaluation of health-related outcomes must be reconsidered. Albrecht and Devlieger (1999) posit that the relationship between objective medical health and subjective perceptions of QL results from a balancing act between a person's body (organic and physical function dimensions), mind (rational and intellectual capacities of the self) and spirit (recognition that the self is part of a higher being or that having a purpose in life larger than and extending beyond the self). These authors argue that whereas illnesses and dissatisfaction with life reflect distortions of the body–mind–spirit balance, good QL in the presence of adversity reflects a reconstituted balance. As a holistic concept, quality of life goes beyond disease categories and daily activities and directs attention to the more complete social, psychological and spiritual being. From this perspective, one-dimensional instruments are ill designed to capture the complex processes that interrelate social contexts, emotional adaptation and dynamic subjective perspectives into shaping the QL of individuals.

Various methodological issues and a number of technical and practical considerations need to be considered in selecting QL and HrQL instruments. Methodologically, psychometric considerations, such as reliability, validity, discriminatory power, and responsiveness to change, are important. Technical considerations include choosing among the many types of QL measures, which are generally classified as global, individual, generic, specific (for therapeutic/function, condition, situation, population), battery, and utility or preference instruments. For example, generic instruments are designed to measure QL over a wide range of populations, medical conditions, and personal functioning. On the other hand, specific instruments are a better choice when the investigator wants to focus on the problems associated with specific diseases, disabilities or patient groups. Yet another preferred solution could be taking a modular approach, where a generic and widely applicable core of items would be supplemented by more specialized scales. Technical aspects also include a wide variety of other choice decisions ranging from response formats (e.g. true/false vs. multiple choice), scaling (e.g. 1–10 vs. 0–3) and weighting techniques, instrument length (e.g.

single-item vs. multiple items), and report presentation (e.g. indices vs. profiles) to the degree to which the instrument will be sensitive across languages and dialects, customs, beliefs and cultures.

Practical considerations go beyond the question of whether or not the data will be useful or applicable to real-life situations. Practical considerations may guide decisions that include selecting (a) when, where and how long it takes to administer the instrument, (b) the administration method (direct observation, face-to-face interview, telephone interview, self-administered questionnaires, proxy respondents), (c) strategies that increase responding ratios, (d) methods of data processing and analysis that minimize error, (e) methods associated with low administration costs, (f) ways of reducing discomfort to the participants, (g) how to train personnel to standardize the data collection process, (h) methods for data diffusion and presentation, and (i) ways to assure that ethical considerations are respected (e.g. confidentiality). These decisions are very important and can dramatically influence experimental findings. For example, in studies investigating the QL of clients or patients, informal or formal caregivers can provide proxy evaluations that add or complement the patients' self-report evaluations. In comparison with patients' self-reports, these studies often find that proxy respondents tend to report lower functioning and lower quality of life of the patients.

FUTURE PERSPECTIVES

Despite considerable methodological and analytical advances over the past two decades, further work is required. Recent studies during the 1990s have benefited from and contributed to: (a) the increase knowledge of effective formatting methods that benefit data quality (Mullin et al., 2000); (b) the development of shorter measures (e.g. COOP/WONCA charts; SIP-30; SF-24; NHP-12) that decrease the burden on patients; (c) more sophisticated analytic techniques and better approaches to interpreting results; (d) new theoretical models; (e) the development of individualized measures; (f) the emergence of computerized testing; (g) the inclusion of QL information to administration bases; and (h) more careful consideration of ethical concerns (Wood-Dauphinee, 1999).

There are many theoretical models that attempt to explain and identify the determinants of QL using both objective and subjective QL indicators. The names of these theories are: Standard Needs Approach, Bottom-Up Influences, Relative Standards, Social Production Function Theory, Psychological Processes Approach, Culture, Personality and Genetic Predisposition Theories, Discrepancy Theories, Goals Theory, Adaptation and Coping Theory, and the Evaluation Theory (see Browne, McGee & O'Boyle, 1997; Diener & Lucas, 2000). Although each of the theories is supported by evidence, none of the models by itself explains all of the data.

Important advancements to cross-cultural instrument development come from several research groups. *The European Group for Quality of Life and Health Measurement Group* uses the *Nottingham Health Profile*. The *European Organisation for Research and Treatment of Cancer* initiated the development of the *EORTC Quality of Life Questionnaire* in 1986. *The International Quality of Life Assessment Project Group* was formed in 1991 and developed the *SF-36 Health Survey*. *The European Quality of Life Project Group* contributed to the development of the *EUROQOL Questionnaire*. Finally, the *World Health Organization Quality of Life (WHOQOL) Group* was formed with the aim of developing a quality of life instrument by simultaneous study in different cultures.

CONCLUSIONS

QL and HrQL measures are used for the purpose of (a) understanding the determinants, causes and impact of QL within individuals and across groups, (b) assessing and monitoring the impact of social and environmental conditions on QL, (c) evaluating the outcome of the effects of health and social policies, and of clinical interventions, and (d) helping policy-makers (e.g. allocating resources in relation to need). QL information can also be useful for promotional purposes to industry and formulary listings of providers. Clearly, such wide range of purposes is not likely to be satisfied by any single questionnaire or indicator. An instrument designed for one purpose (discriminative, predictive, or evaluative) will not necessarily work well when used for

another purpose because the properties required in any given instrument depend on the specific purpose for which the instrument will be used (Leidy et al., 1999; Wu & Cagney, 1996).

There is a considerable variation in the quality and sophistication of the available QL measures. This variability may be the result of the relative newness of the field, where the development of QL instruments is a recent endeavour compared with measurement advances in the fields of personality, intelligence, or public opinion. Nonetheless, assessment of the patient's experience of disease and treatment is now acknowledged as a central component of healthcare and healthcare research. Research findings in the area of QL have great potential for contributing to alleviate suffering, minimize discomfort and morbidity, and improve medical health and subjective well-being. Thus, continuous efforts to improve upon current QL assessment efforts should prove to be a worthy human endeavour.

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Abilio Reig-Ferrer

RELATED ENTRIES

Applied Fields: Health, Health, Well-Being

RELIABILITY

INTRODUCTION

Reliability as a central concept of test theory dates back to the beginning of the 20th century. It is based on the existence of intra-individual variability as well as variation between persons. With intra-individual variability or measurement error, true score was also introduced as a central concept of classical test theory. Observed score variance could then be thought of as true score variance plus error variance. The reliability of a test, rating scale, assessment or any other more or less standardized procedure within a given (sub)population of persons (or other objects of measurements, e.g. classrooms) is defined as the ratio of true score variance to observed score variance or as the squared correlation between observed scores and true scores (Lord & Novick, 1968: 61):

$$\rho_{XT}^2 = \frac{\sigma_T^2}{\sigma_X^2} = \frac{\sigma_T^2}{\sigma_T^2 + \sigma_E^2} (= \rho_{XX'})$$

Its minimum value is zero, its maximum value one. As will be demonstrated, the definition is not very useful until we have defined precisely what we mean by 'error'.

After the 1960s, Item Response Theory, IRT for short, became an influential approach in test theory. With IRT person parameters on a latent scale replace true scores. At first sight, there seems to be no place for reliability within the context of IRT. It can be demonstrated, however, that reliability is an important concept in the newer test theoretical approach also.

RELIABILITY AND SOURCES OF VARIATION

When the length of a person is measured repeatedly, we notice small differences in the reading of the length: there is error in the measurements. The same is the case in measuring a person's characteristics in psychological testing. When an intelligence test would be administered to a person repeatedly, we would expect scores to vary: again there is measurement error. Unfortunately, the experiment of repeatedly testing a person with the same measurement instrument is seldom done; in practice we should expect memory effects. Instead, we could administer two tests meant to measure the same construct. Then a score difference might not only be due to chance fluctuations in item responses, but also to differences in content. Many more sources of variation can be thought of; for example, systematic fluctuation of responses over time. Sources of variance due to person characteristics can be classified as lasting or temporary, and lasting or specific. Further, there are factors affecting test administration and there is a category for variance not accounted for

otherwise. Most of the sources of variation in responses might be regarded as a source of error variation, but the same sources might be regarded as sources of true variation, depending on the purpose of the test administrator. Let us give an example, mentioned by Stanley (1971: 366), who discusses the subject of sources of variation extensively. A person may be fatigued on the day of testing and this influences test performance. When our interest is to predict performances over some period, reliability would be consistency over time. When the intercorrelations among tests administered at the same session are studied, consistency at that session is relevant. So, the definition of error depends on the purpose of the investigator, and this should determine the choice of reliability coefficient(s).

RELIABILITY COEFFICIENTS: PARALLEL-TEST, TEST–RETEST METHOD AND SINGLE-ADMINISTRATION

A parallel test is defined as a test on which true scores and error variances are identical to those of the first test: two parallel tests are exchangeable. If we administer two parallel tests in one test session, we can easily obtain a parallel-forms reliability or equivalence coefficient. The reliability of either of the two tests equals the correlation between both tests. There are several disadvantages, however. First, theoretically there is no unique set of parallel tests. This advantage can be circumvented by precisely describing the characteristics which makes tests parallel. Second, parallelism of tests can only be verified when we have at least three tests. Alternative models that may be used for the estimation of reliability are: tau-equivalent tests, essential tau-equivalent tests and congeneric tests. In tau-equivalent tests true scores are identical, but error variances are unequal, in essential tau-equivalent tests true scores are identical apart from an additive constant, and in congeneric tests true scores on different test forms are linearly related. A reliability estimate based on the assumption of congeneric test forms can be obtained for three or more tests. The hypothesis that tests conform to the congeneric test model can, however, only be tested when at least four different tests are administered. Finally, the extra time needed for administering another test might be difficult to get or might instead be used for lengthening the original test, making this test more reliable.

A special case of alternate forms arises when behaviour is rated by two or more raters. The interrater correlation seems to be the obvious choice as a reliability coefficient, but it neglects differences in e.g. rater severity. An alternative approach is to use generalizability theory. When raters have only a few observational categories at their disposal, frequently a nominal measure of agreement (see Cohen, 1960) is used instead of a reliability coefficient.

Another method to obtain test reliability is to administer the same test again on a second occasion. When the interval between the two occasions is small, there is a large risk that persons remember their responses at the first occasion. With a larger time interval the risk that persons have changed is large. So, the test–retest method is useful only when the characteristic being measured is a stable characteristic. The resulting reliability coefficient is therefore called a stability coefficient. When a stability coefficient is used, it is important for the test developer to report the time interval of the reliability study as information on details is always important (Standards of Educational Testing, APA, AERA & NCME, 1999: 32).

There is a third method for the estimation of reliability, based on a single administration of a test. This approach is viable when a test is not speeded and consists of several parts or items. The various estimates suggested with this approach are discussed in the next section.

Table 1 gives an overview of the major approaches to reliability estimation and the corresponding reliability coefficients.

RELIABILITY COEFFICIENTS BASED ON A SINGLE ADMINISTRATION OF A TEST

Assume that a test can be divided into two parallel part-tests; this might be done by pairing similar items and allocating the two items to different part-tests. Then the reliability of both half tests is obtained as the correlation between the two part-tests. The reliability of the total test

Table 1. Major approaches to reliability estimation

Reliability coefficient	Major error source	Data-gathering procedure	Statistical data-analysis
(1) Stability coefficient (test–retest)	Changes over time	Test–retest	Product-moment correlation
(2) Equivalence coefficient	Item sampling from test form to test form	Give form j and form k	Product-moment correlation
(3) Internal consistency coefficient	Item sampling; test heterogeneity	A single administration	(a) Split-half correlation & Spearman–Brown correction coefficient alpha (b) λ_2 (c) Other

can be obtained using the Spearman–Brown formula for a lengthened test

$$\rho_{X(k)X'(k)} = \frac{k\rho_{XX'}}{1 + (k-1)\rho_{XX'}}$$

where k is the factor with which the test must be lengthened (in this case $k = 2$). Several other coefficients have been suggested based upon a split of a test into two or more parts. An overview of coefficients is given by Feldt and Brennan (1989). We mention a few coefficients.

When a test has more than two parts, a split into two parts is arbitrary. Several coefficients have been proposed in which all items or units or testlets play a symmetrical role. The units might include several items thought to have correlated errors; this might be the case when, for example, a number of items is related to a particular text.

The most popular coefficient is coefficient alpha,

$$\alpha = \left(\frac{n}{n-1}\right)\left(1 - \frac{\sum \sigma_i^2}{\sigma_X^2}\right)$$

which can be simplified to KR20 for dichotomous items. It is a lower bound to reliability. In many situations, however, the coefficient gives a reasonably accurate estimate of test reliability; it is equal to reliability if items are essentially tau-equivalent. Researchers have sought for better lower bounds; they even have sought for the 'greatest lower bound' to reliability (Ten Berge, Snijders & Zeegers, 1981). A better lower bound to reliability than coefficient alpha is Guttman's λ_2. Presently, coefficient alpha is available in statistical software packages. It can also easily be computed with a spreadsheet. Guttman's λ_2 is also available in present-day software.

Another approach to test reliability is to split the test into several parts thought to be congeneric. Estimated model parameters of the congeneric test model can be used for the computation of the reliability of the total test. With three part-tests the computation is easy, but the model assumptions cannot be verified. With more than three part-tests a program for structural equation or SEM modelling like EQS or LISREL must be used (Jöreskog, 1971). More in general, fitting SEM models results in estimates of psychometric characteristics of the tests involved in the model.

With random sampling of dichotomously scored items, where each examinee responds to a different sample of items, another reliability coefficient is relevant: KR21, in the past known as an approximation to KR20.

The value of the reliability coefficient is subject to sampling fluctuations. References to the literature on sampling fluctuations, especially theory relevant to the comparison of reliability coefficients, can be found in Feldt and Brennan (1989: 126–127). The bootstrap method can also be used for the construction of a confidence interval. Raykov (1998) presented a bootstrap study with respect to reliability.

THE RELIABILITY OF TEST BATTERIES AND STRATIFIED TESTS

Many tests have strata or subdivisions covering various aspects of interest. The subtests may or may not be of interest on their own; an example of the latter case is a verbal subtest in a test battery. Either way, let us assume that the reliabilities of the subtests have been estimated. Then the reliability of the total test is easily

computed with the formula for the reliability of a composite test

$$\rho_{XX'} = \frac{\sum \rho_{ii'}\sigma_i^2 + \sum\sum \sigma_{ij}}{\sigma_X^2}$$

When the reliabilities of the subtests are estimated with coefficient alpha, the reliability coefficient for the total test is the stratified-coefficient alpha.

MAKING A TEST MORE RELIABLE

It is possible that in a preliminary investigation the test is deemed too unreliable for accurate measurement. Several measures can be taken, in isolation or in combination, to improve the reliability of the test scores:

- Add items. The Spearman–Brown formula for the reliability of a lengthened test can be used for the estimation of the number of items needed to obtain the desired test reliability. Its use presupposes the addition of items similar to those already in the test.
- Eliminate items. Reliability can be improved by eliminating an item with a low/negative item–rest correlation, the correlation between item and the remaining test items.
- Use optimal item weights. There are several definitions of what optimal weights are. 'Maxalpha' weights maximize coefficient alpha (not reliability itself), 'maxrho' weights maximize the reliability of a set of congeneric measurements (Jöreskog, 1971). Maxalpha weights, including the differential weighting of response alternatives, is achieved in a homogeneity analysis or dual scaling (Nishisato, 1994). In IRT models items have optimal weights other than unit weights, with the exception of the Rasch model. There are two problems with item/option weighting: first, the empirical weights are liable to sampling fluctuation; second, the scoring rule should be acceptable to test takers.
- Improve instructions in order to better standardize test administration. Unreliability can be brought about by less than ideal testing circumstances or scoring procedures. When scoring is done by raters, reliability might be improved by more stringent scoring instructions.

RELIABILITY AND VALIDITY

In the end a test must be valid. A test can have different validities, depending on the various uses of a test. The maximum validity of a test is bounded by its reliability: the validity can never exceed the square root of the reliability; in other words, it can never exceed the correlation between the observed scores and the true scores on the test. The correction of attenuation

$$\rho_{T_X T_Y} = \frac{\rho_{XY}}{\sqrt{\rho_{XX'}\rho_{YY'}}}$$

gives the correlation between true scores of two variables.

RELIABILITY AND THE STANDARD ERROR OF MEASUREMENT

From the variance of observed scores and the reliability, the true-score variance and the variance of measurement errors can be computed.

The standard error of measurement, the square root of the variance of measurement errors, can be used for the construction of a confidence interval of a person's true score. This application can be criticized for two reasons. This will be explained later in this section and in the next section.

The standard error of measurement depends not only on the test accuracy, but also on the scale that is chosen. When, for example, length in centimetres is converted to length in inches, the standard error for the measurement of length changes. Reliability, on the other hand, is dimensionless, but depends on the variation of the true scores in the population.

Neither the reliability coefficient nor the standard error of measurement is sufficient to adequately describe the accuracy of a test. For, the variance of errors of measurement should be conceived as an average value, averaged over true score levels. The test developer should also obtain and report information on the conditional error variance (APA, AERA & NCME, 1999: 27). These might be obtained from an IRT-analysis or

from other approaches. A recent discussion of some methods to obtain conditional error variances is given in Lee, Brennan, and Kolen (2000). The possible dependency on the true score level is one reason to be careful with the use of the standard error of measurement for the construction of a confidence interval.

RELIABILITY AND THE ESTIMATION OF TRUE SCORES

The observed score of a person is not the only estimate of his/her true score. The best linear prediction formula is Kelley's formula

$$\hat{\tau} = \rho_{XX'}x + (1 - \rho_{XX'})\mu_X,$$

in which the overall mean of the test scores plays a role, besides the observed score. The lower the reliability, the more the true-score estimate regresses to the overall mean. The Kelley-estimate is not without problems either. One might, for example, obtain a different Kelley-estimate for persons from different populations, which may lead to questions about allocation of persons to populations, for example 'male' and 'female', and the fairness of possible decisions based on its use.

The estimation of true scores by means of a regression formula can be generalized to the estimation of true scores on more than one test. Then the best estimate of a person's true score is based on the scores obtained for several tests. The importance of a test in such a 'prediction' formula depends on its reliability, among other things.

RELIABILITY AND EQUATING

Sometimes it is necessary to develop multiple forms of a test, because the content of a test becomes known to potential test takers after some time. In order to be exchangeable the test forms should be parallel. In case they are not parallel, they should be equated. If tests have different reliabilities, they cannot be equated. In that case one has to resort to, for example, linear true score equating (Kolen & Brennan, 1995). Reliabilities of the tests to be equated and the anchor test used for equating are needed in order to obtain estimates of the standard deviations of true scores, although under some assumptions the explicit computation of reliabilities can be avoided (Angoff, 1971: 582–583).

RELIABILITY AND THE VARIATION IN TRUE SCORES

From the definition it is clear that for a fixed test reliability depends on the variation of true scores. The reliability of a test can be high in one population and low in a second population. In some applications, low test reliability is not an issue since differentiation between persons is not a goal of the testing application. This happens, for example, in criterion-referenced measurement, where examinees are not compared with each other, but with a standard of performance. For this situation, alternatives to the traditional reliability coefficient have been proposed. One of these proposals has been to use a coefficient of decision consistency instead (see, for example, Huynh, 1978). Decision consistency is not, however, a topic that belongs to the subject of reliability proper, defined as a psychometric concept.

RELIABILITY AND IRT

Variation between persons remains important in IRT for several reasons. Without variation there is no use for modelling that includes a latent trait and there is no data that can guide our choice between models. With only a little variation accurate estimation of item parameters (in terms of standard errors of parameter estimates) is not possible for most IRT models. Above all, when there is no variation, shouldn't the conclusion be that the trait is unimportant for differentiating between persons? Actually, many estimation programs compute IRT model parameters with a distribution of latent person parameters or abilities, the IRT-counterparts of true scores, that has a standard deviation equal to one. The size of the test information and its reverse – the error variance associated with the estimation of a person parameter – can then easily be interpreted with a reference to the variation of abilities. Actually, one can set up the computation of the reliability of measurements on a given latent scale given (an approximation to) the ability

distribution and the conditional error variances that can be obtained from the test information. In computerized adaptive testing, or CAT, it is possible to maintain the same level of accuracy over the relevant range of abilities. The problem that the error variance in the definition of reliability is only an average value becomes a lesser problem in this way. Bock and Mislevy (1982) in their work on CAT explicitly derive the reliability of the suggested CAT-procedure.

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Dato N.M. de Gruijter

RELATED ENTRIES

GENERALIZABILITY THEORY, OBJECTIVITY, VALIDITY (GENERAL)

REPORT (GENERAL)

INTRODUCTION

The psychological report presents an opportunity for the professional psychologist to present the results of assessment in a case-focused, problem-solving manner. Its major purpose is to help the referral source make decisions related to the client. It thus represents the end product of assessment. An ideal report will be written according to general guidelines and in a flexible but predictable format.

The most frequent categories of reports are centred around questions related to intelligence/achievement, personality/psychopathology, and neuropsychology areas (Camara et al., 2000). Additional, less frequent categories include adaptive/functional, developmental, neurobehavioural, aphasia, and behavioural medicine/rehabilitation. The most frequent general issues relate to diagnosis and answering which type of treatment would be most effective for a given client. Each of the various categories of assessment require different types of

assessment instruments, knowledge related to the type of difficulty, awareness of the context (educational, legal, medical, rehabilitation, forensic), and knowledge of the various resources available in the community. This knowledge will then be integrated into the report in order to make it more problem focused and relevant to the referral source.

GENERAL GUIDELINES

The *length of the report* varies considerably across various referral settings. Traditionally, psychological reports have been between four and seven single-spaced pages. In medical contexts where time efficiency is crucial, psychological reports rarely exceed two pages. However, psychological reports in a wider number of contexts also appear to be getting shorter due to the cost containment and time efficiency demands of managed healthcare. In contrast, legal contexts demand far more detail, require greater accountability, typically have more complex referral questions, and involve more flexible, ample methods of reimbursement. As a result, reports tend to be 7–10 pages and sometimes even longer. Reports are therefore influenced by and formatted according to the conventions of other health professionals working within the contexts psychologists write for.

A well written report also pays particular attention to the *degree of emphasis* given to the various points. Sometimes, the evidence for a conclusion will be consistent, strong, and clear and this can then be stated accordingly in the report. Other information might be more speculative and should be written with an appropriate degree of tentativeness.

Test interpretations are ideally presented and organized around specific *domains*. The selection of which domains to include should be driven by the types of questions the referral source is requesting. These questions largely determine the types of assessment tools used and types of questions asked of the resulting data. Since each client is different and lives within a different context, the number of domains will vary considerably. Within a psychoeducational context, relevant domains might revolve around cognitive ability, level of achievement, presence of a learning disability, or learning style. In contrast, a report written to assess personality/psychopathology might focus more on such areas as coping style, level of emotional functioning, suicide potential, characteristics relevant to psychotherapeutic intervention, or diagnosis.

Sometimes test results are presented in a test by test fashion. This has the advantage of making it clear where the data came from. However, it runs the risk of being overly data/test oriented rather than person oriented. Research has consistently indicated that readers of reports do not feel this style is 'user friendly' (Tallent, 1993). In addition, it indicates a failure to integrate data from a wide number of sources and suggests that the practitioner has not adequately conceptualized the case. It also encourages a technician-oriented role rather than one in which a knowledgeable clinician integrates a wide array of information to help solve a client's problem.

Consistent with the above themes, *deciding what to include* is largely determined by the referral source. One general principle is that material should only be included if it helps to further understand the client. In this respect, what is unique rather than what is average is usually more important. For example, describing a client's appearance is typically not useful if they made modal responses to the test material and were dressed in average appropriate clothes. In contrast, a client who was obsessively concerned with accuracy (ignoring time concerns) and dressed in an unusually formal fashion does provide useful behavioural observations. These observations also help to place test scores in a wider context, give information related to coping style, and an indication of their personality type.

Generally *raw data and quantitative scores* should be avoided in the impressions/interpretations section of the report. They can potentially make the report seem overly technical and cluttered. Sometimes, however, providing concrete behavioural observations or actual responses to selected items (i.e. MMPI-2 critical items) can make abstract points seem more immediate and insightful into the content of the person's thought processes. This can serve to balance out more high level abstractions. In addition, providing a clear statistic such as a percentile can sometimes make a description seem more clear and accessible. For example, a report might describe how a client with an average IQ had a quite low auditory memory. Stating they

only scored in the '5th percentile' (or 'only five people out of a hundred scored in this range') can provide some precision into the magnitude of their difficulties.

One of the crucial roles of a psychological report is to assist in providing *client feedback*. This is in accordance with client advocacy legislation and the American Psychological Association's ethical guidelines in that clients should know the types of information and recommendations being made about and for them. Such feedback is expected to be clear, accurate, direct, and understandable. This means the results need to be phrased in everyday language rather than formal psychological terminology. There has also been increasing evidence that well integrated client feedback has clear therapeutic benefits (Friedman et al., 2000; Gass & Brown, 1992). Thus the report (and related feedback) can potentially become an integral part of therapy itself. While feedback is typically verbal, an important option is to design the written report, or at least an edited version of the report, in such a way as to be of optimal benefit to the client.

FORMAT FOR PSYCHOLOGICAL REPORTS

There are various ways of organizing a psychological report. Some practitioners prefer to use an informal, relatively unstructured letter format. This is especially appropriate when the report will be seen by a single referral source and the referring person is known to the practitioner. Other reports might be more appropriately organized around quite structured headings (i.e. 'Referral question', 'Test results', 'Summary and recommendations'). Some reports might demand (and practitioners prefer to include) an extensive history whereas others might minimize the history in favour of spending relatively greater time elaborating on impressions and interpretations. Given the recent trends towards treatment planning and demonstrating the practical, everyday relevance of assessment (i.e. Beutler & Williams, 1998; Maruish, 2000; Sbordone & Long, 1996), some reports might place relatively greater emphasis and length into providing concrete, specific recommendations for psychotherapy planning, vocational training, educational intervention, or neuropsychological rehabilitation.

Even if reports do not formally designate specific headings and subheadings, they still typically include a predictable series of content areas. The following listing provides an outline of typical areas (from Groth-Marnat, 1999; Williams & Boll, 2000):

Name:
Age (date of birth):
Sex:
Ethnicity:
Date of report:
Name of examiner:
Referred by:

I. Referral question
II. Evaluation procedures
III. Behavioural observations
IV. Background information
V. Test results
VI. Impressions and interpretations
VII. Summary and recommendations

An additional feature is an indication at the top of the report that the report is 'Confidential'. The report should conclude with the signature, name, and title of the author. This is crucial since it indicates that responsibility for the contents of the report is being formally accepted by the author. Identifying information is fairly straightforward (name, age, sex, etc.) but the additional features (I–VII) require elaboration.

The *referral question* sets the stage for the rest of the report. It is therefore especially important to make sure it is as clear and specific as possible (i.e. 'My understanding is that you would like me to evaluate Mr. X with particular reference to the nature and severity of his deficits, the extent of care he would require, ability to work, personality functioning, and the likelihood of any further improvement'). Often clarifying the referral question will require discussions with the referral source since it is not unusual to have an initially poorly articulated (or at least partially developed) referral question. One means of assisting with this is to ask the referral source what decisions they need to make related to the client. Sometimes discussions with the referral source will mean indicating the sorts of questions that can and cannot realistically be answered through formal assessment. Such discussions may

even result in a mutual decision that formal assessment is not appropriate for the case. A clearly articulated referral question will carry through to the rest of the report in that it provides a frame of reference for this material as well as a rationale for what is relevant to include in the sections on background information (history), impressions/interpretation, and especially the summary/recommendations section. One effective technique is to create bulleted points in the summary, each of which provide a clear answer to each of the referral questions. However, the points need to be consistent with material presented previously in the impressions/interpretation section. A nice beginning to the referral question section (and the report in general) is to make a brief, succinct, orienting, statement related to the client (i.e. 'Mr. X is a 36 year old, white, right handed, married male with a high school education who sustained a severe, diffuse closed head injury on April 12, 1998').

The *evaluation procedures* section is simply a listing of the various instruments used. Sometimes, particularly in legal settings, this includes the date when administered and the length of time they took to complete the test. It is sometimes useful to include the total time involved in the entire evaluation. If the report relied on previous records (academic, vocational, legal, medical), then the dates and, if relevant, the authors of the reports should be given (i.e. 'In addition, I reviewed the following reports by ...').

Often *behavioural observations* can provide a useful context for understanding test data. For example, low scores on cognitive tests may be the result of low motivation or perhaps a problem solving style that sacrifices speed for accuracy. These and related behavioural observations can be noted in the behavioural observations section. Behavioural observations should generally be kept concise and relevant. They should also refer to concrete, observable behaviours rather than either high level abstractions or conclusions about the client. Thus, it would be preferable to state that the client moved slowly and they were self-critical (i.e. 'the client continually commented that they weren't able to do very well') rather than to make inferences (i.e. 'the client appeared depressed'). Inconsistencies in the client's behaviour might also be useful to note. These might include a young person who acts older than their stated age or a person who says they feel fine but appear anxious and defensive. Additional domains of behavioural observations include attitude toward the examiner and test situation, attitudes toward self, reaction to praise, reaction to failure, motor coordination, reaction time, and behaviours related to speech and language.

One of the potentially most useful functions of the professional psychologist is to provide descriptions of relevant *background information*. This might be particularly important in a medical context where physicians neither have the time nor the appropriate training to access important client information. At the same time, the background information section should avoid being overly inclusive. For example, it is unlikely to be useful to provide a detailed developmental history for an adult who is seeking vocational assessment. On the other hand, a detailed developmental history would be essential for an adolescent referred to assess possible learning disabilities. It is usually important to clarify where the information came from (i.e. 'The client reported that ...' or 'The report of 3/6/98 by Dr. Y indicated that ...'). Possible domains for history taking and inclusion in the background information section include the following: history of the problem, medical history, vocational/employment background, family background, personal history (infancy, early/middle childhood, adolescence, early/middle adulthood, late adulthood), and miscellaneous areas such as fears, self-concept, recurring dreams, or specific memories.

Some reports include a *test results* section which lists the actual scores on the tests. If this is done, it is often useful to translate the scores into percentiles to enable readers to more easily understand the meanings of the test scores. A further related strategy is to develop a profile sheet depicting relative high and low performances. Sometimes these might have cutoffs for such categories as 'impaired', 'superior', or 'dysfunctional'. In some cases the test results/scores are placed in a section within the body of the report itself. In reports, the 'test results' section is included as an appendix. It is also not unusual for reports to exclude the actual test data. This is especially the case in medical settings where concise reports are greatly valued. Actual test scores might also be excluded if it is known that the referral source is neither trained in, nor interested in, seeing the actual scores.

The main body of the report is contained in the *impressions and interpretation* section. It

represents an integration of findings based not only on test scores, but also behavioural observations, relevant history, relevant records, and additional available data. The importance of presenting the information according to domains rather than test by test has already been discussed. The selection of domains is based on answering the referral question. If ability/IQ measures have been measured, it is traditional to place these first since they usually provide an important context for understanding most other types of information. Most of the time actual IQ scores are given along with percentiles and intelligence classification (Low Average, Superior, etc.). Some authors might prefer to provide an estimate of the range of possible error of IQ scores by including the Standard error of Measure. In contrast, other authors might consider this to be too technical and test-oriented and decide to omit this information. If there is a chance the IQ scores might be misunderstood, then they are sometimes excluded and only the percentiles and intelligence classifications are given.

Different types of referral categories, along with the specific referral questions, will determine the additional domains to include. For example, when assessing intellectual/achievement types of referrals, important domains might include general cognitive ability, specific strengths and weaknesses, level of achievement, aptitudes, learning style, interests, and possibly vocational interests. A neuropsychological report might not only focus on cognitive abilities and achievement but also learning/memory, language functions, attention, visuoconstructive abilities, executive function, emotional functioning, and potential and strategies for cognitive rehabilitation (Groth-Marnat, 2000).

The most valuable section is usually the *summary and recommendations*. The importance of this section is that sometimes it is the only section read by allied health professionals concerned with time efficiency. The summary provides an opportunity for the practitioner to succinctly state the main conclusions of the report. As indicated previously, the summary section also provides an opportunity to make sure each one of the referral questions have been addressed. The recommendations are an opportunity to provide person-focused suggestions on solving specific problems. A clear research finding is that reports are typically rated as most useful if the recommendations are highly specific rather than general (Ownby, 1990; White et al., 1984). Thus a statement such as the 'client should begin individual psychotherapy' is not as useful as one that states the 'client is likely to benefit most from weekly sessions of individual psychotherapy using strategies to decrease their level of subjective distress, enhance social supports, and increase their level of awareness related to self-defeating patterns in interpersonal relationships'. Once a report has been submitted, follow-up contact with the referral source is advisable in order to provide ongoing feedback related to the accuracy and usefulness of the report as well as help facilitate the actual implementation of the recommendations.

FUTURE PERSPECTIVES AND CONCLUSIONS

The above guidelines and outline for a psychological report may, in some ways, appear as a mechanical process. It should also be stressed that the most successful reports are likely to emerge from clinician–client interactions that are characterized by a high level of involvement and understanding. This is then likely to be reflected in a report that is more full, in depth, and captures the complexity and 'humanness' of the client. Technical skills and mechanical interpretation are no substitute for this process. An additional essential quality is that clinicians are well informed related to the type of problem and overall context the client is functioning in.

Given that there is surprisingly little research on psychological reports, it would be crucial to expand this research base. The most likely avenue would be to investigate the interface between research on clinical judgement, psychometrics, and the ability of clinicians to interface with computer assisted interpretations in such a way as to increase the accuracy of clinician-based judgements. This would need to be continually evaluated against the relative usefulness of reports with various referral sources.

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Gary Groth-Marnat

RELATED ENTRIES

Assessment Process, Ethics, Reporting Test Results in Education, Standard for Educational and Psychological Testing

REPORTING TEST RESULTS IN EDUCATION

INTRODUCTION

In this entry we shall discuss both how test reports are currently reported as well as enumerating steps that might be taken to improve reporting still further. To the extent that space allows I will try to show rather than tell, although a combination will be used when that seems helpful. I will span three situations for which test results are reported. These are:

(i) results that are reported to an individual examinee,
(ii) results that are reported to an institution,
(iii) results that are reported for a state or nation.

While all of these situations share a number of common aspects, there is also enough that is unique to justify separate treatment. I shall begin with a statement of purpose, then examine the extent to which these purposes are fulfilled in some representative reports, and then finally will try to extend practice by suggesting modifications that could aid in achieving these goals.

There are essentially four questions that a score report should answer, the first three of which are:

1 What is my score? For individuals this might be a single number or a set of numbers, for institutions or nations a summary statistic or a distribution.
2 How do I compare to others? A fact without context is of little value. A single number tells us nothing without the ancillary knowledge about how everyone else did. Even so-called 'criterion-referenced tests' have latent in them the performance of a reference population. Thus, a 4-minute miler is applauded even if he ran alone on the track, but the 'objective criterion' of

4-minutes gets its meaning from the knowledge of how many have tried to do it and how few have succeeded.

3 How stable is my score? If you stand on a bathroom scale and it reads 100 kg, how much will it change if you get off and then get on again?

While all of these questions are important to answer, this ordering represents the typical priority. Hambleton and Slater (1996) in a survey of educational policy makers support this prioritization. This result was confirmed in subsequent experiments on this same class of test users (Wainer, Hambleton & Meara, 1999). Thus the visual emphasis given to each question should reflect this prioritization. In addition, there is a fourth question, strongly related to the first three, whose answer is too often left implicit,

4 What does my score mean? Obviously, this is a validity question, and its answer depends on the score level, how that score compares with others, and how stable the score is. The precise form of this question varies with who asks it. But the answer is almost always a probability statement. For the individual, the question might specialize to 'Can I get into Princeton?'; for an institution it might become 'How well can this student handle the coursework here?'; and for a national report it often reflects the policy issues that drive the assessment with causal questions like, 'Has the intervention aided minority achievement?'

INDIVIDUAL SCORE REPORTS

Let us consider a score report for a college admissions test that is typical of those provided annually to well more than a million high school students in the United States.

Shown in Exhibit 1 is the first page of a report that is sent to each examinee. The principal individual information is contained in the upper left-hand box. It includes answers to all three

College Admissions Testing Program

Student Score Report

Report Date 9/01/01

Seq# 000000012
Jane Doe
12 Main Street
Hometown, NJ 12345

Your Scores

Test Date: January 2001

Academic Skills Test	Score	Score Range	Percentiles College-bound Students National	State
Reading	81	77–85	97	97
Math	83	79–86	98	98

What does your score range mean?
No single numerical score can exactly represent your academic skills. If you had taken different editions of the test within a short period of time your performance would probably vary somewhat on the 0 to 90 point scale.

How do you compare with college-bound students?
Percentiles indicate what percentage of test takers earned a score lower than yours. The national percentile for your reading score of 81 is 97, indicating that you did better than 97% of the national group of college-bound students. The national percentile for your math score of 83 is 98, indicating you did better than 98% of the national group of college-bound students.

Did you do better in reading or math?
Your score indicates that you performed similarly on the math test and the reading test.

What's the average reading or math score?
For college-bound students in the class of 1999, the average reading score was 50.5 and the average math score was 51.1.

Will your scores change if you take the test again?
If you take the test again, especially if you study between now and then, your scores may go up.

Among students with reading scores of 81, 63% score lower on a second testing and 37% score the same or higher. On average, a person with a reading score 81 loses 2.1 points.

Among students with math scores of 83, 65% score lower on a second testing and 35% score the same or higher. On average, a person with a math score 83 loses 1.8 points.

Exhibit 1. A standard college admissions test score report sent to an individual examinee.

College Admissions Testing Program

Test Date: January 2001

Student Score Report
Report Date 9/01/01

Jane Doe
12 Main Street
Hometown, NJ 12345

Scores for Jane Doe

Academic Skills Test	Score	Percentiles among college-bound students: National	Among the applicants of the colleges you applied to: Ivy U	Elite C	State U
Reading	**81**	97	47	75	97
Math	**83**	98	57	77	98

How do you compare with college-bound students?
Percentiles indicate what percentage of test takers earned a score lower than yours. The national percentile for your reading score of 81 is 97, indicating that you did better than 97% of the national group of college-bound students. The national percentile for your math score of 83 is 98, indicating you did better than 98% of the national group of college-bound students.

What's the average reading or math score?
For college-bound students in the class of 1999, the average reading score was 50.5 and the average math score was 51.1.

How do you compare with the other seniors who have applied to the same colleges you have?
Your test performance ranks you at:
Ivy U about average among all their applicants,
Elite C among the top quarter of their applicants,
State U among the top 2% of their applicants.

Ivy U accepts about 10% of all applicants
Elite C accepts about 25% of all applicants
State U accepts about 50% of all applicants

Exhibit 2. A modification of the report shown in Exhibit 1.

questions, with little in the way of visual emphasis to their relative importance to the examinee. Just beneath this box are several paragraphs of prose that provide a general discussion of the meaning of the numbers communicated previously.

Beneath this discussion might be a breakdown of the overall performance by the category of questions asked as well as a summary of performance on previous test administrations.

While this report has much to recommend it, there are some changes that could be helpful. In particular, it would seem that two simple modifications ought to be seriously considered. First, keep in mind the priority of the questions asked and make the examinee's scores stand out. Exhibit 2 does this by using a much larger font size for the individual scores. The extra space that this takes up was obtained by moving score stability information to a less prominent position later on in the report. The answers to the second question were specialized in this report to provide the examinee's relative position among all the applicants to the three colleges she applied to. Obviously, if the examinee does not provide college choice information, the report would have to retreat back to comparison groups of convenience. Institutional reports do not suffer from this shortcoming and much more informative displays can result (see Exhibit 3). Evidence to help answer the fourth question is provided in the text, which could be customized for each examinee.

INSTITUTIONAL SCORE REPORTS

Shown in Exhibit 3 is an extract from a typical report sent to colleges describing the performance of an examinee on a college admissions test. This report has much to recommend it from a content point of view, although graphical improvements could provide visual emphasis to those aspects of the report of greatest potential interest to the user. It is noteworthy to see that this report is organized in a way that reflects the priority of interests of the user.

After identifying the examinee, the results start with an answer to the first question by displaying the examinee's scores on each of the subtests and

DOE JOHN A		Soc. Sec. No.:	123-45-1983	Type of testing:	NATIONAL
12 MAIN STREET	MALE	County:	WASHINGTON	Date tested:	10/00
HOMETOWN, NJ 12345	8/2/83	Phone Number:	609-555-1212	Ed. Level when tested:	SENIOR

2000-01 *COLLEGE COPY* **STUDENT PROFILE REPORT**

H.S. ATTENDED: 067-980 HOMETOWN SR HS 31415 W. 2ND AVE HOMETOWN, NJ 12345

	SUBJECT AREA (SCORE RANGE)	H.S. GRDS	STANDARD SCORES	NORMS (%ILES) LOCAL	NATIONAL	
SCORES AND PREDICTIVE DATA	ENGLISH (01–50)	A	25	83	93	NATL
	MATH (01–46)	C	19	38	60	NORMS
	SOC STUDIES (01–48)	A	26	73	88	SHOWN
	NAT SCIENCES (01–50)	B	22	42	58	**COL**
	COMPOSITE SCORE (01–50)		23	59	77	**BND**

Overall GPA Predictions

NAME OF GROUP	FRESHMAN YEAR	RES PLAN	%ile RANK	PROB ≥C
EDUCATION	00/ 1	S	91	89
BUS ADMINISTRAT	00/ 1	S	94	92
LIBERAL ARTS	00/ 1	S	74	81
ENGINEERING	00/ 1	S	41	32
ALL FRESHMEN	99/ 1	S	75	80

Specific Course Predictions

NAME OF COURSE	FRESHMAN YEAR	GRP NO	GROUP NAME	%ile RANK	PROB ≥C
FRESHMAN ENGLISH	00/ 1	1	ALL FRE	91	89
COLLEGE ALGEBRA	00/ 1	1	ALL FRE	94	92
HISTORY	00/ 1	2	LIBERAL	74	81
CHEMISTRY	00/ 1	3	ENGINEE	41	32
PSYCHOLOGY	99/ 1	4	ALL FRE	75	80

Exhibit 3. A standard college admissions test score report sent to a college that the examinee has applied to.

Scores and Predictive Data for John A Doe

			Norms College Bound		Overall GPA Predictions for college class of 2004			Specific Course Predictions for college class of 2004			
Subject Area	HS Grades	Standard Scores	Local	National	Name of Group	%ile Rank	Prob ≥C	Name of Course	Group name	%ile Rank	Prob ≥C
English	A	25	83	93	Business Admin	94	92	Freshman English	All Freshmen	89	72
Social Studies	A	26	73	88	Education	91	89	History	Liberal Arts	86	82
Math	C	19	38	60	Liberal Arts	74	81	Psychology	All Freshmen	79	89
Nat'l Sciences	B	22	42	58	Engineering	41	32	Chemistry	Engineering	59	68
Composite Score		**23**	**59**	**77**	**All Freshmen**	**75**	**80**	College Algebra	All Freshmen	15	18

Exhibit 4. A modification of the report shown in Exhibit 3.

provide context (question 2) by transforming them into both local and national percentiles. Next they provide an answer to the most important question (4) 'How well can this student handle the coursework here?' by providing the examinee's percentile rank at that institution in each of several programmes of study as well as overall. Then last, the report makes specific projections, helpful for both admissions decisions as well as subsequent guidance decisions, if the student ends up matriculating at this institution. The answer to question (3), score stability, is relegated to another, less central, part of the report.

This report, because of its explicit connection to the criteria of interest to the user, is clearly state-of-the-art. In Exhibit 4 are some suggestions for graphical modifications that might convey these results more efficiently. These changes involve minor typographic changes that emphasize the overall scores and ranks, and ordering the examinee's performance from high to low.

NATIONAL SCORE REPORTS

Shown in Exhibit 5 is a graph that is a central display of the 'State Assessment Report Card' published periodically by the National Assessment of Educational Progress (NAEP). The location of each state tells its relative position and the shading conveys stochastic variability by indicating if the mean score of the state of interest is significantly different than another. Although this display answers questions (2) and (3), remarkably, to find the actual mean score of any state one must return to the component data tables.

An alternative (Exhibit 6), originally proposed by Wainer (1996) and improved upon by Almond et al. (2000), remedies this lack. It also provides a quantitative measure of the size of the difference between states.

CONCLUSIONS

In this entry, examples of what ought to be considered in improving current practice in score reporting have been provided. In addition, there is an attempt to demonstrate how such displays can evolve by making the goals of the report, as well as the order of its priorities, explicit. A single data display cannot do everything equally well. Choices must be made. Improvements for one purpose may represent a reduction in usability for another. The biggest change to current reporting practice that would result from a serious consideration of user needs would be the diminution of priority given to the communication and discussion of score stability. The scores presented must be stable enough for their intended purpose, but beyond that (which could be communicated implicitly) the users typically do not care very much. And, for the most part, most commercial tests have reliabilities (0.90 and above) that are more than enough for their task.

Test results are less likely to be stable enough when test scores are broken up into subscores for diagnostic purposes. When subscores are communicated and there is the clear indication that those subscores are to be used for some sort of remediation, it is the responsibility of the testing organization to be sure that the remediation will not be chasing noise. This means stabilizing the scores somehow (e.g. using empirical Bayes estimates [Thissen & Wainer, 2001]) and communicating clearly how much variability should be expected.

Finally, typography and graphic display seems worthy of some discussion. In the world of

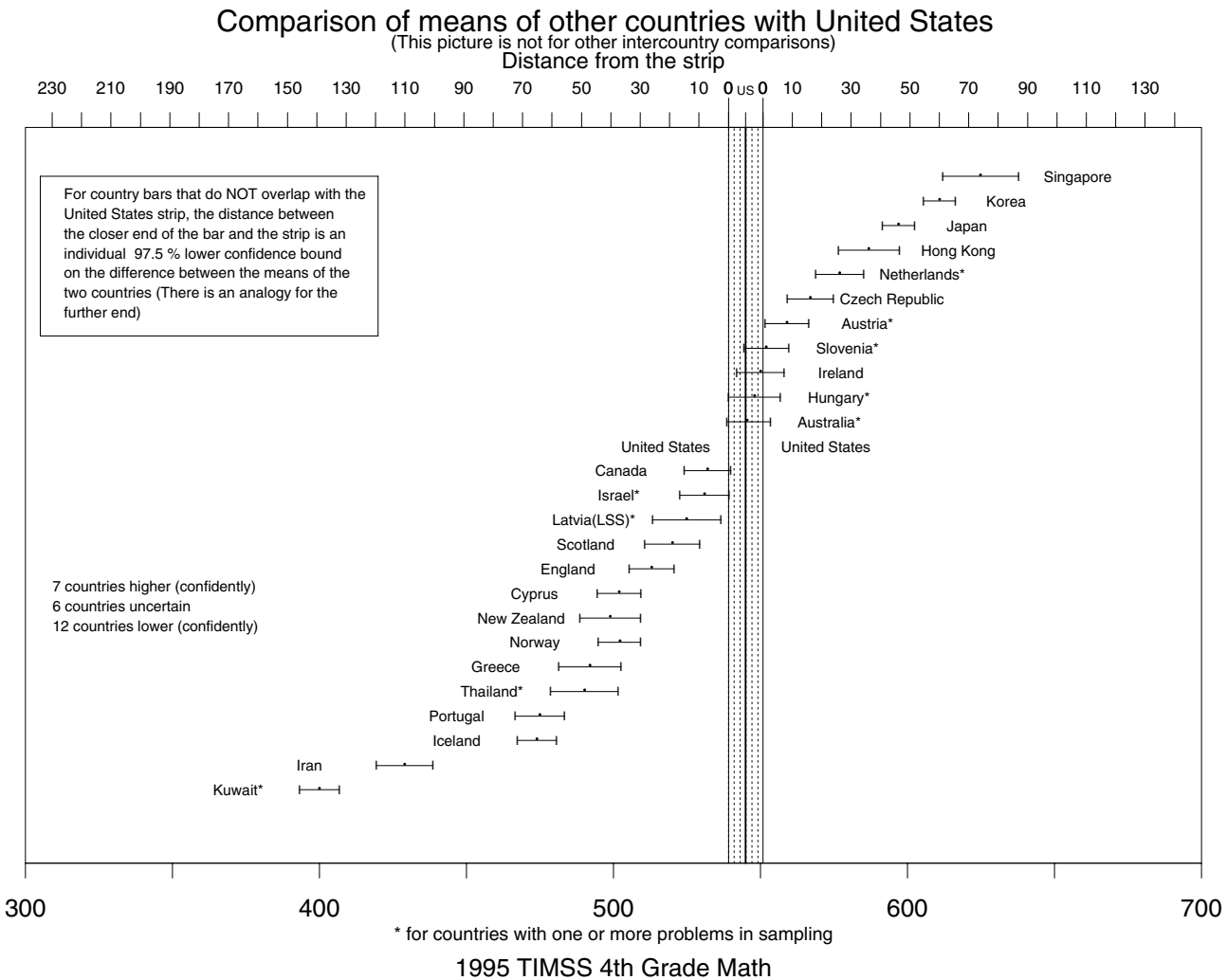

Exhibit 5. A standard display (from Reese et al., 1997) comparing the performances of the participating jurisdictions in the National Assessment of Educational Progress – the state assessment.

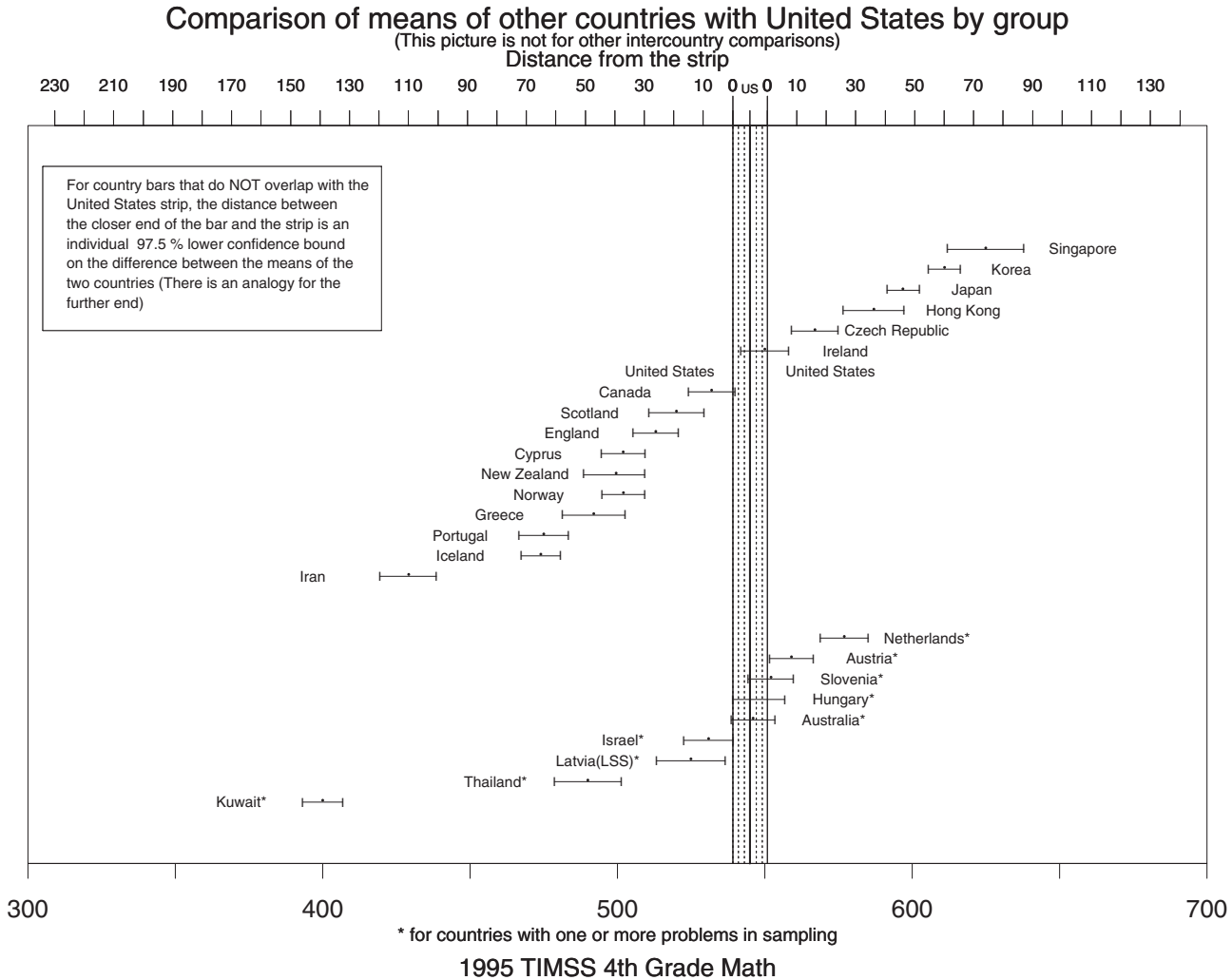

Exhibit 5. Continued.

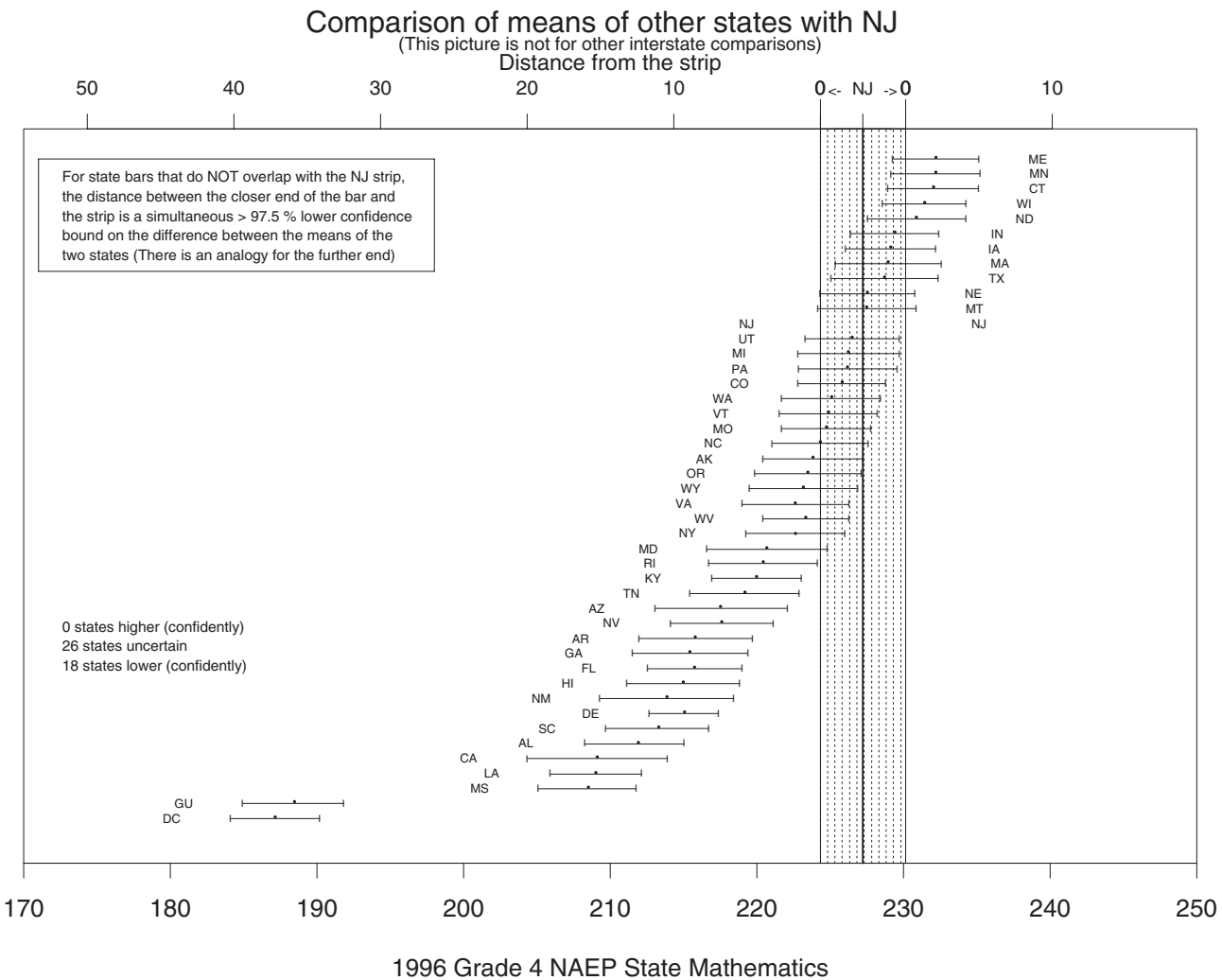

Exhibit 6. A modification of Exhibit 5, from Almond et al., (2000).

paper-based reports, it has often been important to squeeze everything into a very limited space. This has yielded graceless reports filled with densely printed columns of numbers of varying usefulness wearisome to the eye. Typically, the content of such reports is based upon need and history. Institutional inertia has meant that once material has found its way onto such a report it is very difficult to remove it. With the broad availability of electronic reporting battles to remove long included information need not be fought. Instead material can be organized hierarchically so that the user can access what is required and leave alone what is not – but it is all there. Such a methodology also allows the transmitter of the information, by keeping track of which aspects of the score reports are accessed, to reshape future reports to suit their patterns of use.

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RELATED ENTRIES

Report (General), Applied Fields: Education, Assessment Process, Ethics, Standard for Educational and Psychological Testing

RESIDENTIAL AND TREATMENT FACILITIES

INTRODUCTION

During the last decades there has been a trend towards building down inpatient care, but still many persons receive treatment in residential facilities. However, there are few assessment instruments measuring dimensions of such facilities and there are few empirical studies. Assessments of facilities should aim at the three basic questions of whom, what and how: (1) *Who* is the facility serving? (2) *What* kind of treatment are the patients offered? (3) *How* are the patients doing? (Or: What is the success rate of the programme?)

WHO IS THE FACILITY SERVING?

This basic question can be measured by simple aggregate data for patients like age, gender, diagnoses and a global measure of severity of the illness or state of the patient. It might be useful to aggregate data of the following instruments that most often are used to evaluate single patients.

The Health of the Nation Outcome Scales (HoNOS) (Wing et al., 1998) are designed to be rated by the clinician in every day clinical practice. They can be used to get a profile of the patients on twelve key dimensions comprising problems concerning behaviour, self-injury, drinking or drug-taking, cognition, physical illness, psychotic symptoms, depressed mood, relationships, activities of daily living, living conditions and occupation.

The Global Assessment of Functioning Scale (GAF) is used extensively as a global instrument (Endicott et al., 1976). However, it is important to keep in mind that without proper training and monitoring of reliability, the scores may easily

Table 1. Overview of instruments for evaluation of residential and treatment settings

Focus of interest	Instrument	Measures	Filled in by	Unit characterized by
Who are the patients?	HoNOS	Psychiatric problems	Therapist	Aggregate scores
	GAF	Global functioning	Therapist	Aggregate scores
	SCL-90	Distress	Patient	Aggregate scores
What kind of treatment is given?	ESMS	Type of service	Researcher	One form per unit
	ICMHC	Specialization of unit	Researcher	One form per unit
	CPPS	Treatment philosophy	All staff	Aggregate scores
	PACI	Physical dimensions	Researcher	One form per unit
	PASCI	Policy and service	Researcher	One form per unit
	WAS/COPES	Ward atmosphere	Patients & staff	Aggregate scores
	SDAS	Aggressive behaviour	Staff	Aggregate scores
	SOAS	Aggressive incidents	Staff	Aggregate scores
How successful is the programme?	GAF	Global functioning	Therapist	Aggregate scores
	SCL-90	Distress	Therapist	Aggregate scores
	VSSS	Patient satisfaction	Patients	Aggregate scores

become so inaccurate that they are nearly worthless (Loevdahl & Friis, 1996). To improve reliability, a new version of the scale has been suggested, with separate scales for assessment of severity of symptoms and severity of functional impairment (Goldman et al., 1992).

In many settings, it may also be relevant to add a scale like the SCL-90 (Derogatis et al., 1976) to give a measure of the level of perceived distress. However, this scale is not applicable for the most severely ill patients, like those with chronic psychoses. Many of these patients are either unable to complete the form or tend to score in the range of normal controls.

Karterud et al. (1998) give an example of how such aggregate data can be used to monitor units within a network of day hospitals.

WHAT KIND OF TREATMENT ARE THE PATIENTS OFFERED?

Only recently a systematic description and categorization of facilities has been published. The European Service Mapping Schedule (ESMS) has been developed by an international expert panel to classify the whole range of adult mental health services, including residential units with various intensities and types of care (Johnson et al., 2000). The instrument can be used to describe and study services, as well as differences and gaps in services. This is especially useful for describing and analysing systems of services, but it may also be used for describing and comparing dimensions of individual residential facilities. The map of the service tree has three main branches: residential services, day services and structured activities, and out-patient and community services. Within each branch the services are classified according to characteristics such as acute/non-acute, hospital/non-hospital, time limited/indefinite, mobile/non-mobile and different levels of intensity of services. Characteristics, structure, functions and range of services can be described, and levels of service use can be measured for each type of service. A glossary defines all terms in the instrument so that they can be used in the same way in different studies. A recent study in Spain shows how the instrument can be used and includes a discussion on reliability and validity (Salvador-Carulla et al., 2000).

The International Classification of Mental Health Care (ICMHC) has been developed in a WHO collaborative study (de Jong, 2000). Ten modalities are rated for each module of care (treatment unit) using a 4-point Level of Specialization Scale. The scales are applicable for residential as well as non-residential treatment units and evaluate areas like: relationships, functional assessment, care, activities of daily living, therapeutic interventions, social and interpersonal skills, daily activities, and interventions aimed at family and relatives. The ICMHC gives guidelines on how to identify the smallest functional treatment unit of measurement in the structure of services, which also is useful when using other instruments to assess treatment units.

Treatment philosophy or practice can be measured by giving the Community Program

Philosophy Scales (CPPS) to the staff (Jerrell & Hargreaves, 1991). The CPPS was developed for community treatment teams, and has 20 subscales measuring some general aspects (openness for new ideas, involvement, programme clarity, cohesion, supervision), to what extent the team addresses different needs of the patient, and the team's emphasis on different treatment approaches. Most of the subscales have proved to be reliable and to be applicable also to residential treatment units. A revised and extended version of CPPS is being developed with scales covering additional dimensions of residential treatment.

The Policy and Service Characteristics Inventory (PASCI) is another instrument that can be used to measure policy and characteristics of available services (Timko, 1995). The 140 items are filled-in by a researcher together with an administrator or other responsible staff. PASCI gives nine subscales divided into three groups: requirements for residents' functioning (expectations of functioning, acceptance of problem behaviour), individual freedom and institutional structure (policy choice, resident control, policy clarity and provision of privacy), and provision of services and activities (availability of treatment services, availability of daily living assistance and availability of social-recreational activities). Internal consistency (Cronbach's alpha) and test–retest reliability has been shown to be good or acceptable for most of the subscales.

The psychosocial climate can be measured by questionnaires like the Ward Atmosphere Scale (WAS) (Moos, 1996) or the analogue Community Oriented Program Environment Scale (COPES) (Moos, 1996). Both scales have ten subscales which measure aspects of the following three main areas: Relationship, Personal growth and System maintenance. These scales have several advantages: they can measure both staff and patient perceptions of the climate, and both the real and the ideal setting. As different patient groups prefer and seem to benefit from different types of milieus, such measurements may be important for tailoring the milieu to the needs of specific type of patients (Friis, 1986; Moos, 1996). A limitation is the fact that the scale is difficult or impossible to fill in for very sick patients, and there is a need for six to ten completed forms to form a fairly stable mean score for a unit. Each of the ten subscales is based on items that measure either behaviour (patient or staff) or staff attitude. It is worth noting that while behaviour and staff attitude items usually are strongly positively correlated, this may not always be the case. On wards with severely disturbed patients, one may e.g. find that the higher the level of perceived aggression, the more negative is the attitude toward display of aggression (Roessberg & Friis, 2000). On such wards, the sum of all items in the Anger and aggression subscale may underestimate the level of aggression of the ward. To obtain a more accurate measure it might be necessary to calculate two separate scores, one for aggressive behaviour and one for attitude towards display of aggression.

The WAS and the COPES measure fairly stable characteristics of a treatment milieu (Moos, 1996), what one could term 'the personality of the climate'. We lack good alternatives to measure the more fluctuating states of the climate. Concerning aggression, a possible candidate for measurement of state is the Social Dysfunction and Aggression Scale (SDAS) (Wistedt et al., 1990). The SDAS gives a score for each patient's level of inward and outward aggression. The aggregates of SDAS scores for all patients in a ward are in our experience useful measures to monitor fluctuations in the overall level of aggression in the ward. The SDAS scores can also be used for comparisons of wards.

The number of discrete aggressive events on a ward can be measured by use of the Staff Observation Aggression Scale (SOAS) (Nijman et al., 1999; Palmstierna & Wistedt, 1987). The SOAS may be used for monitoring aggression at a ward. But as the number of aggressive incidents usually is fairly low, the monitoring is sensitive to random variation. However, the SOAS form may help the leaders of the ward to pick up early warning signals of an increase in violence, so they can take necessary steps to avoid an epidemic of violence.

The use of medication can be measured by scoring the types of medication and the dosage for each patient e.g. by use of the ATC and DDD systems (Guidelines for ATC classification and DDD assignment, 1999). As medication may fluctuate during the stay, comparisons between units are most easily made by rating the dosages at a fixed point of time, e.g. at discharge.

Use of restraint and compulsory treatments are obviously important aspects of a unit's treatment programme that should be rated. However, to

our knowledge, there are yet no published instruments that are suitable for this purpose.

Length of stays is also a useful dimension to include in a description or assessment of residential treatment units. Length of stay will reflect the duration of exposure to treatment, but also the role of the unit within the mental health services in the catchment area. Length of stay is most often measured as the mean duration for patients discharged within a specified period of time. In some cases it may be more useful to use the median, as the mean score is much more influenced by outliers such as exceptionally long stays.

Staff/patient ratio, the professional profile of the staff and staff turnover may be other useful characteristics to include in assessments of residential units. These dimensions are important in assessing the resources available and the possibility for continuity of care.

Physical dimensions of the facilities may be important, but are very seldom measured. One of the few instruments here is Physical and Architectural Characteristics Inventory (PACI) with assessment of seven dimensions such as community accessibility, physical features that add convenience, aid recreation and provide support for patients, and space for patient and staff function (Timko, 1996).

TO WHAT EXTENT DOES THE UNIT SUCCEED IN HELPING PATIENTS IMPROVE?

In a previous section, we mentioned that aggregate data can be used to give an overall description of the group of patients admitted to a unit. In the same way aggregate data of, e.g., changes in severity of symptoms and functional impairment will give an overall description of the unit's success in helping patients improve. GAF or S-GAF give a global measure that can be used across all patient groups, while the SCL-90 can be relevant as a measure of improvement in the level of perceived distress. However, as mentioned above, this scale is not applicable for the most severely ill patients.

For most diagnostic groups of patients, there are several well-established questionnaires and rating scales that may give aggregate scores to be used in assessment of treatment success. Other entries of this encyclopedia address such instruments for specific patient groups.

User satisfaction with different aspects of the treatment has become increasingly emphasized as an important measure of the quality of a treatment programme. Several instruments in the form of questionnaires or interviews are available and have been used also regarding residential treatment (Ruggeri, 1996). One of the more widely used is the Verona Service Satisfaction Scale (VSSS) (Ruggeri & Dall'Agnola, 1993). This is a questionnaire covering overall satisfaction, the skills and behaviour of the staff, information, access, efficacy, types of intervention and relative's involvement.

FUTURE PERSPECTIVES AND CONCLUSIONS

Through the last decades, the growing emphasis on non-residential mental health services has created more interest for research on such services compared to research on residential treatment. This is also reflected by the fact that there are few instruments in widespread use for assessment of residential facilities, even if such facilities still are important corner stones in mental health services for persons with severe mental disorders. The growing number of new instruments for assessment of residential and other treatment units (see Table 1) may be a signal of new interest in residential treatment as a part of mental health services research and evaluation. Further development of and experience with such instruments are important steps in this development and may increase our possibility to understand the complexity of residential treatment and its contribution within the mental health services.

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RELATED ENTRIES

Applied Fields: Education, Applied Fields: Gerontology, Outcome Assessment/Treatment Assessment, Perceived Environmental Quality

RISK AND PREVENTION IN WORK AND ORGANIZATIONAL SETTINGS

INTRODUCTION

Occupational safety thinking has undergone considerable extensions of scope during the last years. The focus shifted from personal characteristics as source of risk to the influence of work place as source of risk to organizational factors (Sheehy & Chapman, 1987). Prevention of occupational accidents and safeguarding of employee health as well as protection of environment have become

critical elements within a holistic framework of comprehensive 'integrated safety management' strategies (Zimolong, 1996). According to Hoyos and Ruppert (1993) safety can be achieved through joint and continuous efforts of management and employees in conjunction with requisite technical installations and safeguards. Thus, attention is directed to aspects of the encompassing organizational system instead of only focusing on individual workers and their work place but it remains centred on the focal organization.

Concepts in this field mainly theorize unsafe behaviour of single persons, either from a cognitive, motivational or learning perspective. Cognitive models of unsafe or risk-taking behaviour assume that people have a target level of risk to which they adapt their individual behaviour like in the risk homeostasis theory (Wilde, 1982), or that people act not as decision makers that makes them run risks (Wagenaar, 1992). According to Trimpop (1996) the motivation to perform safely is mainly influenced by three motives: to prevent a personal injury, to minimize efforts for work and to design work variable. People then calculate cost and benefits of future behaviour including emotional as well as cognitive aspects. Learning theories (Musahl, 1996) centre past behaviour, the probability of unsafe behaviour in the future increases as long as unsafe behaviour in the past did not lead to accidents. Recent models are expanded to organizational factors assuming that working conditions themselves can lead to accidents or increase the accident risk by so called error enforcing conditions (Reason, 1990).

Feed-forward strategies are mainly based on risk or hazard assessment. Feedback strategies are mainly based on accident and injury rates gathered from insurance statistics. An accident is often defined by three or more days of absence from work. Less than three days is defined as near-accident and usually no report has to be submitted.

Prevention strategies either focus on the individual, as personnel selection, training, and certain reward systems, or on ergonomic design. Münsterberg's early attempts to reduce accidents of 'motormen in street railway transportation' (Münsterberg, 1913: 63) and later of ship officers through respective selection techniques based on laboratory experiments are well known early approaches to occupational accident prevention. Another example of selection methods is the cognitive failure questionnaire (Broadbent, 1982), developed to detect accident-prone people. Empirical data again do not show definite results (Klumb, 1995). Training methods for safe behaviour aim at behavioural change through extending knowledge or competence as safety talks and safety discussion do (Fahlbruch, 1998). Reward systems aim either at the individual or a team, examples are bonus systems related to safety competitions among different work units. Preventions that aim at improving the ergonomic design state a priority of collective protection over an individual one. Other kinds of intervention focus on participation of workers in quality or safety circles. Recently the institutionalization of safety management systems or integrated HSE management systems is asked for. The perceived importance of leadership for safety leads to the involvement of managers and supervisors as well as to specific training for the management (Zimolong, 1995).

SYSTEM SAFETY

Disasters like the Chernobyl accident or major train accidents, like Clapham Junction or Eschede, lead to a different perspective on safety: accidents are considered as loss of control of the whole system with drastic negative consequences for people and environment. Such accidents are usually the case for high-hazard industries (Fahlbruch & Wilpert, 1999). It is the domain of such large-scale, low-risk, high-hazard organizations and their complete and disastrous breakdowns for which Fahlbruch and Wilpert (1999) reserve the notion of 'system safety' which they define 'as a quality of a system that allows the system to function without major breakdowns under predetermined conditions with an acceptable minimum of accidental loss and unintended harm to the organization and its environment' (p. 56). One reason is the design principle, the 'defence-in-depth' design, which is introduced in these kind of industries.

Accident causation theories are the main theoretical background in this field. Recent models are based on the concept of barriers which should protect objects from sources of danger. Reason (1990) extends his accident causation theory to several barriers within the organization. He assumes that in high-hazard

organizations, one unsafe act by an operator cannot cause a system's breakdown because of the defence-in-depth designs and that additional weaknesses in the organization are necessary for the occurrence of accidents. He introduces the concept of active and latent failure. Active failures are associated with the 'front-line' operators at the sharp end and trigger immediate adverse effects. Latent failures are associated with persons at the blunt end who are not involved in 'front-line' activities, e.g. decision makers. Their erroneous actions remain unrecognized for a long time period weakening the system functions like resident pathogens. Therefore, fallible decisions by top level management, deficiencies by line management, psychological precursors of unsafe acts, unsafe acts of operators as well as inadequate system defences together create a limited window for an accident occurrence path. Reason identifies eleven general failure types, latent failure domains: hardware defects, inappropriate design, poor maintenance management, poor operating procedure, error enforcing conditions, poor housekeeping, incompatible goals, communicational failures, organizational failures, inadequate training and inadequate defences (Groeneweg, 1992). Recently, the importance of inter-organizational factors as contributing to the occurrence of accidents is stated (Wilpert & Fahlbruch, 1998).

Assessment of risk is again conducted in a feed-forward or feedback way. Probabilistic risk or safety assessment methods serve to foresee possible accidents and to identify possible weaknesses in order to improve the system defences by countermeasures. This is a field mainly dominated by engineers and therefore the methods are based mainly on the functionality of the system. Main feedback strategies can be seen in accident analysis aiming at identifying factors that contributed to the occurrence of the given event. For these identified factors including weaknesses within the organization safety intervention/measurements have to be generated. Results of event analyses then lead to the learning of the organization with the aim to improve reliability and safety. Therefore, the systematical analysis of events can be seen as the starting point for learning from operational experience, and valid methodologies for event analysis are important for building a valid basis for the subsequent processing of learning. Opportunities for event analysis methodologies are seen in the possible prevention of future events, in the identification of potential organizational weaknesses, in the chance for systematic modelling of organizational context and interactions as well as in a possible stimulation of systematic thinking.

Prevention aims either at improving the technical system in the direction of less error proneness or at introducing error management, in which errors are seen as a learning chance for the organization (Frese, 1995), or at the introduction of organizational learning systems which are fed by the results of analyses of events and near-accidents. Examples of an organizational learning system are event databases as Synergi (Aase & Ringstad, 2002).

SAFETY CULTURE

Since the Chernobyl accident the term safety culture has been introduced. Safety culture is seen as a holistic concept and has tremendously stimulated practice and research in the field of high-hazard systems. The concept of safety culture serves also as an effective vehicle to promote theorizing and empirical research by directing the attention to wider managerial, organizational and inter-organizational issues of safety. But there is still a lack in common understanding of what safety culture means. Definitions range from cognitive aspects over shared value and norms to behaviour.

Measurement of safety culture is conducted either by safety climate or safety culture questionnaires, interviews, document analyses and observations (for an overview, see Büttner, Fahlbruch & Wilpert, 1999 or Guldenmund, 2000). Prevention is meant to increase systemic thinking and questioning attitude and mainly mediated by training.

INSTRUMENTS

In the occupational safety area, risk assessment is mainly done again by risk or hazard analysis. Methods are often practical orientated designed for certain industries focusing on factors which were causal in past accidents, like missing protection equipment or falling things. In recent days, long-term health hazards as well as sources

of psychological strain are often integrated in the analyses. But it seems that there is a lack in proved or evaluated instruments; the safety diagnosis questionnaire (Hoyos & Ruppert, 1993) can be seen as an exception. This questionnaire combines personal, work place and organizational factors and is closely related to methods of work or task analysis. Feedback analysis is mainly done without systematic methods. The TOR method (Technique of Operations Review – Weaver, 1973) can be stated as an exception. After an information search the TOR scheme with management categories mainly is used to identify causes by answering questions. But usually only categorization according to causal categories instead of systematic analysis methods is conducted.

In the system safety field, usually quantitative methods as PSA are used for feed-forward analysis, but in recent times more qualitative approaches gain ground, trying to introduce management and cultural aspects as well (Kirwan, 1998). Human behaviour is included in these assessments by modelling human reliability. Human reliability assessment (HRA) methods can be categorized according to Giesa (1996) into decomposition methods, e.g. Technique for Human Error Rate Prediction – THERP (Swain & Guttmann, 1983), time-reliability correlations, e.g. Human Cognitive Reliability – HCR (Hannaman, Spurgin & Lukic, 1984), and structured expert assessments, e.g. Success Likelihood Index Method – SLIM (Embrey, Humphreys, Rosa, Kirwan & Rea, 1984). For an overview and evaluation of different HRA techniques, see Kirwan (1996, 1997 a, b, c & d) and Kirwan, Kennedy, Taylor-Adams, and Lambert (1997). The authors used evaluative criteria like accuracy and precision as well as optimism/pessimism of estimates and judgement consistency. They conclude that future validation of the methods in use should be expanded to cover the entire process of task and error analysis and address the problem of internal validity as well.

Existing feedback methods in the field of system safety mainly focus on individual, technical and organizational failures as do ASSET (Assessment of Safety Significant Event Teams – IAEA, 1991, 1994a), CREAM (Cognitive Error and Reliability Analysis Method – Hollnagel, 1998) or MORT (Management Oversight and Risk Tree – Johnson, 1980). This can be seen as a shortcoming for the above reasons (Fahlbruch, 2000). An exception is the event analysis methodology Safety through Organizational Learning – SOL (Fahlbruch & Wilpert, 1997), which takes individual, group, organizational, inter-organizational as well as technical factors into account and which was also evaluated for its support of analysts (for a review of analysis methods see Benner, 1985; Becker et al., 1996; Fahlbruch, 2000).

There exist no complete and accepted instruments yet for assessing safety culture (Fahlbruch & Wilpert, 2000). First approaches are questionnaires of safety climate or safety culture like the ASCOT methodology for nuclear power plants (IAEA, 1994b).

FUTURE PERSPECTIVES AND CONCLUSIONS

In conclusion, it can be stated that the approaches of occupational safety are characterized by the following advantages: in this field exists a great variety of qualitative and quantitative prevention orientated measurement methods. Theorizing, measurement and interventions aim at integrating Human Resource Management. A certain disadvantage may still remain in the existing orientation towards the man–machine interaction, despite the efforts to consider also organizational factors. The system safety approaches are characterized by the following advantages: efforts are made to learn from experience, whereas experience from the whole organization is gathered, event analysis methods enhance the search for organizational factors and thus, the concentration on the man–machine interface could be overcome. But there are also disadvantages: system safety approaches still have a lack of diagnostic methods for safety status, nearly no qualitative prevention oriented measurement can be found and there is no systematic integration of human resource management knowledge. Furthermore, the interaction between different organizations is still not fully taken into account. Analyses and interventions are usually restricted by the borders of the organization, not taking inter-organizational issues into account.

Safety culture can be seen as the future construct for both fields, the occupational safety

and the system safety field, but there is still the need for further theoretical work and the development of adequate assessment tools, because existing ones are still faced with shortcomings like remaining in the level of cognitive aspects or lack of evaluation (Fahlbruch & Wilpert, 2000).

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Babette Fahlbruch

RELATED ENTRIES

Applied Fields: Work and Industry, Applied Fields: Organizations, Job Stress, Stress

SELF, THE (GENERAL)

INTRODUCTION

The self-system is very complex. It has become usual to distinguish between the self as subject (as Ego or I) and the self as object. The self-system assessment has been restricted to the latter. However, even when the self is considered as an object there are various domains to be assessed: the self as self-concept or, in general, self-representation, including schemas, contents and the structure of the self-knowledge (usually, with specific instruments to assess them); the self as a process, as a set of cognitive and behavioural activities, or instances related to oneself (mainly, assessed by techniques or procedures of functional analysis).

SOURCES IN SELF-THEORIES

Self-system assessment emerged originally rooted in phenomenological theories with emphasis on the self-concept. In these theories, the self-concept and the self-consciousness were assumed to govern the behaviour, to account for its consistencies, and, hence, to provide psychology with valid scientific explanations and predictions. However, in spite of their historical background, the instruments for assessment have become largely independent from the theories in which they are inspired, and are often used within other theoretical frames, e.g. trait models or in a highly atheoretical practice, where the self-concept is only assessed and described, but not alleged as a causal or explanatory factor.

A wide array of assessment procedures and tools have been designed. The most common procedures of self-concept assessment are based on self-reports, as rating scales, questionnaires, inventories, and adjective checklists. There are also other well known techniques, but rarely used in other fields, as Q-sort, semantic differential, grid-technique related to personal constructs, open-ended statements, and projective techniques. Most of the standardized instruments are supposed to be administered not only with a fixed content of items, but also by a specific procedure. Nevertheless, in some cases, the assessor can use an established set of items (adjectives, statements) in a format not previously foreseen by its designers, i.e. Q-sort.

Some more general personality repertoires and questionnaires include a scale or factor of the self-concept or of a quality of it, for instance the 'strength of the self'. Here, only specific devices are reported. Among the best known and popular instruments, the reader can find those that, whether explicitly linked to self-theories or not, rely on self-reports as the data that provide objective bases for inferences about concepts, schemas, attitudes and feelings about oneself.

STANDARDIZED INSTRUMENTS TO ASSESS THE SELF-CONCEPT

One of the first attempts to cover the domain of self-description was made by Sheerer (1949). This author extracted from protocols of cases at a counselling centre all the relevant statements for attitudes either to oneself or to other people. These statements served as input for a 101-item rating scale, that lies on the basis of other similar scales.

A similar attempt was made by Butler and Haig (1954) in a set of one-hundred self-referent items. Inspired in Carl Rogers' model of the self, they aimed to pinpoint an index of self-regard and self-acceptance in the correlation between the real and ideal self. Butler and Haig's list has been the source of the item content for various instruments. These items; anyway, can be assumed in other formats, for instance, those of scale, inventory, or questionnaire, subjects having only to answer yes or no. On the other hand, there are still other instruments based on discrepancy values taken as an index of self-regard or self-esteem. Thus, the *Index of Adjustment and Values* (IAV) (Bills, 1958) intends to provide a self-minus-ideal discrepancy score. It consists of a checklist with 49 adjectives reflecting desiderable or undesiderable traits. Discrepancy scores are obtained through the contrast of the three columns formed with the answers to these questions: (1) How often are you this way? (2) How do you feel about being this way? (3) How long would you like to be this way?

The traditional assessment of the self-system has oscillated between a global approach, as an unidimensional entity, and a search for specific measures related to various facets or dimensions of the self. The continuum from general to specific assessment instruments of the self displays a spectrum from mono-trait to multi-trait approaches. Global scales are unidimensional, while specific ones assume that the self construct is too wide and that other more precise scales or subscales are needed in order to get an accurate assessment and prediction. A favourite topic has been the self-esteem and its analogues: self-acceptance, self-evaluation. But the self-esteem itself can be considered as global in contrast with more specific domains of the self-evaluation: academic, corporal, or moral domains.

At the global pole of the continuum there are repertoires and questionnaires that, like the *Children's Self-Concept Scale* (PH), by Piers–Harris (1969), and the *Tennessee Self-Concept Scale* (TSCS), by Fitts (1965), try to cover a wide array of contents. PH presents a set of 80 declarative sentences about 'the way I feel about myself' to be marked yes or no. Six factors have been found and can be measured by PH: behaviour, intellectual and school status, physical appearance and attributes, anxiety, popularity, and happiness (or satisfaction). So, it provides a portrait of self-knowledge and not only of self-esteem. The TSCS has two forms: (a) a brief Counselling Form; and (b) a longer Clinical and Research Form. This longer form consists of 100 self-descriptive statements which subjects may or may not endorse, to portray their own picture of themselves. Its age of application ranges from 12 to late adulthood; and it is presumed to tap also the whole range of psychological adjustment: from well adapted people to psychotic patients. The TSCS provides scores on: identity, self-satisfaction, the physical self, the moral self, the personal self, the family self, and the social self.

There are also instruments designed to assess self-esteem. Thus, the *Coopersmith Self-Esteem Inventory* (SEI) (Coopersmith, 1967), whose published version consists of 58 items with an age range of pertinence from 10 to 16; and Rosenberg's Self-Esteem Scale, constructed as a brief and unidimensional scale (10 statements) to explore a global evaluative self-regard (Rosenberg, 1965). There are still more specific scales, devoted to a very concrete aspect of the self-image and the self-evaluation. This is the case of a scale designed by Lerner, Orlos and Knapp (1976) to assess how people evaluate themselves and how much they are satisfied with their physical appeal and effectiveness. Although designed for late adolescence, this scale also fits childhood and adulthood. As the self is a salient construct during the adolescence, it has been especially explored along this age; many scales and inventories have been designed or tested for late childhood and adolescence.

PROBLEMATIC ISSUES IN THE ASSESSMENT OF THE SELF-SYSTEM

Traditional assessment was: (1) limited to internal, private, non-directly observed, and dispositional or

trait-like structures; and (2) related to cognitions, judgements and attitudes towards oneself. The assessment heavily relied upon inferences from subjective self-reports. Hence, the psychometric assessment of the self-concept had to face problems of reliability and validity similar to those found in the assessment of cognitive and affective structures. When individuals are self-concerned, biases of social desiderability, acquiescence or, on the contrary, refusal, and, in general, distortion, come to the stage. These problems in the assessment of self-system are not unique in kind, but they are especially uneasy to deal with.

At present, classical scales, inventories and questionnaires to assess self-esteem and self-concept have come under strong criticism. Most reviewers of the psychometric approach to self-concept by standardized instruments (Crowne & Stephens, 1961; Lowe, 1961; Wylie, 1974) have been not only dissapointed, but very critical. Critics emphasize that self-concept assessment and research lack conceptual clarity and are plagued with artefactual biases and shortcomings.

There are no satisfactory working definitions of the self-concept and of other self-related constructs involved in psychometrical tools. Most definitions of the self-concept are highly abstract to be empirically testable. Semantic ambiguity precludes rigorous tests of crucial hypotheses. In short: over-generalized self-referent constructs, such as self-concept, not to say self-consistency or self-actualization, and their presumed markers are not useful; they do not contribute to explain and to predict the behaviour; and they must be replaced by other more fruitful constructs leading to more scientific tools.

The self-concept is neither an entity, nor a unique concept. Actually, it consists of a set of self-oriented concepts, a variety of mental representations about oneself. Moreover, the self-system appears to be internally complex and multi-faceted. So, a multitrait model is needed, where each aspect calls for a related instrument or scale. Actually, many instances have been targets of specifically designed assessment tools, each of them tapping one dimension that is presumably relevant for the prediction of behaviour. Therefore, it is brought to psychometric scrutiny: self-attributions, self-monitoring, self-awareness, self-talk, self-presentation, self-disclosure, self-enhancement, self-criticism, self-worth.

This view of the self-system, as a multiple, complex, and multidimensional set of components, could be integrated in a theoretical approach in which a hierarchical organization is proposed. Thus, it has a core nucleus and several peripheral elements (L'Ecuyer, 1978). In such hierarchy, theory holds together various components, whereas empirical research and assessment aim to specify concrete elements in an approach that can meet (so it is expected) the requirements of traditional psychometrics.

FROM PSYCHOMETRIC TOOLS TO BEHAVIOURAL ASSESSMENT

In spite of endeavours to restore it, psychometrical assessment and its instruments, mainly based on insight, self-reports and Q (questionnaire) data, has remained under suspicion. Assessors have turned to more reliable and objective procedures, those of a behavioural analysis. In this shift, the self-system is considered and assessed no more according to the phenomenal field of the subject experience, but in terms of the observer's objective categories. So, research and assessment have been redirected to chains of behaviour with a high commitment of the self-system.

The self-system consists not only of private events, but also of overt behaviours that can be observed. The self-related behaviour is a class of behaviour; and the self-system may and must be seen as a pattern of self-referent behaviour. More precisely, much of the human behaviour, in fact any purposive behaviour, is mediated by self-related processes. Thus, coping overt behaviour could be considered as a self-protective action, hence as a part of self-related activity. Models by Bandura (1977) and by Kanfer and Karoly (1972), that point to self-regulation as an intrinsic element of goal-directed behaviour, make possible a behavioural and functional analysis of the self-system anchored in motor and verbal activity. The self-system is heavily involved in goal-directed action (Bandura, 1989), where human agency comes to overt motor or verbal behaviour through self-related instances and processes: self-observation, self-evaluation, and self-reinforcement.

In this analysis, the self-system is more than a self-concept or a self-consciousness, that are private inferred instances of it. The self-system is not only

a multi-faceted structure, as it is widely recognized, but also a behavioural set of ongoing processes, displayed in a stream of activities from self-perceiving and self-knowing to self-reinforcing, self-talking, and self-helping. It is a functional system as well: it contributes to protect the individual by coping with adverse events and, overall, to adjust the person to the environment and to provide an hedonic positive balance. The challenge for the assessor is to objectively grasp such instances and functions of the self-system with techniques able to produce L (life) and T (test) data.

BEHAVIOURAL TECHNIQUES AND PROCEDURES

According to the principles of behavioural assessment, the techniques and procedures to assess the self-system, i.e. self-related behaviour, are not specific. They are subjected to common tenets and methodological requirements of this kind of analysis. General procedures of behavioural assessment are valid, of course, in self-related behaviour patterns and/or self-oriented qualities of behaviour, even when research is focused on self-structures and processes that are not directly but only indirectly observed and inferred.

Many observable self-referent behaviours do not raise any problem to be classified, assessed, and measured: self-caring, self-talking in loud voice, self-injuries, and self-aggression (Iwata, Dorsey, Slifer & Bauman, 1994; Pelios, Morren, Tesch & Axelroad, 1999). In general, the occurrence and qualities of overt self-behaviour are easy to assess. They do not pose major problems of coding and recording.

The challenge arises when private activity, like self-attention or self-evaluation, or less concrete but objective qualities across behaviours, as self-regulation (Taylor & O'Reilly, 1997), must be assessed. The best option tries to turn such behavioural instances in operations either of the observer or of the subjects. There are aspects of behaviour where the task is to experiment rather than to assess. Namely experimenting is probably the best way of assessing. Thus, for instance, researchers on objective self-awareness and self-attention have proceeded in an approach where the assessment is not aside from experimental manipulation (Duval & Wicklund, 1972). Some simple devices play a salient role in controlled, experimental or non-experimental assessment situations, e.g. the use of mirrors. From Narcissus, natural or artificial mirrors have played a conspicuous role in physical self-regard, self-image, and self-evaluation. Self-directed behaviours in the presence of mirrors yield direct data for inferring self-recognition. Modern technology still provides other tools, such as audiotape and videotape, with or without subjects' awareness of having been recorded.

To move body parts (e.g. head, arms, legs, right, left) with or without verbal instructions in presence of mirrors is highly useful in the study of the ontogeny of self-recognition in childhood, when self-system begins to develop a physical self-image. An image from which the child will later abstract a generalized self and a conscious knowledge of himself, through an on-going task of integration of increasingly wider sets of information inputs.

Such is also the case of techniques based on the self/others contrast: actor/observer, insider/outsider, inward/outward, self/others' attributions, self/other agreement or discrepancy, to see one-self as/or not as others see us (Horowitz, 1998; Ogilvie, Fleming & Pennell, 1998). These techniques are widely used in the assessment of self-schemas: cognitive structures that contain generic knowledge about the self (Cash & Labarge, 1996; Muran, Samstag, Segal & Winston, 1998; Sheeran & Orbell, 2000). In settings where potential self-related stimuli are presented to the subject, there are indexes of presence of self-related schemas: in reaction time, speed of processing, accessibility in memory retrieval, salience, readiness, and ability to categorize behaviours along certain dimensions, richness and complexity of self-related descriptions when compared with others' descriptions (Rogers, Kuiper & Kirker, 1977; Rogers, Rogers & Kuiper, 1979).

INTEGRATION OF APPROACHES

Although well founded on integrative tendencies of our time, it is ironic that classical procedures for self-concept assessment have come again in behavioural assessment. In fact, they never disappeared. Forced-choice techniques, like Q sort and grid format, seem to assure a more objective account for the self-report and for the elicitation of personal constructs. The main point, however, from the behavioural approach is that objectivity is searched not only through techniques of data

collecting, but also chiefly through data processing. Data collected with a repertory grid are submitted to qualitative analysis, as well as to quantitative recording and to statistical scrutiny (Feixas & Villegas, 1990).

Discrepancy or congruence between real/ideal scores (or other/self scores) also come back, as a marker of an evaluative process, that may be only implicit in the subject's awareness. Thus, it is presumed that phenomenological subjectivity biases could be eschewed by purely objective comparison between two sets of statements (Fierro, 1986).

Not only classical procedures, also scales thorougly akin to traditional ones, have been designed to serve to a behavioural and objective approach. This is the case of the well-known *Self-Monitoring Scale*, by Snyder (1986), with 25 items. Monitoring refers to the degree to which individuals are sensitive to the demands of concrete situations as well as to their own expressive behaviour in those settings. In a similar vein, Scheier and Carver (1985) have designed a *Self-Consciousness Scale*, that consists of 22 items distributed in three subscales: public, private, and social consciousness.

FUTURE PERSPECTIVES

The present focus of self-psychology on self-construction and self-narratives (Freeman, 1993) invites to foresee a development of behavioural assessment of self-system along the promising way of an analysis of autobiographical materials and personal documents. This approach was originally linked either to a dynamic conception or to an idiographical study. Nowadays, however, the textual analysis of spontaneous autobiographical documents, such as memories, diaries, letters, is an objective procedure to assess the self-system and to infer basic laws concerning not only contents (episodic, ideologic contents), but chiefly formal aspects: clarity, certainty, saliency, and (un)stability of one's own descriptions along the time. Personal self-descriptive texts are first order sources to have a look into personal self-schemas and scripts (in the sense of social psychology), i.e. into explicit or implicit narratives and representations of oneself. From these sources come to light the features, the structure, and the ontogenesis of the self-system: how people perceive themselves, and how they have come to their self-perception (Clarke, 1995).

When there are not such previous texts, the assesser can ask the person to write down autobiographical accounts for a certain amount of time with specific instructions. These accounts may refer to current or past events and experiences belonging to personal memory. Thus, very long-term samples of behaviour can be gathered to grasp people's representations of their life-course patterns across various time scales. In this context, traditional repertoires and inventories of autobiographical memory (e.g. Siegel, 1956) can still be useful for the assessment of the life story, as well as of the self-system.

CONCLUSIONS

Today and in the future, verbal behaviour in self-reporting is likely to remain at the very centre of the assessment of the self-system even within a behavioural approach. However, the behavioural assessment differs from the traditional in its theoretical framework and its use of the rules for inference. Self-reports are weighted as overt behaviours rather than as signs of internal structures. They are taken as a representative sampling of a behaviour class. Finally, the analysis of those self-descriptive statements proceeds from the point of view of an external observer, not from the insight perspective of subjects. When the behavioural assessor uses classical procedures and/or scales, he assumes that it is possible for an objective practice to collect self-reported data and to restate them through analysis techniques similar to those used in the study of texts and verbal discourse.

The key point for an objective assessment of the self-system is a shift from a construct oriented to a behavioural oriented approach. This is anchored in scientific or technical operations that go beyond assessment, although bounded to if: either in a research process, where the assessment is an instance among others, ideally experimental control and inference; or within clinical and intervention settings, where the assessment is a tool at the service of behavioural therapy or modification.

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Alfredo Fierro

RELATED ENTRIES

Personality Assessment (General), Theoretical Perspective: Constructivism

SELF-CONTROL

INTRODUCTION

Self-control skills consist of self-monitoring, self-evaluation, and self-administered reinforcement. Self-control is also referred to as self-instruction, self-management, learned resourcefulness, lifestyle organization, and controlled reinforcement is delayed or absent. There are at least four self-report instruments that have been developed to assess self-control skills. Some instruments measure the components of self-control and related skills while others measure behavioural outcomes of self-control. The psychometric characteristics of each instrument will be summarized and recommendations for future instrument development will be discussed.

ASSESSMENT OF SELF-CONTROL

Kanfer (1970, 1977; Kanfer & Karoly, 1972) defined self-control as a repertoire of three self-regulating behaviours including self-monitoring, self-evaluation, and self-reinforcement. According to this definition, the individual monitors a behaviour targeted for change or maintenance. The target behaviour can be overt (e.g. eating) or covert (e.g. thoughts and emotions). The individual then compares the target behaviour to an internalized standard and identifies discrepancies. Based on this comparison, the individual engages in self-reinforcement or self-punishment, which subsequently influences whether further self-monitoring and self-evaluation will occur and whether the target behaviour is modified or maintained. Self-control skills are deemed essential when environmentally controlled reinforcement is delayed or absent.

Self-control is achieved when the individual is able to initiate and persist in a low probability target behaviour (e.g. exercising) as opposed to a competing higher probability behaviour (e.g. watching television). Also, the target behaviour must be maintained without immediate environmental reinforcement. For example, exercising regularly on one's own reflects self-control, whereas exercising only when a coach is prodding, praising, or criticizing does not.

Various definitions of self-control and related constructs have been proposed that differ from that originally proposed by Kanfer. Alternative constructs that have appeared in the self-control literature include self-regulation, self-instruction, lifestyle organization, and learned resourcefulness (see Table 1).

Table 1. Construct definitions

Construct	Definition
Self-control	Applying the processes of self-monitoring, self-evaluation, and self-reinforcement to alter the probability of a response in the relative absence of immediate external support.[a]
Self-instruction	Applying alternative, specific, coping self-statements to the solution of each phase during the solution of a problem.[b]
Self-regulation	Applying the processes of self-monitoring, self-evaluation, self-reinforcement, as well as self-efficacy, to the mediation of most external influences and the motivation of purposeful action.[c]
Lifestyle organization	Setting goals for oneself and then systematically using cognitive and behavioural strategies to reach those goals.[d]
Learned resourcefulness	A personality repertoire consisting of beliefs and self-control skills and behaviours.[e]

[a]Rehm, 1977 (p. 790). [b]Meichenbaum, 1985 (p. 69). [c]Bandura, 1991 (p. 248). [d]Williams et al., 1992 (p. 217). [e]Rosenbaum, 1990 (p. 14).

Self-regulation (Bandura, 1986, 1991; Kanfer & Schefft, 1988) consists of the three self-control behaviours proposed by Kanfer (i.e. self-monitoring, self-evaluation, self-reinforcement), as well as self-efficacy beliefs. Self-efficacy refers to an individual's belief about one's personal effectiveness and, according to Bandura (1991), these beliefs influence whether and in what manner self-control will be implemented.

Self-instruction (Meichenbaum, 1977) refers to the internalization of self-directive speech and involves self-monitoring of self-statements and the use of alternative, self-reinforcing statements. Unlike Kanfer's conceptualization of self-control, however, self-instruction does not involve the evaluation of one's behaviour according to internalized standards.

Lifestyle organization is defined as setting 'goals for oneself and then systematically using cognitive and behavioural strategies to reach those goals' (Williams, Moore, Pettibone & Thomas, 1992: 217). This conceptualization appears to implicitly incorporate Kanfer's three self-directive aspects of self-control including self-monitoring, self-evaluation, and self-reinforcement. Lifestyle organization also refers to other cognitive and behavioural strategies including awareness of lifetime goals and solicitation of feedback from others.

Learned resourcefulness (Rosenbaum, 1990) refers to a constellation of cognitive and behavioural responses, or coping skills, that are somewhat related to Kanfer's concept of self-control. The Self-Control Schedule (SCS) was developed by Rosenbaum (1980) to measure learned resourcefulness and the SCS has accrued strong support for its construct validity (M. Rosenbaum, personal communication, November 25, 1999). Rosenbaum (1990) distinguished between self-control as representing primary cognitive responses and learned resourcefulness as a related but distinct personality repertoire. Due to this distinction, the SCS will not be reviewed in this entry and will be discussed only in reference to its use in psychometric evaluations of other self-control measures.

For the purposes of this entry, self-control will be understood in terms of Kanfer's three-component model. Kanfer's conceptualization of self-control provides a parsimonious and clearly delineated construct. As described earlier, each component of self-control is inextricably linked to the other two in the performance of a targeted behaviour that is not subject to immediate environmental reinforcement. Kanfer's model is extensively cited and is widely recognized as fundamental in the assessment of self-control (Brandon, Oescher & Loftin, 1990; Rehm, Kornblith, O'Hara, Lamparski, Romano & Volkin, 1981; Rosenbaum, 1980) and in the training of self-control skills (Febbraro & Clum, 1998).

MEASURES

Four self-report measures designed to assess self-control as defined by Kanfer's three-component model are described in Table 2 in the order in which they were published. Each of these measures was developed for use among adults and adolescents.

Table 2. Psychometric evaluation of self-control questionnaires

	Psychometric evaluation			
Measure	Content validity	Construct validity	Convergent validity	Reliability
SCQ	Rehm et al., 1981	Rehm & Rokke, 1988 Rude, 1989	Rosenbaum, 1980	O'Hara et al., 1982 Rude, 1989
FSRQ	Heiby, 1982	Heiby & Campos, 1986 Wagner et al., 1988	Heiby, 1982 Heiby, 1983a	Heiby, 1982 Heiby, 1983a
SCQ-Brandon	Brandon et al., 1990	Brandon et al., 1990	Brandon et al., 1990	Brandon et al., 1990
LSA	Williams et al., 1992	Williams et al., 1992	Williams et al., 1992	Williams et al., 1992

Note: References appearing in the content validity column are the original publications for each measure.
Selected summary articles are included in the construct validity column. Refer to text for complete references.

The Self-Control Questionnaire (SCQ)

The SCQ (Rehm et al., 1981) consists of 40 items rated on a 5-point scale. Total SCQ scores range from 0 to 160. No norms or cutoff scores are available.

Reliability

Psychometric studies of the SCQ have reported high internal consistency and stability, with Cronbach's coefficient alphas ranging from 0.69 (Rude, 1989) to 0.88 (O'Hara, Rehm & Campbell, 1982) and 5-week test–retest reliability estimated at 0.86 (O'Hara et al., 1982).

Content Validity

Content validity of the SCQ is difficult to ascertain because details concerning its construction are unavailable. The SCQ, however, is described as rationally derived (Rehm & Rokke, 1988) and has been used to assess the effectiveness of Fuchs and Rehm's (1977) self-control behaviour therapy for depression. Based on this self-control treatment model, the SCQ measures deficits in self-monitoring (i.e. self-monitoring of negative events; selective monitoring of immediate versus delayed consequences of behaviour), self-evaluation (i.e. exceedingly demanding standards; inaccurate perceptions of personal responsibility), and self-reinforcement (i.e. infrequent self-reward and self-administering excessive punishment) (L.P. Rehm, personal communication, October 9, 2000). A sample SCQ item is, 'Criticizing myself is often the best way to help me get through a difficult task.'

Construct Validity

The strongest construct validity evidence for the SCQ derives from studies demonstrating an expected increase in SCQ scores after self-control therapy for depression (Rehm, 1984). Scores on the SCQ also predicted postpartum depression when administered during the second trimester of pregnancy (O'Hara et al., 1982). Discriminant validity is supported by significant correlations between the SCQ and Beck Depression Inventory of 0.16 (Rosenbaum, 1980) and 0.31 (O'Hara et al., 1982), indicating the SCQ is not a measure of depression per se. Rude (1989) investigated the constructs underlying the SCQ using exploratory factor analysis (EFA) and identified the following factors: (1) positive focus, (2) self-reward and long-range focus, (3) external locus of control, (4) external standards for self-appraisal, (5) self-punishment, and (6) fatalism (Rude, 1989). According to Rude, Factors 1 and 5 reflect self-reinforcement, Factor 2 reflects both self-reinforcement and self-monitoring, and Factor 4 reflects self-evaluation, indicating the three components of Kanfer's model are assessed by the SCQ. Factors 3 and 6 are not consistent with Kanfer's model.

Convergent Validity

A significant correlation between the SCQ and the Self-Control Schedule (SCS) of 0.42 (Rosenbaum, 1980) provides some support for convergent validity of the SCQ. As described earlier, the SCS is a more general measure of coping skills, including self-control related cognitions and behaviours.

Frequency of Self-Reinforcement Questionnaire (FSRQ)

The FSRQ (Heiby, 1982) consists of 30 items scored as 'true' or 'false'. The total score for the FSRQ ranges from 0 to 30. A cutoff score of 17 has been used to discriminate between high and low frequency of self-reinforcement (Heiby, 1982, 1983a, 1983b; Varese, Pelowski, Riedel & Heiby, 1998).

Reliability

The FSRQ has demonstrated high internal consistency (split-half reliability = 0.87) and high test–retest reliability over an 8-week interval ($r = 0.92$) (Heiby, 1983a). The stability of the FSRQ was also indicated by results demonstrating that the number of self-reinforcing statements made by individuals across situations correlate highly with FSRQ scores ($r = 0.72$ to 0.79). The number of statements across situations, however, did not differ significantly, suggesting the generalizability of self-reinforcement (Heiby, 1982).

Content Validity

The FSRQ was developed based on Rehm's (1977) definition of self-control, which incorporated Kanfer's model to explain depressive

symptomatology. Heiby (1982) referred to self-control as self-reinforcement and suggested that the three components of self-control are constituent elements of self-reinforcement. From an initial pool of 100 items generated by Heiby (1982), 10 judges selected those items that conformed to Rehm's definition of self-control, as well as those that were amenable to a 'true' or 'false' response format. To be retained, an item must have achieved 80% inter-judge agreement. This process yielded the 30-item FSRQ. A sample item is, 'I don't often think positive things about myself.'

Construct Validity

Construct validity of the FSRQ is supported by significant correlations with health locus of control, amount of exercise, exercise motivation, self-motivation (Heiby, Onorato & Sato, 1987), and life satisfaction (Seybolt & Wagner, 1997) as hypothesized. Predicted significant negative relationships were found between scores on the FSRQ and measures of anxiety (Heiby et al., 1987) and depressive symptomatology (Heiby, 1983b; Heiby et al., 1987; Schlatter, Heiby, Dubanoski, Kameoka & Denney, 1993; Dubanoski et al., 1996; Wilkinson, 1997; Varese et al., 1998; Wong, Heiby, Kameoka & Dubanoski, 1999). Discriminant validity has been demonstrated by non-significant correlations with social desirability (Heiby, 1982), gender (Parmar & Cernovsky, 1993; Seybolt & Wagner, 1997), and psychiatric diagnoses (Parmar & Cernovsky, 1993).

Support for construct validity also has been provided by findings of three experimental studies. First, in a crossover treatment study of four cases of depression, two cases that demonstrated deficient self-control skills, as assessed by the FSRQ, achieved clinically significant improvements following self-control therapy for depression (Heiby, 1986). Second, scores on the FSRQ were shown to increase significantly as a result of self-control therapy for depression (Heiby, Ozaki & Campos, 1984). Third, manipulation of environmentally controlled reinforcement showed that low scorers (<17) on the FSRQ experienced significantly greater depressed mood as a result of decreased experimenter-controlled reinforcement (Heiby, 1983b).

Wagner, Holden, and Jannarone (1988) conducted exploratory factor analyses of the FSRQ and found five factors underlying the measure: (1) self-evaluation, (2) self-reinforcement and self-reward, (3) don't self-praise, (4) be self-critical, and (5) responding emotionally to criticism and to self-evaluation. Wagner et al. noted that while the self-evaluative and self-reinforcement aspects of Kanfer's self-control model are adequately represented by FSRQ items, the self-monitoring aspect of self-control was not.

Convergent Validity

Convergent validity of the FSRQ has been demonstrated by significant positive correlations between FSRQ scores and reported self-praise on analogy tasks ($r = 0.69$) and on anagram tasks ($r = 0.65$) (Heiby, 1983a). In addition, the FSRQ is also significantly correlated with the frequency of daily self-monitored self-reinforcement ($r = 0.78$), as well as experimenter ratings of subjects' tendency to self-reinforce ($r = 0.42$) (Heiby, 1982).

The Self-Control Questionnaire (SCQ-Brandon)

The Self-Control Questionnaire developed by Brandon and his colleagues (1990) (SCQ-Brandon) is composed of 16 items rated on a 5-point scale. Total SCQ-Brandon scores range from 16 to 80. No norms or cutoff scores are available.

Reliability

Internal consistency reliability for the SCQ-Brandon is high, with a Cronbach's coefficient alpha of 0.80 (Brandon et al., 1990). Temporal stability of the measure has not been reported.

Content Validity

The SCQ-Brandon was designed to measure behavioural outcomes of self-control skills rather than self-control skills per se. A sample item is 'I snack between meals'. The SCQ-Brandon was developed to assess physical and emotional health-related behaviours. The authors defined self-control in terms of electing to engage in a low probability behaviour over a high probability behaviour (Brandon et al., 1990). This definition parallels Kanfer's criterion for achieving effective self-control skills, namely persistence in a low

probability target behaviour in opposition to competing higher probability behaviours, without supportive environmental reinforcement. Because the SCQ-Brandon measures outcomes of self-control rather than self-control as a construct, item content does not clearly reflect the three components of self-control (i.e. self-monitoring, self-evaluation, and self-reinforcement).

To establish content validity of the SCQ-Brandon, the author (Brandon et al., 1990) and his colleagues identified 10 health-related areas (e.g. eating behaviours, emotional control, exercise behaviour, study habits) in which behavioural outcomes of self-control could be assessed. Six to eight items were generated for each health-related area. Items were reviewed by six judges who were instructed to select behavioural outcome items that are highly dependent on self-control skills and items that most clearly indicate presence or absence of self-control skills. EFA of the SCQ-Brandon yielded the following five factors defined by 16 items: (1) eating behaviour, (2) time management, (3) emotional control, (4) social behaviour, and (5) financial planning (Brandon et al., 1990). These factors are consistent with 5 of the 6 rationally derived health-related areas assessed by the SCQ-Brandon.

Construct Validity

Because the SCQ-Brandon is designed to measure behavioural outcomes of self-control rather than self-control skills per se, construct validity of the SCQ-Brandon has been evaluated by inspecting the relation between scale scores and health behaviours. Brandon et al. (1990) found a significant correlation between scale scores and fitness level among cyclists ($r = 42$) and that these scores significantly distinguish between a group of cyclists who exercise regularly from a group of college students who do not.

Convergent Validity

Some support for the convergent validity of the SCQ-Brandon was provided by a significant moderate correlation ($r = 35$) with the California Personality Inventory (CPI) Self-Control subscale (Brandon et al., 1990). The CPI subscale, however, is a more general measure of self-control that was not developed based on Kanfer's definition of self-control.

The Lifestyle Approaches Inventory (LSA)

The LSA (Williams et al., 1992) is a 16-item instrument, scored on a 5-point scale. Total score on the LSA ranges from 0 to 64. No norms or cutoff scores are provided.

Reliability

Reliability estimates for the LSA is high with a reported Cronbach's coefficient alpha of 0.80 and test–retest reliability over a one-week interval of 0.90 (Williams et al., 1992).

Content Validity

The LSA was developed to measure self-control as well as various indicators of health, including self-efficacy and health habits (Williams et al., 1992). According to the authors, the LSA was also developed to complement cognitively oriented measures such as the SCS and SCQ, and the behaviourally oriented SCQ-Brandon.

Content validity of the LSA is derived from the text of a self-help book, *Manage Your Life* (Williams & Long, 1991), which summarizes 20 years of self-management research. An initial pool of 48 items drawn from this text by Williams et al. (1992) was reduced to 16 items based on the results of an EFA. Four factors resulted: (1) performance focus and efficiency, (2) goal directedness, (3) timelines of task accomplishment, and (4) organization of physical space. A sample item from factor 2 is, 'In most situations, I have a clear sense of what behaviours would be right or wrong for me.'

Construct Validity

Construct validity of the LSA is supported by significant positive correlations with self-efficacy, life satisfaction, purpose in life, physical health status and health habits, and significant negative correlations with external locus of control and perceived stress. Discriminant validity was demonstrated by non-significant relationships between the LSA and religious beliefs and practices (Williams et al., 1992). Further construct validity support was provided by the following findings: (1) as predicted by the authors, LSA scores were significantly more highly correlated with

scores on a general self-efficacy scale than scores on a social self-efficacy scale, and significantly higher mean scores were found among female, middle-aged, and educated subjects (Williams et al., 1992); (2) LSA scores were significantly negatively related to scores on the Judgement–Perception index of the Myers–Briggs Type Indicator ($r = -40$; Williams, Verble & Price, 1995), suggesting that self-management is related to an organized personality characteristic; and (3) consistent with the prediction that lower degree of self-management is associated with risk for problem-drinking behaviours, LSA scores were found to be significantly negatively correlated with scores on the Michigan Alcoholism Screening Test (McKee, 1996).

Convergent Validity

Convergent validity of the LSA was supported by significant and moderately high correlations with both the SCS ($r = 68$) and SCQ-Brandon ($r = 69$) (Williams et al., 1992). These findings are consistent with the authors' aim to develop an instrument that assessed both cognitive aspects of self-control, as measured by the SCS, and behavioural aspects of self-control, as measured by the SCQ-Brandon.

FUTURE PERSPECTIVES

The literature suggests that each of these self-control instruments can be further developed and validated. These suggestions include the following.

Construct validity evidence for the SCQ has focused on the measure's utility in studies on depression. It has been suggested that the SCQ may be an effective measure of vulnerability for depression (Rehm & Rokke, 1988; O'Hara et al., 1982); however, the SCQ may also be predictive of other psychopathologies.

According to Wagner and colleagues (1988), the FSRQ contains superfluous items that could be replaced by items that strengthen internal consistency of the measure and improve the assessment of self-monitoring skills. Also, replacing the 'true' or 'false' format of the FSRQ with a Likert scale format may improve the sensitivity of the instrument and make it more conducive to factorial investigation (Wagner et al., 1988). An advantage of the FSRQ, however, is that cutoff scores guide test interpretation.

The SCQ-Brandon requires further psychometric evaluations, particularly evidence for the measure's validity. For example, in support of the measure's construct validity, relationships between self-control skills and behavioural outcomes measured by the SCQ-Brandon need to be demonstrated.

Perhaps the most crucial need for the LSA is clearer articulation of the construct it purports to measure. The absence of a clear definition of lifestyle organization limits efforts to validate the LSA. Indeed, in light of the assessment literature reviewed here, consensus on the definition of 'self-control' (or self-regulation or self-management) is currently the most pressing requirement for the assessment of self-control skills.

CONCLUSIONS

Currently, there are at least four self-report instruments designed to assess self-control skills. These instruments vary along several dimensions. The SCQ and the FSRQ closely adhere to Kanfer's three-component model of self-control, while the SCQ-Brandon and the LSA are based on other theoretical models. Similarly, while item content of the SCQ and FSRQ was designed to measure components of self-control as defined by Kanfer, the SCQ-Brandon and the LSA, in part, were constructed to measure behavioural outcomes of self-control skills.

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RELATED ENTRIES

APPLIED FIELDS: CLINICAL, THEORETICAL PERSPECTIVE: COGNITIVE-BEHAVIOURAL, THEORETICAL PERSPECTIVE: PSYCHOLOGICAL BEHAVIOURISM

SELF-EFFICACY

INTRODUCTION

Perceived self-efficacy is concerned with people's beliefs in their capabilities to produce given attainments (Bandura, 1997). Perceived self-efficacy operates a core factor in the agentic causal structure of social cognitive theory (Bandura, 2001). This belief system is the foundation of human motivation and accomplishment. Unless people believe they can produce desired outcomes by their actions, they have little incentive to act, or to persevere in the face of difficulties. Whatever other factors serve as motivators, they are rooted in the core belief that one has the power to accomplish things by one's actions.

One cannot be all things, which would require mastery of every realm of human life. People differ in the areas in which they cultivate their efficacy and in the levels to which they develop it even within selected pursuits. Thus, the efficacy belief system is not a global trait but a differentiated set of self-beliefs linked to distinct realms of functioning. Multidomain measures reveal the patterning and degree of generality of people's sense of personal efficacy.

STRUCTURE OF SELF-EFFICACY BELIEFS

There is no all-purpose measure of perceived self-efficacy. The 'one-measure-fits-all' approach usually has limited explanatory and predictive value because most of the items in an all-purpose measure may have little or no relevance to the selected domain of functioning. Moreover, in an effort to serve all purposes, items in a global measure are usually cast in a general, decontextualized form leaving much ambiguity about exactly what is being measured and the level of task and situational demands that must be managed. Scales of perceived self-efficacy must be tailored to the particular domains of functioning that are the object of interest.

Although efficacy beliefs are multifaceted, social cognitive theory identifies several conditions under which there is some covariation even across distinct domains of functioning. Interdomain relations occur when different spheres of functioning are served by similar subskills; generic self-regulatory strategies are applied across different realms of activity; beliefs in one's learning efficacy are generalized across different types of challenges; there is co-development across dissimilar activity domains; and powerful mastery experiences produce a generalized transformational restructuring of efficacy beliefs.

CONTENT VALIDITY

The content of efficacy scales should accurately reflect the construct. Self-efficacy is concerned with perceived capability. The items should be phrased in terms of *can do* rather than *will do*. *Can* is a judgement of capability; *will* is a statement of intention. Perceived self-efficacy is a major determinant of intention, but the two constructs are conceptually and empirically separable. Perceived self-efficacy should also be distinguished from other constructs such as self-esteem, locus of control, and outcome expectancies. Perceived efficacy is a judgement of capability; self-esteem is a judgement of self-worth. Locus of control is concerned not with perceived capability, but with belief about whether outcomes are determined by one's actions or by forces outside one's control. High locus of control does not necessarily signify a sense of empowerment and well-being. For example, students may believe that high academic grades are entirely dependent on their performance (high locus of control), but feel despondent because they believe they lack the efficacy to produce those superior academic performances. Perceived self-efficacy should also be distinguished from outcome expectations which are judgements about the physical, social, or self-evaluative outcomes that are likely to flow from given performances.

FUNCTION OF SELF-EFFICACY BELIEFS

Perceived efficacy plays a key role in human functioning because it affects behaviour not only directly, but by its impact on other key determinants such as goals and aspirations, outcome expectations, affective proclivities, and perception of impediments and opportunities in the social environment (Bandura, 1986, 1995, 1997; Maddux, 1995; Schwarzer, 1992). Efficacy beliefs influence whether people think erratically or strategically, optimistically or pessimistically; what courses of action they choose to pursue; the challenges and goals they set for themselves and their commitment to them; how much effort they put forth in given endeavours; the outcomes they expect their efforts to produce; how long they persevere in the face of obstacles; their resilience to adversity; how much stress and depression they experience in coping with taxing environmental demands; and the accomplishments they realize.

Meta-analyses across different spheres of functioning confirm the influential role of perceived self-efficacy in human self-development, adaptation, and change (Holden, 1991; Holden, Moncher, Schinke & Barker, 1990; Multon, Brown & Lent, 1991; Stajkovic & Luthans, 1998).

DOMAIN SPECIFICATION AND SELF-EFFICACY MULTICAUSALITY

The construction of sound efficacy scales relies on an informative conceptual analysis of the factors governing the selected domain of functioning. Knowledge of the activity domain specifies which aspects of personal efficacy should be measured. Consider the self-management of weight as an example. Weight is determined by what people eat, by their level of exercise which burns calories and can raise the body's metabolism, and genetic factors that regulate metabolic processes. A comprehensive efficacy assessment would be linked to the contributing behavioural factors over which people can exercise some control. This would include perceived capability to manage food purchases, to exercise control over eating habits, and to adopt and stick to an increased level of physical activity. Perceived self-efficacy will account for more of the variation in weight management if the assessment includes perceived capability to regulate food purchases, eating habits and exercise than if it is confined solely to eating habits. If negative affect triggers overeating, assessment of perceived efficacy for affect regulation will explain additional variance in self-management of weight. Thus, multifaceted efficacy scales not only have predictive utility, but provide insights into the dynamics of self-management of behaviour.

If self-efficacy scales are targeted to factors that, in fact, have little or no impact on the domain of functioning, such research cannot yield a predictive relationship. If, for example, relaxation does not affect drug use, then perceived self-efficacy to relax will be unrelated to consumption of drugs because the causal theory is faulty. Under these circumstances, null results will reflect faulty theory rather than self-efficacy irrelevancy. In short, self-efficacy scales must be tailored to relevant activities and assess the multifaceted ways in which efficacy beliefs operate within the selected activity domain.

GRADATIONS OF CHALLENGE

Perceived efficacy should be measured against levels of task demands that represent gradations of challenges or impediments to successful performance. Self-efficacy appraisals reflect the level of difficulty individuals believe they can surmount. If there are no obstacles to overcome, the activity is easily performable and everyone has uniformly high self-efficacy for it.

The events over which personal influence is exercised can vary widely. It may entail regulating one's own motivation, thought processes, performance level, emotional states, or changing environmental conditions. The content domain should correspond to the area of functioning one seeks to manage. The nature of the challenges against which personal efficacy is judged will vary depending on the sphere of activity. Challenges may be graded in terms of level of ingenuity, exertion, accuracy, productivity, threat, or self-regulation required, just to mention a few dimensions of performance demands.

Many areas of functioning are primarily concerned with self-regulatory efficacy to guide and motivate oneself to get things done that one knows how to do. In such instances, self-regulation is the

capability of interest. The issue is not whether one can do the activities occasionally, but whether one has the efficacy to get oneself to do them regularly in the face of different types of dissuading conditions. For example, in the measurement of perceived self-efficacy to stick to a health-promoting exercise routine, individuals judge how well they can get themselves to exercise regularly under various impediments, such as when they are under pressure from work, are tired or depressed; in foul weather; or when they have other commitments or more interesting things to do.

Constructing scales to assess self-regulatory efficacy requires preliminary work to identify the forms the challenges and impediments take. People describe in open-ended interviews and pilot questionnaires the things that make it hard for them to perform the required activities regularly. The identified range of challenges or impediments are built into the efficacy items. Sufficient gradations of difficulties should be built into the efficacy items to avoid ceiling effects.

RESPONSE FORMAT

In the standard methodology for measuring efficacy beliefs, individuals are presented with items portraying different levels of task demands and rate the strength of their belief in their ability to execute the requisite activities. They record the strength of their efficacy beliefs on a 100-point scale, ranging in 10-unit intervals from 0 ('Cannot do'); through intermediate degrees of assurance, 50 ('Moderately certain can do'); to complete assurance, 100 ('Certain can do'). A simpler response format retains the same scale structure and descriptors but uses single unit intervals ranging from 0 to 10.

Scales that use only a few steps should be avoided because they are less sensitive and less reliable. Efficacy scales are unipolar, ranging from 0 to a maximum strength. They do not include negative numbers because a judgement of complete incapability (0) has no lower gradations.

Preliminary instructions should establish the appropriate judgemental set. People are asked to judge their operative capabilities as of now, not their potential capabilities or their expected future capabilities. It is easy for people to imagine themselves to be fully efficacious in some hypothetical future. However, in the case of perceived self-regulatory efficacy to maintain a given level of functioning over time, people judge their assurance that they can perform the activity regularly over designated periods of time. For example, recovered alcoholics would judge their perceived capability to refrain from drinking over specified time intervals.

Efficacy beliefs differ in generality, strength, and level. People may judge themselves efficacious across a wide range of activity domains or only in certain domains of functioning. In addition, efficacy beliefs vary in strength. Weak efficacy beliefs are easily negated by disconfirming experiences, whereas people who have a tenacious belief in their capabilities will persevere in their efforts despite innumerable difficulties and obstacles. Strength of perceived self-efficacy is not necessarily linearly related to choice behaviour. A certain threshold of self-assurance is needed to attempt a course of action, but higher strengths of self-efficacy will result in the same attempt. The stronger the sense of personal efficacy, however, the greater the perseverance and the higher the likelihood that the chosen activity will be performed successfully.

One can also designate self-efficacy beliefs in terms of level, i.e. the number of activities individuals judge themselves capable of performing above a selected cutoff value of efficacy strength. However, converting a continuous measure of efficacy strength into a dichotomous measure on the basis of a minimal cutoff strength value loses predictive information.

A more sensitive and informative measure is provided by computing the probability of successful performance as a function of the strength of perceived self-efficacy (Bandura, 1977). This microlevel analysis retains the predictive value of variations in strength of efficacy beliefs.

MINIMIZING RESPONSE BIASES

The standard procedure for measuring beliefs of personal efficacy includes a number of safeguards to minimize any potential motivational effects of self-assessment. Self-efficacy judgements are recorded privately without personal identification to reduce social evaluative concerns. People make multiple judgements of their efficacy across the full range of task demands within the activity domain. Perceived efficacy and behaviour are assessed in

different settings and by different assessors to remove any carryover of social influence from assessment of one factor to the other.

If merely recording a level of efficacy made it so, personal change would be trivially easy. People would rate themselves into grand accomplishments. Numerous tests for reactive effects of self-assessment have been conducted (Bandura, 1997). The findings show that people's level of motivation, affective reactions, and performance attainments are the same regardless of whether they do or do not make prior efficacy judgements. The non-reactivity of self-efficacy assessment is corroborated across cognitive, affective, and behavioural spheres of functioning. Making efficacy judgements does not increase congruence between perceived efficacy and behaviour under either high or low social demand for consistency. Nor are efficacy judgements influenced by a responding bias to appear socially desirable, regardless of whether the domain of activity involves sexual behaviour, alcohol consumption, smoking, dietary practice, or self-management of diabetes.

ASSESSMENT OF PERCEIVED COLLECTIVE EFFICACY

The theorizing and research on human agency has centred almost exclusively on personal influence exercised individually. People do not live their lives autonomously. Many of the outcomes they seek are achievable only through interdependent efforts. Hence, they have to work together to secure what they cannot accomplish on their own. Social cognitive theory extends the conception of human agency to collective agency. People's shared beliefs in their collective power to produce desired results is a key ingredient of collective agency.

A group's attainments are the product not only of shared knowledge and skills of the different members, but also of the interactive, coordinative, and synergistic dynamics of their transactions. Therefore, perceived collective efficacy is not simply the sum of the efficacy beliefs of individual members. Rather, it is an emergent group-level property. A group operates through the behaviour of its members. It is people acting coordinately on a shared belief, not a disembodied group mind that is doing the cognizing, aspiring, motivating, and regulating. There is no emergent entity that operates independently of the beliefs and actions of the individuals who make up a social system.

There are two main approaches to the measurement of a group's perceived efficacy. The first method aggregates the individual members' appraisals of their personal capabilities to execute the particular functions they perform in the group. The second method aggregates members' appraisals of their group's capability operating as a whole. The latter holistic appraisal encompasses the coordinative and interactive aspects operating within groups.

Some researchers advocate that perceived collective efficacy be measured by having a group arrive at a single judgement of the group's capability (Guzzo, Yost, Campbell & Shea, 1993). The discussion approach is methodologically problematic, however. Constructing unanimity about a group's efficacy via group discussion is subject to the distorting vagaries of social persuasion by members who command power and other types of pressures for social conformity (Earley, 1999). Persuasory efforts to reach consensus can alter members' views. Moreover, no social system is monolith with a unitary sense of efficacy. A forced consensus to a single judgement masks the variability in efficacy beliefs among the various factions within a social system and misrepresents their beliefs.

The two informative indices of perceived collective efficacy differ in the relative weight given to individual factors and interactive ones, but they are not as distinct as they might appear. Being socially situated, and usually interdependently so, individuals' judgements of their personal efficacy are not detached from the other members' enabling or impeding activities. Rather, a judgement of individual efficacy inevitably embodies the coordinative and interactive group dynamics. Conversely, in judging the efficacy of their team, members certainly consider how well key teammates can execute their roles.

Given the interdependent nature of the appraisal process, linking efficacy measured at the individual level to performance at the group level does not necessarily represent a cross-level relation. The two indices of collective efficacy are at least moderately correlated and predictive of group performance. It is commonly assumed that an emergent property is operative if differences between groups remain after statistical methods are used to control variation in characteristics of

individuals within the groups. The analytic logic is fine, but the results of such statistical controls can be quite misleading. Because judgements of personal efficacy take into consideration the unique dynamics of a group, individual-level controls can inadvertently remove most of the emergent group properties.

The relative predictiveness of the two indices of collective efficacy will depend largely on the degree of interdependent effort needed to achieve desired results. The aggregated holistic index is most suitable for performance outcomes achievable only by adept teamwork. Under low system interdependence, members may inspire, motivate, and support each other, but the group outcome is the sum of the attainments produced individually rather than by the members working together. Aggregated personal efficacies are well suited to measure perceived efficacy for the latter types of endeavours.

A growing body of research attests to the impact of perceived collective efficacy on group functioning (Bandura, 2000). Some of these studies have assessed the motivational and behavioural effects of perceived collective efficacy using experimental manipulations to instil differential levels of perceived efficacy. Other investigations have examined the effects of naturally developed beliefs of collective efficacy. The latter studies have analysed diverse social systems, including educational systems, business organizations, athletic teams, combat teams, urban neighbourhoods, and political systems.

The findings taken as a whole show that the higher the perceived collective efficacy, the higher the groups' motivational investment in their undertakings, the stronger their staying power in the face of impediments and setbacks, the more robust their resilience to adversity, and the greater their performance accomplishments.

FUTURE PERSPECTIVES

There are several directions in which the assessment of perceived self-efficacy will evolve. Complex performances are governed by multiple forms of perceived efficacy involving self-management of cognitive, motivational, affective, and behavioural aspects of functioning operating in concert. With advances in knowledge of multicausality, assessments of multifaceted efficacy contributors to human functioning will supplant simple single faceted efficacy causation. Further developments in the methodology of self-efficacy assessment will broaden and extend this line of inquiry to perceived self-efficacy to regulate one's affective life as well as performance accomplishments.

Social cognitive theory distinguishes among three different forms of agency – they include production of effects through *direct individual agency*; through *proxy agency* relying on the efforts of intermediaries; and by *collective agency*. Each of these expressions of agency is rooted in the belief that one can make things happen. Much of the research on perceived self-efficacy has focused on individual efficacy and the processes through which it exerts its effects. In many activities, people do not have direct control over social conditions and institutional practices that affect their lives. They seek their well-being and security through proxy agency. In this socially mediated exercise of perceived efficacy, people try to get those who have the resources and expertise or who wield influence and power to act on their behalf to get the outcomes they desire. There is much conceptual and methodological work to be done on the largely neglected phenomenon of the exercise of proxy agency through perceived efficacy.

The extraordinary advances in electronic technologies and growing globalization of human interconnectedness present new adaptational challenges and enlarged opportunities for people to exercise some measure of control over their personal development and to shape their national life. These rapidly evolving realities place a premium on perceived collective efficacy. Here, the efficacy locus is the perceived capabilities of social subsystems, such as families, communities, educational systems, business organizations, and the perceived efficacy of social and political institutions to make a difference in people's lives. The development of valid measures of perceived collective efficacy for these various subsystems is another future direction of research that has promise of providing new insights into the determinants, structure, and function of collective efficacy in people's efforts to shape their social future.

The management of everyday life requires a blend of individual, proxy, and collective agency. These different forms of human agency are rooted in a sense of personal efficacy. Indeed, beliefs of personal efficacy to manage one's life circumstances and to have a hand in effecting societal changes contribute substantially to perceived collective

efficacy (Fernández-Ballesteros, Díez-Nicolos, Caprara, Barbaranelli & Bandura, 2001). Research into the relationship among these different forms of perceived efficacy and how they operate in concert is important to a broad understanding of human self-development, adaptation and change.

CONCLUSIONS

Scientific advances are greatly accelerated by methodological development of assessment tools for key determinants of human functioning. Quality of assessment provides the necessary basis for stringent empirical tests of theory. Given the centrality of efficacy beliefs in people's lives, sound assessment of this factor is crucial to understanding and predicting human behaviour and guiding personal and social change.

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Albert Bandura

RELATED ENTRIES

Applied Fields: Clinical, Applied Fields: Health, Theoretical Perspective: Cognitive-Behavioural, Theoretical Perspective: Psychological Behaviourism, Self-Control

SELF-OBSERVATION (SELF-MONITORING)

INTRODUCTION

Self-monitoring refers to an assessment procedure in which individuals systematically observe instances of their own behaviour and maintain records of those occurrences. In self-monitoring, more than in other forms of assessment, the client becomes the assessor, learning to observe, document and measure behaviour as well as environmental variables that may control it. The

resultant data ideally reflects the frequency, duration or intensity of target behaviours in the client's everyday environment, and provides a baseline against which to measure the effects of therapeutic interventions. In addition to measuring target behaviour, self-monitoring is often used to identify situational variables and consequences associated with the client's behaviour in natural settings. This information can be used in a functional analysis of problem behaviours and the development of therapeutic interventions. In the following sections, the advantages and disadvantages of self-monitoring relative to other assessment methods are discussed. Issues concerning the implementation and accuracy of self-monitoring as well as its therapeutic effects are also described. Some potential directions for future research are also offered.

SELF-MONITORING AS AN ASSESSMENT TOOL

Self-monitoring is widely used in clinical practice (Elliot, Miltenberger, Kaster-Bundgaard & Lumley, 1996), and is considered to be one of the most direct forms of behavioural assessment (Cone, 1978). It is more direct than self-report questionnaires in that it assesses behaviours at the time of their occurrence. It is therefore less reliant on processes of recollection and less susceptible to memory errors and distortions. The main disadvantages of self-monitoring relative to self-report is that self-monitoring requires more time and effort, and that there are no population norms for self-monitored data.

Self-monitoring also has advantages over the use of direct observation by trained observers. Direct observation is often impractical, due to time constraints, cost factors, the scarcity of adequately trained observers, and the likelihood that the presence of observers will alter the frequency or form of target behaviours. Moreover, many treatment targets are not amenable to direct observation. For example, thoughts and feelings are private by nature and cannot be observed by others. Alternatively, behaviours may be private by convention, such as sexual behaviour, and the less intrusive method of self-monitoring may be more appropriate.

METHODS OF SELF-MONITORING IN BEHAVIOURAL ASSESSMENT

The general goals of behavioural assessment are to measure behaviour and identify its controlling variables. This investigative process typically begins with a broad focus on a wide range of potential target behaviours, and progressively focuses on more specific behavioural targets for change. Self-monitoring methods can be selected to suit each stage of this process.

Diary Formats

In early stages of clinical assessment, specific behaviours to target for change may be difficult to identify. For example, the goal of anger management can include a wide range of behaviours that may or may not be problematic for a given client. Even when target behaviours are readily identified, it is important to collect as much information as possible concerning the settings and consequences associated with these behaviours. Under these circumstances, a diary format may be most useful. Diary formats allow the self-recorder to supply more elaborate and narrative descriptions of their behaviour and the environment in which it occurs. As specific target behaviours are identified, the format of self-monitoring can become more structured, assessing specific targets while minimizing the extent of recording required.

Frequency Counts

Ideally, self-recordings would be made each time a specific target behaviour occurs. This facilitates identifying variations in behaviour across time and situations and provides detailed baseline data. A continuous frequency count is most feasible when a target behaviour is discrete and fairly low in frequency, with a short duration. Less discrete responses such as anxiety can be difficult to discriminate as separate instances. Recording all occurrences of highly frequent behaviours can be too burdensome. Alternatives include other methods of self-monitoring, or recording frequency counts for only a portion of the day.

Duration Recording

In some cases, the amount of time consumed by a target behaviour is of more interest than its

frequency. For instance, if the client's goal is to increase positive interactions with a spouse, the length of each interaction will vary and would be important to observe and record. Duration recordings may also be desirable for target behaviours that are repetitive and very frequent such as nail-biting or obsessional ruminations.

Time Sampling

Time sampling can be used as an alternative to duration recordings or when frequency counts of highly frequent behaviours would be impractical. In time sampling, long intervals such as a day are divided into smaller time blocks of time. The client records whether or not the target behaviour occurred within each of these smaller intervals. Clients might also be provided with a variable cue and asked to 'spot check' whether or not a target behaviour is occurring at the time of the cue. These time sampling procedures yield less precision than frequency counts or duration recording but can be less demanding of self-recorders.

Self-Ratings

In clinical settings, the intensity of a target behaviour is frequently important (e.g. urges to use drugs or self-cut). When this is the case, self-ratings may be incorporated into self-monitoring. Using this method, the clinician provides the self-monitor with a scale to be used in rating more subjective dimensions of self-observed behaviour. For example, Linehan (1993) employs diary cards in Dialectical Behaviour Therapy that include a 5-point scale to assess urges to self-harm. Self-rating scales are highly flexible and can be used to assess problems for which questionnaires are unavailable.

PROMOTING ACCURATE DATA COLLECTION

The primary concern in assessment is that measurements of behaviour reflect the actual frequency and setting of the client's behaviour. When utilizing self-monitoring, the clinician is concerned with promoting compliance with the procedure and accurate data collection. While compliance is necessary for accurate data collection, it is not a sufficient condition for accuracy. In the following subsections, strategies for promoting compliance and accuracy are discussed separately.

Compliance

Several steps may be taken proactively to promote compliance with self-monitoring procedures. These include: (1) providing explicit instructions and a clear rationale for self-monitoring (Shelton & Ackerman, 1974); (2) providing reinforcement for data collection; (3) making the importance of self-monitored data explicit for the client by discussing self-monitored data throughout treatment; (4) asking self-monitors to enter into contracts to collect data; (5) collecting monetary deposits from self-monitors, to be returned after data collection; and (6) collecting data between sessions via daily mailings to the therapist (Harmon, Nelson & Hayes, 1980) or through random phone checks made by therapists (Christensen, Johnson, Phillips & Glasgow, 1980).

When problems with compliance occur, several hypotheses might be explored. Non-compliance may reflect more general behavioural patterns or difficulties in the therapeutic relationship (Baird & Nelson-Gray, 1999). Non-compliance might more specifically reflect that the client does not see the relevance or importance of self-monitoring. Exploring problems with compliance might also reveal skill deficits of the client, as well as environmental factors and cognitions that interfere with compliance (Shelton & Levy, 1981).

Accuracy

It has been suggested that self-observers have a unique capacity for accuracy because they alone are able to potentially observe all occurrences of their target behaviours (Kazdin, 1974a). Of course, an absolute criterion for the accuracy of an assessment device cannot be determined, given that there are no error free measures of behaviour. The relative accuracy of self-monitoring has typically been assessed by comparison to data obtained by independent direct observers or collected via mechanical devices. Self-monitored data may also be compared to behavioural by-products. For instance, self-monitored caloric intake might be compared to weight changes (Mahoney, Moura & Wade, 1973).

In the 1970s and early 1980s, considerable research was devoted to identifying variables that enhance or detract from the accuracy of self-monitored data. Accuracy can be compromised by disruptions either in the act of self-observation or that of self-recording. Difficulties with self-observation can result when the client is unsure what the target behaviours are, or when targets are 'fleeting', habitual, or insidious, and thus difficult to notice.

Other factors may interfere with the act of recording. Recordings may be neglected if the self-recording procedure is too cumbersome or complex. Alternatively, expectancies about the potential approval or criticism of a therapist may cause socially undesirable behaviours to be under-recorded or desirable behaviours to be over-recorded. When ongoing data collection has not occurred, data sheets may be filled in just prior to treatment sessions and bear little relation to the client's actual experience over the week.

Several procedures have been shown to enhance the accuracy of self-monitored data. These include: (a) clearly defining target behaviours; (b) providing training to self-monitors (Mahoney, 1977; Nelson, Lipinski & Boykin, 1978); and (c) emphasizing the importance of accurate data collection and providing reinforcement for accurate data collection (Lipinski, Black, Nelson & Ciminero, 1975). Accuracy can also be enhanced by (d) minimizing the number of target behaviours being monitored at one time (Hayes & Cavior, 1977); (e) requiring that recordings be made immediately after the target behaviour occurs (Frederiksen, Epstein & Kosevsky, 1975); and (f) regularly checking the accuracy of self-monitored data and informing self-recorders of these accuracy checks (Lipinski et al., 1975; Lipinski & Nelson, 1974; Santogrossi, 1974).

THERAPEUTIC EFFECTS OF SELF-MONITORING

Reactivity

In assessing behaviour, it is frequently a concern that the method of measurement can alter the form or frequency of behaviours being assessed. This phenomenon is termed *reactivity*. Research devoted to reactivity in self-monitoring has produced consistent observations that implementing self-monitoring procedures alters the frequency of behaviours being measured. While this creates problems in obtaining a valid baseline, the effect is often advantageous for clients, because reactive effects of self-monitoring consistently occur in the therapeutic direction. That is, unwanted behaviours tend to decrease and desirable behaviours tend to increase when they are self-monitored (Sieck & McFall, 1976). The change is typically small and short-lived but represents some relief for clients at the beginning stages of treatment and may encourage continued investment in therapy.

Several factors can enhance or attenuate reactive effects of self-monitoring. Existing evidence suggests that reactivity can be enhanced when the target behaviour is clearly defined and overt (Hayes & Cavior, 1977), when the self-monitor is motivated to change (Lipinski et al., 1975), when goals for behaviour change are clearly specified (Kazdin, 1974b), when reinforcement for that change is provided by clinicians (Lipinski et al., 1975), when each occurrence of the target is self-recorded (Frederiksen et al., 1975), and when concurrent response requirements are limited (Hayes & Cavior, 1977). Some studies have also indicated that more intrusive recording devices enhance reactive effects (Kirby, Fowler & Baer, 1991; Nelson et al., 1978) although null findings have also been reported (Nelson, Hay, Devany & Koslow-Green, 1980; Schloss, Thompson, Gajar & Schloss, 1985). Finally, for undesirable behaviours, reactive effects have been increased by requiring that recordings be made just prior to the occurrence of the target behaviour (Bellack, Rozensky & Schwartz, 1974; Rozensky, 1974).

FUTURE PERSPECTIVES

Self-monitoring enjoys widespread use among clinicians. It is also an integral part of ongoing data collection within several empirically validated psychological treatments. Despite its widespread acceptance within clinical settings, research in the area of self-monitoring has declined steadily since the late 1970s (Korotitsch, Gaynor & Nelson-Gray, 1998). This appears to correspond with a dramatic proliferation of brief self-report questionnaires

and research addressing the psychometric properties of those instruments. The decline in research is ironic and troubling given the aforementioned popularity of self-monitoring within clinical settings. Several lines of potential research have been suggested. For instance, little information is available regarding potential differences in accuracy as a function of diagnostic status. The relative accuracy and sensitivity of self-monitoring as compared to other types of measurement such as interviews or self-report questionnaires is also unclear. The impact of self-monitoring on clients might also be examined in an attempt to ascertain if self-monitoring procedures might in some situations have detrimental effects. Finally, and most critically, there has been little attention toward empirically evaluating the utility of self-monitored data within treatment. The impact of collecting and using self-monitored data, on the effectiveness of treatment, has not been adequately evaluated.

CONCLUSIONS

Self-monitoring is a widely used method of behavioural assessment in which clients are asked to observe and to document occurrences of behaviours that are being targeted in their treatment. The popularity of self-monitoring among clinicians can be attributed to its flexibility and directness. Self-monitoring procedures can be tailored or modified to accommodate individual clients with highly specific or idiosyncratic behavioural targets. Self-monitoring also provides a more direct measurement of behaviours in the client's everyday environment because recordings are made at the time the target behaviour occurs rather than reported at a later time.

Self-monitoring research has generally focused on the relative accuracy and reactivity of self-monitoring procedures. Early research has offered specific suggestions for implementing self-monitoring in such a way as to maximize the accuracy of data collection, as well as the reactive effects that are therapeutically desirable. While the research devoted to this area has declined since the 1980s, self-monitoring remains a standard form of assessment within clinical settings. The selection of a particular self-monitoring procedure should be guided by consideration of its appropriateness for a particular target behaviour, and by practical concern for the convenience of clients. The procedures should be thoroughly explained and clearly related to the overall goals of treatment. When implemented in this manner, self-monitoring can provide a detailed ongoing account of behaviour that can be useful at all stages of assessment and treatment.

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RELATED ENTRIES

APPLIED FIELDS: CLINICAL, THEORETICAL PERSPECTIVE: COGNITIVE-BEHAVIOURAL, THEORETICAL PERSPECTIVE: BEHAVIOURAL

SELF-PRESENTATION MEASUREMENT

INTRODUCTION

Self-presentation is the generic term for the human tendency to describe oneself in a self-serving fashion. Because this tendency is assumed to interfere with accurate psychological assessment, much work has been put into devising methods to measure and control for self-presentation. For reviews, see Paulhus (1991) and the entry on Self-Report Distortions' in this volume.

Assessment psychologists would prefer to eliminate or, at least, identify sources of variance that are irrelevant to the attributes being measured (e.g. traits, values, attitudes). Self-presentation is usually assumed to fall in this irrelevant category. Sometimes it is – for example, when a random subset of job applicants is so motivated to land the job that they are faking good. When self-presentation is stable across time and assessment context, however, self-presentation tendencies are called response styles. Because consistent styles must have their own cognitive and/or motivational roots, they can be studied as personality traits in their own right. And their manifestations of self-presentation are likely to go

well beyond biased behaviour on self-report instruments.

In this entry, three types of such styles are distinguished and substantiated with popular examples. The first type comprises trait measures of self-aware tendencies to engage in self-presentation (e.g. Self-Monitoring Scale). The second category comprises measures that diagnose the overall social desirability of current responding (e.g. the Impression Management scale). The third category comprises self-deceptive biases in self-descriptions (e.g. the Narcissistic Personality Inventory).

TYPE 1: SELF-AWARE PREDICTORS OF TRAIT SELF-PRESENTATION

This type refers to measures where respondents accurately report their tendencies toward self-presentation. The classic example is Snyder's (1974) construct of self-monitoring. Although it began with a conception closely linked to the clinical definition (see the entry on 'Self-Observation' in this volume), Snyder's construct is now quite distinct. In the most recent elaboration, self-monitoring is described as the active construction of public selves designed to achieve social ends; that is, favourable outcomes (Gangestad & Snyder, 2000).

The instrument designed to assess the construct – Snyder's (1974) Self-Monitoring Scale – has been immensely popular. Median reliabilities are 0.71 (alpha) and 0.73 (2-week test–retest). One repeated criticism concerned the multidimensionality of the original 25 item SMS (e.g. Briggs & Cheek, 1988) and even of the reduced 18-item version (Romera, Luengo, Garra & Otero-Lopez, 1994).

Nonetheless, the SMS has proved especially useful as a pre-test before laboratory studies of self-presentation. For example, it has been shown to predict who will manipulate their self-decriptions to get a date (Rowatt, Cunningham & Druen, 1998). Critics have replied that the bulk of its successful predictions derive from its major component, extraversion (John, Cheek & Klohnen, 1996).

A more complex instrument in this category is the Social Skills Inventory (e.g. Riggio, Watring & Throckmorton, 1993). Respondents are asked about a wide variety of social skills such as empathy, and perspective taking. Again, extraversion appears to be a significant underlying component of this measure.

TYPE 2: DIAGNOSTIC INDICATORS OF IMPRESSION MANAGEMENT

This second type of measure indexes the total amount of positivity in an individual's self-descriptions. One example is the Impression Management (IM) scale (Paulhus, 1991). Typical reliabilities are 0.80, for internal consistency, and 0.76 for 4 month test–retest reliability. The Marlowe–Crowne scale and various lie-scales also fall into this category.

These measures are often used to diagnose desirability response sets: that is, the degree to which respondents have engaged in impression management while completing a battery of self-report measures. Temporary distortion can arise from any number of sources; for example, high motivation among some applicants or patients to appear positive to an interviewer. Trait contributions include the tendency to avoid negative self-presentations (Paulhus, 1991).

Unfortunate for the simple self-presentation interpretation is that some high scorers are accurately reporting that they have desirable traits, in particular traits such as agreeableness, and responsibility (McCrae & Costa, 1983). Interpretation of the scores as a desirability response set can certainly be ruled out if the self-report conditions entail no demand for self-presentation; for example, anonymous administration.

An unassailable usage for type 2 measures is for indexing situational differences in demand for self-presentation: since mean levels are being compared, no interpretation of individual differences is involved.

TYPE 3: SELF-DECEPTIVE SELF-ENHANCEMENT

Some individuals seem to believe their own exaggerated self-descriptions. Presumably, this tendency requires a degree of self-deception to ignore or distort information that would undermine a biased self-view (Paulhus, 1986). The classic example is the narcissistic personality who continually enhances the self and derogates others because of a belief that he/she is superior to

others (e.g. Morf & Rhodewalt, in press; Paulhus, 1998). A solid body of evidence on so-called 'normal narcissists' has demonstrated that their self-descriptions are exaggerated even when the administration is anonymous. The most popular measure of this type is the Narcissistic Personality Inventory (Raskin & Hall, 1981). Typical reliabilities are 0.78 for internal consistency and 0.74 for a 2-month test–retest reliability. Another such measure is the Self-Deceptive Enhancement scale (Paulhus, 1991).

COMPARISONS AND RECOMMENDATIONS

Each category of measures reviewed here involves a different linkage between a self-presentation style and a tendency to engage in self-presentation. High scores on Type 1 and Type 3 measures identify individuals who possess the type of character prone to self-presentation (e.g. self-monitors and narcissists). Such measures allow prediction of who will self-enhance in the future: (1) Type 3 chronically self-enhances and (2) Type 1 enhances when opportune. In contrast, Type 2 measures indicate who is currently giving desirable answers.

Consider a study where the SMS (Type 1), the IM scale (Type 2), and the NPI (Type 3) are administered twice – the second time under a demand for positive self-presentation. Scores on the SMS and NPI should change very little and can be used to predict relative degrees of self-enhancement behaviour at time 1 or time 2. But, because scores on the SMS or NPI are not responsive to situational demand, they cannot be used to indicate the absolute level of self-presentation. In contrast, Type 2 measures such as the IM scale will be higher at time 2 because they measure absolute levels of self-presentation: their interpretation at time 1 should be in terms of valid personality differences.

The different styles of self-presentation tapped by measures of Types 1 and 3 is reflected in the flexibility of their self-presentation. A situational deterrent such as accountability will alter the self-presentation behaviour of self-monitors but not that of narcissists. Attempts to embarrass or confront the latter do not seem to have any effect (Robins & John, 1997): narcissist self-enhancement cannot be bridled.

CONCLUSIONS

Self-presentation is among the most complex of human behaviours. Accordingly, the analysis and diagnosis of self-presentation as a style is a challenging problem to assessment psychologists. The above analysis suggests guidelines but is surely not the final word.

More work is required to compare the three categories of self-presentation styles head-to-head across a variety of circumstances. One new but already active issue concerns differences in self-presentational style across the type of content that is being self-presented. Paulhus and John (1998) have argued that the content of self-presentation styles involves the two primary human values of agency and communion. So far, available measures in this category emphasize self-enhancement that is agentic; that is, emphasizing competence and energy. Yet to be developed is a corresponding measure of moralistic or communal self-enhancement.

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RELATED ENTRIES

Self-Reports (General), Self-Report Distortions, Self-Report Questionnaires, Self-Reports in Behavioural Clinical Settings, Self-Reports in Work and Organizational Settings

SELF-REPORT DISTORTIONS (INCLUDING FAKING, LYING, MALINGERING, SOCIAL DESIRABILITY)

INTRODUCTION

Self-report inventories are among the most commonly used methods of psychological assessment. Their validity depends largely on the cooperation of test-takers, who are generally instructed to read items carefully and provide honest responses. When test-takers provide inaccurate information, the results of the inventory may be invalid. Several types of response distortion, also known as response sets, response biases, or test-taking attitudes, have been recognized, and many multiscale inventories of personality and psychopathology include one or more validity scales designed to detect them. The accuracy of these validity scales in identifying response distortions has been widely studied. This entry reviews types of response distortions and methods for their detection.

TYPES OF RESPONSE DISTORTION

Negative impression management, also described as overreporting of symptoms, malingering, or faking bad, is a deliberate attempt to create an impression of disturbance or impairment by exaggerating or fabricating problems and negative characteristics. Positive impression management, also described as underreporting of symptoms, defensiveness, socially desirable responding, or faking good, is a deliberate attempt to create a favourable impression by falsely denying problems and endorsing positive characteristics. Random responding, in which the test-taker responds independently of the content of the items, can result from poor reading or language skills, lack of cooperation, carelessness, poor concentration, or confusion. Acquiescence and naysaying are tendencies to respond indiscriminately in the 'true' or 'false' directions, respectively, without consideration of item content. Because any of these response distortions can invalidate the results of a self-report inventory, standard clinical practice generally requires consideration of scores on validity scales before proceeding with interpretation of test results (Greene, 2000). Table 1 lists instruments and scales commonly used to detect response distortions.

Table 1. Selected instruments and scales used to detect response distortions

Response distortion	Instrument	Scale(s)
Negative impression management	MMPI-2	F, Fb, Fp
	PAI	NIM
	SIMS	Li, Af, N, P, Am
	SIRS	RS, SC, IA, BL, SU, SEV, SEL, RO
Positive impression management	MMPI-2	L, K, S
	PAI	PIM
	PDS	IM, SDE
Random responding	MMPI-2	VRIN, F
	PAI	ICN, INF
Acquiescence/naysaying	MMPI-2	TRIN

Note. For Instrument: MMPI-2 = Minnesota Multiphasic Personality Inventory – Revised, PAI = Personality Assessment Inventory, SIMS = Structured Inventory of Malingered Symptoms, SIRS = Structured Interview of Reported Symptoms, PDS = Paulhus Deception Scales. For Scales: F = Infrequency, Fb = Back Page Infrequency, Fp = Infrequency-Psychopathology, NIM = Negative Impression Management, Li = Low Intelligence, Af = Affective Disorders, N = Neurological Impairment, P = Psychosis, Am = Amnesia, RS = Rare Symptoms, SC = Symptom Combinations, IA = Improbable or Absurd Symptoms, BL = Blatant Symptoms, SU = Subtle Symptoms, SEV = Severity of Symptoms, SEL = Selectivity of Symptoms, RO = Reported vs. Observed Symptoms, L = Lie Scale, K = Correction Scale, S = Superlative Scale, PIM = Positive Impression Management, IM = Impression Management, SDE = Self-Deceptive Enhancement, VRIN = Variable Response Inconsistency, ICN = Inconsistency, INF = Infrequency, TRIN = True Response Inconsistency.

The current mental health and legal systems include several circumstances in which important consequences depend on the outcome of psychological testing (Baer, Wetter & Berry, 1992; Berry, Baer & Harris, 1991). Plaintiffs suing for psychological damages may receive large financial settlements if their psychological injuries are judged to be significant. Work-related injuries may lead to pensions through Workers' Compensation, while disabilities related to military service may result in eligibility for pensions through the Social Security system. Criminal defendants may wish to be found unfit to stand trial or not guilty by reason of insanity. These situations can present test-takers with powerful incentives to exaggerate or fabricate psychological problems. Other situations provide incentives for positive impression management. For example, divorcing parents undergoing court-ordered psychological examinations to resolve custody disputes, applicants for jobs or training programmes for which psychological testing is required, and patients wishing to be released from treatment, or transferred to less restrictive units or institutions, may attempt to create an unrealistically favourable impression. As psychologists are increasingly asked to evaluate individuals in these situations, the availability of tools for detecting response distortions has assumed increased importance.

PREVALENCE OF RESPONSE DISTORTIONS

Scales designed to detect response distortion are less accurate in populations with very low base rates of distortion (Finn & Kamphuis, 1995). For this reason, assessment of response distortion in individual cases should consider the base rate of distortion in the population of interest. In research settings, where results of inventories have no important consequences for test-takers, who often remain anonymous, base rates of response distortion are probably very low. In forensic settings, where individuals are being evaluated for competency to stand trial, criminal responsibility, or mental state at the time of the crime, estimates of the base rate of malingering have ranged from 31–47% (Berry et al., in press). In personnel selection and child custody evaluation settings, Baer and Miller (2002) found a median base rate estimate of positive impression management of 30%. These findings suggest that in settings where the results of psychological testing have important consequences for the client, the possibility of impression management should routinely be considered (Berry, Wetter & Baer, 1995). Base rates of random responding have rarely been investigated. In samples of students, community members, and police

recruits completing the MMPI-2, Berry et al. (1992) found that 29–60% of participants acknowledged providing some random responses. However, the reported number of items answered randomly was low, ranging from 12 to 38 items.

DETECTION OF NEGATIVE IMPRESSION MANAGEMENT

Overreporting of symptoms has been the most widely studied of the response distortions, largely because of the increased acceptance of psychological assessment methods within the legal system. Most scales designed to detect overreporting on self-report inventories consist of items that appear to have pathological or deviant content, but that are rarely endorsed in normative or psychiatric samples. For example, the F (Infrequency) Scale of the MMPI-2 (Butcher et al., 1989) consists of items endorsed by less than 10% of the inventory's original normative sample, with content including paranoid thinking, antisocial attitudes, hostility, and poor health (Graham, 2000). The Infrequency-Psychopathology (Fp) Scale of the MMPI-2 (Arbisi & Ben-Porath, 1995) and the Negative Impression Management Scale of the Personality Assessment Inventory (PAI: Morey, 1991) both consist of items with pathological or bizarre content that are rarely endorsed by either normal or psychiatric samples. Respondents attempting to create a negative impression have been found to endorse many more of these items than are endorsed by individuals with psychiatric impairments.

Several factors can complicate the detection of malingering (Berry, Wetter & Baer, 1995). For example, respondents might accurately describe some of their symptoms, while exaggerating others and entirely fabricating still others. The specificity of the malingerer's complaints also must be considered. Some respondents may endorse most items that appear pathological (global malingering), while others may attempt to endorse only symptoms of a specific disorder. Global malingerers may be easier to detect than those feigning specific disorders (Graham, 2000). A related issue is coaching, or the extent to which test-takers have obtained information designed to help them complete psychological tests in a manner consistent with their goals. Many attorneys believe that educating their clients about the psychological tests they will complete, including informing them of the nature of validity scales, is their professional responsibility (Wetter & Corrigan, 1995). Thus, it seems likely that some test-takers involved in legal proceedings have been coached by their attorneys in how to complete the tests. Studies suggest that malingerers who have been coached about the purpose and function of validity scales are more difficult to detect than those who have not been coached, or who have been coached about symptoms of a specific disorder (Graham, 2000).

Empirical studies and meta-analytic reviews of the literature have suggested that several overreporting scales are at least moderately effective in discriminating overreporters from honest responders. The overreporting scales of the MMPI and MMPI-2 have obtained the most empirical support. In a meta-analytic review of studies comparing malingering and honest groups on the original MMPI, Berry et al. (1991) found a mean effect size (*d*) of 2.07 for several overreporting scales, suggesting that malingering and honest respondents differ by just over two standard deviations on these scales. Optimal cutting scores were variable, as were correct classification rates, although many were respectable. Rogers, Sewell, and Salekin (1994) obtained similar results in a meta-analysis of overreporting scales on the MMPI-2. In addition, several tests dedicated exclusively to the detection of malingering have shown promising efficacy, including the Structured Inventory of Malingered Symptoms (SIMS: Smith & Burger, 1997), and the Structured Inventory of Reported Symptoms (SIRS: Rogers, Bagby & Dickens, 1992).

DETECTION OF POSITIVE IMPRESSION MANAGEMENT

Most scales designed to detect underreporting of symptoms or socially desirable responding include items of one or two types. Some describe common minor faults or weaknesses that most individuals are willing to acknowledge, whereas others describe rare virtues that few honest respondents would claim. Both types of items have low endorsement frequencies in clinical and non-clinical populations. Thus, respondents who consistently deny common problems and endorse

rare virtues are judged to be responding defensively. This approach is exemplified by the Lie (L) Scale of the MMPI-2, and the Positive Impression Management (PIM) Scale of the PAI. An alternative approach is illustrated by the K (Correction) Scale of the MMPI-2, which was empirically derived by identifying items that discriminated a non-clinical sample from patients with known psychopathology who had produced MMPI profiles with no clinical elevations. Similarly, the Superlative (S) scale of the MMPI-2 was empirically derived by comparing a group of pilots seeking employment with a major airline with the MMPI-2 normative sample.

The detection of positive impression management also can be complicated by several factors. Studies of coaching suggest that test-takers who have been informed of the presence and purpose of validity scales often can produce profiles that appear normal without elevating the relevant validity scales (Baer & Sekirnjak, 1997). Some authors have suggested that socially desirable responding in certain circumstances, such as personnel selection and child custody evaluation, should be considered normal, as most test-takers in these settings are 'putting their best foot forward' rather than denying significant problems (Bathurst, Gottfried & Gottfried, 1997). Careful assessment is required to discriminate normally functioning test-takers who are responding defensively due to situational demands from test-takers who are concealing psychopathology. Other authors have suggested that socially desirable responding reflects substantive variance in personality, and that the ability to respond in a socially desirable manner when applying for a job predicts emotional stability and conscientiousness (Ones, Viswesvaran & Reiss). Finally, Paulhus (1998) has suggested a two-factor model of socially desirable responding, in which impression management is a deliberate attempt to create a positive impression, while self-deceptive enhancement is an unconscious overconfidence similar to narcissism. The Paulhus Deception Scales (1998) assess both factors.

Empirical studies and meta-analytic reviews of the literature have suggested that positive impression management is more difficult to detect than negative impression management, perhaps because participants in most studies of positive impression management are students, job applicants, or custody litigants, many of whom are probably functioning within normal limits. Differences between their scores when responding honestly and when making the best possible impression may be small, especially when compared to differences between their scores when responding honestly and when making a bad impression. A meta-analytic review of studies comparing fake-good and honest groups on the original MMPI (Baer et al., 1992) found a mean effect size (d) of 1.05 across several scales, suggesting that honest and fake-good respondents differ by just over one standard deviation on these scales. Optimal cutting scores were variable, as were correct classification rates, which ranged from 48% to 84%. Baer and Miller (2001), in a similar review of studies using the MMPI-2, found a mean effect size (d) of 1.26. Correct classification rates were similar to those reported by Baer et al. (1992) and were generally lower when participants feigning good adjustment had been coached about validity scales.

DETECTION OF RANDOM RESPONDING, ACQUIESCENCE, AND NAYSAYING

Scales used to detect random responding typically consist of pairs of items with either similar or opposite content, so that the test-taker's response to one item can be predicted from the response to the other item. Pairs with similar content should be answered similarly (both true or both false) whereas pairs with opposite content should be answered differently (one true and one false). For each pair that is answered inconsistently, a point is added to the random responding scale. This approach is exemplified by the Variable Response Inconsistency (VRIN) Scale of the MMPI-2 and the Inconsistency (ICN) Scale of the PAI. Random responding can also be detected with Infrequency scales (described earlier), as random responders are likely to endorse a number of these items by chance. However, Infrequency scales alone cannot distinguish between random responding and overreporting. For this reason, use of an inconsistency scale such as VRIN to clarify an elevation on an Infrequency scale is often recommended (Graham, 2000).

Few scales designed to detect acquiescence and naysaying have been developed. The best known is probably the True Response Inconsistency (TRIN) Scale of the MMPI-2. The TRIN scale

consists of pairs of items with opposite content. Responding inconsistently by indiscriminately giving primarily true or primarily false responses elevates the TRIN scale.

The efficacy of inconsistency scales in detecting random responding, acquiescence, and naysaying has been investigated in very few studies. Berry et al. (1991) found high classification rates for the VRIN scale in a study of random responding on the MMPI-2 in a college student population. Research investigating the efficacy of the TRIN scale for detecting acquiescence and naysaying is needed.

FUTURE PERSPECTIVES

Research on detection of response distortions is likely to improve as research designs are refined. The simulation design, in which participants instructed to fake are compared to participants given the standard instructions, is the most commonly used. Its ecological validity can be improved in several ways (Rogers, 1997). Participants instructed to fake should be similar to those with whom the test is used in clinical practice. The comparison group given standard instructions should be carefully chosen. For example, in overreporting research, participants instructed to feign psychopathology should be compared to individuals with true psychiatric problems, while studies of positive impression management should compare normally functioning individuals with those who have significant problems but are instructed to attempt to conceal them. Participants instructed to feign good or bad adjustment should be given a realistic scenario to imagine in which feigning might occur, such as, 'Imagine you are applying for a desirable job.' They should be instructed to respond believably in their feigned presentation, and should be offered incentives for successful feigning. Their understanding of and compliance with their feigning instructions should be assessed.

Alternative research designs with greater ecological validity should be used more frequently. The differential prevalence design compares groups of participants whose circumstances provide incentives for feigning with participants who appear to have no such motives. For example, anonymous volunteers might be compared to a sample of custody litigants or criminal defendants being evaluated for fitness to stand trial. The known groups design compares individuals known to have responded honestly with those known to have distorted their responses. Unfortunately, the latter group is difficult to identify, and may not be representative of feigners who are never caught. However, converging evidence across these different methodologies may greatly increase confidence in the utility of validity scales (Rogers, 1997).

CONCLUSIONS

In some settings, response distortions may be sufficiently common that their presence should routinely be evaluated. As no method of identifying response distortions is perfectly accurate, the consequences of both false positive and false negative errors should be carefully considered. Because false accusations of feigning may be extremely detrimental to test-takers, determinations of feigning should only be made on the basis of converging evidence across several methods, including self-report inventories, behavioural observations, interviews, and collateral sources of information. At the same time, failure to rule out feigning in a setting where it may be suspected could be a disservice to the test-taker. Thus, in settings where response distortion is likely, its assessment should not be ignored, but must be conducted with great care. Continued research on improving methods for detecting response distortion is essential.

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RELATED ENTRIES

SELF-REPORTS (GENERAL), SELF-PRESENTATION MEASUREMENT, SELF-REPORT QUESTIONNAIRES, SELF-REPORTS IN BEHAVIOURAL CLINICAL SETTINGS, SELF-REPORTS IN WORK AND ORGANIZATIONAL SETTINGS

SELF-REPORT QUESTIONNAIRES

INTRODUCTION

Self-report questionnaires are among the most widely used methods of psychological measurement. This popularity is a result of many advantages that self-reports hold over alternative assessment methods. Most notably, the technique is very time-efficient for the researcher or professional; time spent on administration and scoring is typically minimal, yet a large amount of information can be obtained. Furthermore, the technique lends itself to high quality standardization. With objective scoring procedures, responses can be compared with high reliability to various large samples of interest, a normative comparison facilitated by the efficiency of the data collection. Finally, self-report offers an opportunity to directly measure the phenomenology or subjective experience of the respondent. For most constructs, subjective experience is

a critical part of the concept; it is difficult to imagine how someone could be given psychological descriptors such as 'unhappy' or 'obsessive' without a glimpse into their personal experience. Self-report provides an objective, standardized method for capturing these experiences (in contrast to unstructured approaches such as interviews or free associations), while less direct assessment techniques (such as projective, observational, or psychophysiological methods) can at best only allow inferences about phenomenology. Thus, self-report holds a vital place in the assessment of virtually any construct in personality and psychopathology.

However, there have also been concerns expressed over the accuracy of self-reported information as an indication of psychological status. One source of distortion may arise from efforts to deceive the recipient of the information; for example, examinees may attempt to appear either better adjusted or more poorly adjusted than is actually the case. A second source may arise from limited insight or self-deception; examinees may genuinely believe that they are doing quite well or quite poorly, but this belief might be at odds with the impression of objective observers. A third source of distortion can also arise from carelessness, confusion, or indifference in taking a test; examinees who answer questions with little reflection (or even randomly) may yield results that do not accurately mirror their experiences. Because of these threats to validity of self-reported information, a number of procedures and strategies (discussed elsewhere in this volume) for identifying such distortion and understanding its effects have been developed.

CONCEPTUAL APPROACHES TO QUESTIONNAIRE CONSTRUCTION

Rational/Theoretical Approach

The oldest approach to questionnaire construction is the rational/theoretical approach, in which a developer attempts to design an instrument that reflects a particular theory about a concept. This theoretical reflection can either be implicit or explicit. The items of the Woodworth Personal Data Sheet, an early psychiatric screening, represented Woodworth's implicit theory about important indicators of psychological adjustment. The items of the Myers–Briggs Type Indicator represent an attempt to implement an explicit psychological theory of personality, that of C.G. Jung.

An important advantage of the rational approach to personality test construction is that it places an important emphasis upon the *content validity* of the resultant measure. However, the early rational approach also suffered from a failure to use data-driven procedures in the development of the measures. Thus, these measures were entirely dependent upon the assumptions of the test author, and erroneous assumptions could take place at the level of interpreting the theory, or at the level of generating the relevant indicators. For example, a test author might assume two concepts are related when they are not, or create an item that may turn out to be measuring something other than what was intended.

Empirical Approach

In the *empirical* approach, only the correlates of item responses matter; the content or theoretical applicability of the item is of no interest in construction. Meehl (1945) provided a manifesto for this approach, stating 'it is suggested tentatively that the relative uselessness of most structured personality tests is due more to a priori item construction than to the fact of their being structured' (p. 6). The empirical approach to test construction is exemplified by the construction of the MMPI and the Strong Vocational Interest Blank. In these instruments, a single extra-test criterion – ability to differentiate members of a criterion group from those in a control group – was used to select items for the final version of these tests. For the Strong, group membership involved persons engaged in particular occupations, while for the MMPI, group membership was determined by psychiatric diagnosis.

The potential advantages of the approach over the rational method were numerous. These tests were unlikely to fall subject to the mistaken theoretical assumptions of the test authors since the approach was explicitly atheoretical. The approach was initially thought to be less susceptible to attempts at impression management; the strategy resulted in the inclusion of a number of so-called 'subtle' items on scales, and these items had content with little apparent relationship to

the construct for which it was scored. Unfortunately, the promise of the empirical approach was often not borne out by subsequent research. First, it quickly became apparent that empirical tests were not free from distortions introduced by efforts at impression management. A second shortcoming was items selected to make one particular discrimination had problems when called upon to make other discriminations. For example, MMPI items, selected to contrast normality with psychopathology, tended to have difficulty making distinctions among different forms of psychopathology. Finally, reliance upon empirical methods to identify 'subtle' items appeared to lead to the inclusion of such items on scales that appeared to have questionable validity upon cross-validation.

Statistical Approach

The *statistical* or *classic psychometric* approach shares a quantitative emphasis with the empirical perspective, but was based upon the classical approach to psychometric theory and also influenced by the development of factor analysis. Rather than external criterion group membership as in the empirical approach, the statistical approach emphasized item intercorrelations as its basis for test construction. This approach seeks to construct scales that are collections of homogeneous indicators of an underlying factor, and they typically will demonstrate high internal consistency (i.e. high KR-20/coefficient alpha).

Such instruments have often selected items by focusing upon item–scale correlations, and choosing those items that demonstrated the largest correlations with the parent scale. Another related strategy involves the factor analysis of item intercorrelations, with factor loadings serving as the basis for item selection. Such factor analyses can be either exploratory or confirmatory, but are typically conducted to evaluate the hypothesis that the item set is unidimensional. This approach also results in scales demonstrating high internal consistency, but there is an added potential to identify problems in discriminant validity, as other factors may emerge and certain items may display multiple high loadings, suggesting ambiguity in interpretation of the item. However, an overemphasis upon item intercorrelation in test construction can lead to the 'attenuation paradox' (Loevinger, 1957) whereby increasing internal consistency through the inclusion of redundant (hence highly correlated) items will decrease validity for measurement of complex constructs. Overemphasis on item intercorrelation can also impair the ability of a scale to capture depth as well as breadth in content validity, as factor analysis can segregate items reflecting a unidimensional construct onto different factors, as a function of differing item difficulties.

One of the most enduring examples of this approach to questionnaire construction is the Sixteen Personality Factor Questionnaire (Cattell, Cattell & Cattell, 1993). The basis of the instrument was Cattell's 'lexical' approach, which sought to identify source traits that explained individual differences as captured by personality adjective terms in the English language. Based upon factor analyses of personality data (including behavioural descriptions as well as questionnaire data), Cattell initially concluded that 16 obliquely related source traits formed the basis for most observable personality differences, and constructed a questionnaire to measure these source traits directly. Subsequent investigations have generally found that the 16 scales are not factorially independent, and efforts to replicate Cattell's results tend to find fewer factors than 16. One of the most popular models of normal personality in contemporary research, the 'five-factor model', resembles the higher order factors of Cattell's theory. The five factors include Neuroticism (worry/insecurity vs. calm/self-satisfied), Extroversion (sociable/affectionate vs. sober/reserved), Openness (imaginative/independent vs. conforming/orderly), Agreeableness (trusting/helpful vs. suspicious/exploitative), and Conscientiousness (organized/disciplined vs. careless/weak-willed). The utility and robust nature of the five-factor model has been supported in a number of research studies, and these five characteristics appear to persist throughout much of adult life. There are a number of instruments available for measuring these five dimensions, with one of the most popular being the NEO Personality Inventory (Costa & McCrae, 1992).

Construct Validation Approach

Construct validity represents the extent to which a test reflects a theoretical construct. Within this

framework, test development cannot proceed without a specification and elaboration of the construct to be measured. Cronbach and Meehl (1955) suggested that assigning variability in behaviour to a hypothetical construct requires a theory comprised of an interconnected system of laws (a 'nomological network') relating hypothetical constructs to one another and to observable behaviour. Thus, questionnaire development from this perspective involves the elaboration and refinement of potential indicators in this network (Loevinger, 1957; Jackson, 1971). Examples of instruments that have been developed from the construct validation perspective are the Personality Research Form (Jackson, 1967) and the Personality Assessment Inventory (Morey, 1991).

The construct validation process often involves three stages. The stage of *theory formulation* involves an explication of the content domain of the construct, including a consideration of *breadth* as well as *depth* of the construct. The *breadth* of content coverage refers to the diversity of elements subsumed within a construct, while *depth* refers to sampling across the full range of intensity or severity of a particular element of a construct. Also required at this stage is a delineation of the nature of the classification of constructs and the linkages between constructs in the model, and a specification of the relationship of constructs to external variables, such as aetiology or intervention. The second stage of *internal validation* involves the operationalization of the constructs and examining various internal properties of the classification; specific properties to be emphasized would depend on the theory elaborated in the initial stage. These properties might include interrater reliability, coverage of the classification, stability of measurement over occasions, internal correlation matrices, internal consistency of features assumed to be indicators of the same construct, characteristics of the item or test information curves, or the replicability of factorial structures across different samples. The third stage of construct validation involves *external validation*. At this stage, links of the constructs to other variables related to aetiology, course, or prediction must be tested. This process involves both convergent and discriminant validation (Campbell & Fiske, 1959). That is, in addition to showing that expected relationships prevail between the construct and to conceptually similar constructs, the process must also involve efforts to demonstrate that observed relationships are not attributable to constructs presumed not to be operating within the theoretical network (i.e. discriminant validity). There are a variety of threats to validity where discriminability plays a vital role. In addition to failures of a questionnaire to provide adequate discrimination among constructs, the influence of *response sets* and *response styles* and the operation of *test bias* (discussed elsewhere in this encyclopedia) can also be considered as issues of discriminant validity.

STRUCTURAL APPROACHES TO QUESTIONNAIRE CONSTRUCTION

Items in personality and psychopathology scales typically involve two aspects: a stimulus aspect (for example, the verbal presentation of a statement or question) and a response method (for example, describing the above item as either 'true' or 'false') that is generally constrained to facilitate scoring.

Stimulus Properties of Items

While the nature of questionnaire items will vary across types of measures, it is helpful to keep several guidelines in mind. Items should be written simply and unambiguously, so that the content is directly relevant to the construct measured by the test. Good items should capture the experiences of the person manifesting the construct rather than those of an outside observer, such as a clinician. Because discriminant validity is often difficult to achieve, items should capture aspects that tend to be fairly unique or specific to the construct. Also, items should not reflect only the most extreme manifestations of the trait. If one assumes that there is meaningful dimensional variability on the construct, then it is important to have items that make discriminations at various points on this dimension. Items should also not be offensive or potentially biased with respect to any gender, ethnic, economic, religious, or other group, and colloquialisms or slang should be avoided to avoid problems in translation or cross-cultural application.

Response Properties of Items

There are a number of methods for scaling responses to items or combinations of items. The *binary summative* method involves a scale score that represents the total number of items endorsed in the direction of the construct; each item is thus scored '1' if so endorsed, and '0' if not endorsed in the critical direction. This method is simple to score, and in the case of binary response options, it is also easy for the respondent to understand. The primary disadvantage is that a limited amount of construct variance is captured by each item; thus, to achieve adequate scale reliability, it is typically necessary to include several items for each construct. The *binary weighted* item scaling method involves the use of items that are initially scored in a binary fashion, and then weighted according to some scaling scheme according to their supposed importance for the construct. In contrast to the binary summative method, it is assumed that all items are *not* comparable indicators; some are assumed to be more important than others, and thus are assigned greater weight in determining the final scale score. However, experimenter-assigned weights typically make little difference in the final result, and greater complexity in scoring and potential scorer reliability problems may offset any presumed gain in validity.

Guttman scaling relies upon items having a monotonic, deterministic pattern; any individual who endorses a particular item on a scale should also endorse items 'lower' on the scale. The scale is 'monotonic' in that this determinism works in only one direction; one does not know how a respondent will answer any items 'higher' on the scale. However, it is very difficult to assemble items that fit the model, and items can also fit that almost certainly do not form a unidimensional scale, simply by varying the base rate (i.e. the a priori probability) of endorsing particular items. *Thurstone scaling* attempts to place individuals along such a fixed continuum by identifying the scale 'values' of a number of different items, and placing respondents on that continuum according to where agreement with a particular attitude is expressed. This type of scaling is non-monotonic, in that a respondent would be expected to disagree with items 'above' his or her absolute placement on the scale, as well as disagree with items 'below' this placement. Again, it is typically difficult to find items that fit the scale model, as this pattern of endorsement probabilities is often seen only if items are 'doublebarrelled' to cut off individuals higher and lower on a continuum. Also, finding items that fit the model toward the extremes of the scale can be particularly difficult. *Rasch scaling* (*Item Response Theory*) models are based upon the item characteristic curve (ICC) that relates probability of endorsement to absolute scale placement of the respondent. The Rasch approach models the ICC with one parameter (the difficulty parameter), while two- and three-parameter models (incorporating discrimination and chance/guessing characteristics of items) are also used. In this approach, items may be scaled by examining the *item information function*, and individuals are scaled according to the information contained in the patterns of items endorsed.

Likert scaling involves the use of 5-point anchored response choices for a particular item, although 'Likert scales' have come to signify nearly any type of items with non-binary, graded response alternatives. Unlike the binary weighted scaling approach, Likert scales use item weights that reflect the respondent's behaviour. As such, the Likert approach often improves the reliability of a scale by capturing more respondent variability per item, particularly with scales comprised of relatively few items. Reliability increases as a function of number of scale steps, rapidly up to roughly 7 response alternatives, and begins to asymptote at about 11 alternatives. Because overuse of a scale midpoint may constitute a response style that could decrease scale reliability, use of an even number of alternatives may be preferable.

The *forced choice* technique requires selecting between response alternatives that differ in their relationship to the measured construct, but are equated with respect to some 'nuisance variable', such as social desirability. The effectiveness of this approach is controversial, with a number of potential shortcomings described. First, the social desirability of a response may be strongly tied to the context of evaluation and the use of universal ratings to equate items is unlikely to work across different contexts. The format also potentially loses information about the absolute strength of the characteristic, and for many

personality or psychopathological characteristics, social desirability is not merely a nuisance variable, but represents a valid aspect of the construct. In some respects, the forced choice technique is similar to a *rank-order method*, where respondents rank a series of items or statements according to some characteristic, such as personal preference. Rank order techniques are primarily interpretable as *ipsative* measures, meaning that they are most informative in making comparisons within an individual rather than across individuals.

CONCLUSIONS

Self-reports provide an efficient and reliable measure of the critically important subjective experience of the respondent. Although self-report is subject to various sources of distortion, the approach often includes some of the most sophisticated techniques for identifying and interpreting this distortion. There are numerous approaches to constructing self-report questionnaires, and these differences can be reflected in the conceptual underpinnings as well as in the structural format of the instrument. Although there is no single 'best' way to construct a questionnaire, the process is generally best guided by a well-articulated theory of the construct to be measured that specifies hypotheses about relevant indicators and relationships to other constructs.

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RELATED ENTRIES

Self-Reports (General), Self-Report Distortions, Self-Presentation Measurement, Self-Reports in Behavioural Clinical Settings, Self-Reports in Work and Organizational Settings

SELF-REPORTS (GENERAL)

INTRODUCTION

The self-report is a method for collecting data whose source is the subject's verbal message about him/herself. The self-report as an assessment method is supported not only by methodological standards but also by knowledge derived from basic psychology research in the fields of language, memory, learning and neuropsychology.

Self-reports provide information about thousands of events, from subjects' external and observable conditions (what subjects do, their circumstances, etc.) to his/her internal events (what they think or feel, their plans, opinions, attributions, desires, etc.). These types of events can refer to the past, to the present, or even to subjects' expectations about the future.

Self-reports are the most widely used methods in psychological assessment in all applied fields (clinical, health, educational, work & organizational, etc.), as well as being useful within all theoretical perspectives (behavioural, cognitive, phenomenological psychoanalytical, psychometric, constructivist, systemic). Therefore, self-reports can be taken and studied from several theoretical, practical, analytical and structural perspectives (for a review see Fernández-Ballesteros, 2002; Meyer et al., 2001).

In psychological assessment the self-report method is considered as an essential form of data-collection for three basic reasons: (1) due to the *relative accuracy* of the information provided by the subject about him/herself and about public events, and for its *efficiency* (compared to other methods) in relation to its cost and benefits; (2) as the *preferred method* in the assessment of subjective and private events (Hollon & Bemis, 1981); and (3) due to its empirically demonstrated *value* in the description, diagnosis and prediction of human behaviour (Schwartz, Park, Knauper & Sudman, 1998).

Although self-reports are considered to be acceptable methods for collecting data, it is well known that they have important sources of errors or response distortions, such as social desirability, faking, impression management, acquiescence, etc., which should be investigated and controlled (see: 'Self-Report Distortions' and 'Self-Presentation Measurement').

The consideration of the self-report in scientific psychology has evolved in accordance with the epistemological assumptions of different theoretical frameworks, and has constituted a central element in the mentalism–physicalism and functionalism–structuralism debates. Historically, it has been the central method in the study of conscientiousness (Wundt, 1902), the object of critical review from behavioural epistemology (Watson, 1920), rejected by the first and second generations of behaviourists (Zuriff, 1985), the object of reconceptualization by the third generation (Mischel, 1968; Staats & Fernández-Ballesteros, 1987), and also a fundamental instrument, both in the study of personality variables and constructs (Wiggins, 1973), and in that of a wide variety of psychosocial characteristics from psychopathological conditions to risk factors, from work performance to environmental attitudes, so that it is considered indispensable throughout the long process of evaluation and change (for a review, see Schwartz, Park, Knauper & Sudman, 1998; Fernández-Ballesteros, 2002).

All self-reports involve questions and answers (oral or written), so that, depending on the structure of these questions and answers, self-reports have several *formats* – interviews, questionnaires, scales, self-monitoring, think-aloud protocols and other specific instruments – for recording subjects' verbal messages about themselves. Nevertheless, in the literature, self-reports are commonly reduced to those that present a structured and standardized format in questions and answers, such as questionnaires, inventories and self-rating scales.

In sum, the self-report is a commonly used method of data collection in psychology and other social sciences, which can be used to collect a broad range of psychological content and events that require different types of cognitive operations by subjects, which can be used differently by assessors from different theoretical perspectives, and which have several types of format. This entry will be dealing with these very general issues related to self-reports.

NATURE OF THE CONTENT REPORTED

As a data-collection method, self-reports have the peculiarity of facilitating the recording of data on a wide range of behavioural content: subjective and overt behaviours, and external events to the subject. Given that the medium of self-reports is thinking and language, they require a neurobiological substratum and a series of extremely complex neurocognitive operations. For these reasons, self-reports constitute a wide methodological category about which it is difficult to make a general appraisal. In order to approach such an appraisal, we will first need to make a brief analysis of the content about which subjects can provide information, and, second, about the cognitive operations the subject must carry out in the act of self-reporting, since these operations lead to specific biases in self-reports.

Hersen and Bellack (1977) pointed out that self-reports primarily collect information about what the subject does, thinks or feels, as well as subjective considerations about what he/she does, thinks and

feels. Moreover, human beings can report on external events and the relationships between external events and behaviour that occurred in the past and are occurring in the present, and about their elaboration upon them, as well as their predictions and expectations for the future.

From a methodological perspective, a general trait emerges from this assortment of events: the possibility of verifying them. The independent verifiability of a reported event is an important condition when we are to judge its validity or accuracy. In sum, self-reported content presents different degrees of *verifiability*. Thus, if people are asked about something they are *doing* at that time, given that this is a *public event*, the information is verifiable through observation. If people are asked about an observable situation in the past (for example, if their parents beat them as a child, or whether they had a particular illness), the chances of verifying such data becomes more complicated, and is sometimes impossible. Nevertheless, such information could be verified if we had archive data or reliable records from the time when it occurred. In other words, any event is verifiable insofar as it is observable and objective data on it are available – as occurs with reports on physiological events.

Finally, subjects can report cognitive *internal events* or their experience and/or elaborated thoughts about any observable fact or event for which as yet no verification is possible (the final criterion should be the subject him/herself (Cone, 1978).

In sum, we are faced with an apparent incongruence; that is, self-reports of verifiable events facilitate the validation process, while self-reports about non-verifiable events – for which we do not have other assessment methods – provide us with less reliable information.

Operations Required

It has already been stated that language is a human communication medium that requires neurobiological equipment (which has been shaped over throughout the individual's and species' development process) and a series of internal neurocognitive operations. Thus, in order to produce a verbal report on oneself, the subject must process the question, search for the required information in his/her memory and, finally, give a response that, in turn, must fit the format presented by the assessor.

There is important evidence from information processing psychology that identifies the conditions affecting the accuracy of self-reports as behavioural data, namely the *accessibility* of that information and the *time* to which it refers.

From a memory model, Ericsson and Simon (1980) stress that 'self-report X need not be used to infer that X is true, but only that the subject was able to say X' (p. 7). In other words, by 'accessibility' we understand the extent to which a reported event is known or can be known by the reporter. Therefore, a first condition of any self-reported event is its accessibility to the subject. For example if the subject is asked about how many times he/she braked when driving to the office this morning, he/she is unable to answer the question because such behaviour is automatic. When this type of question is asked, the subject is likely to answer with the 'available heuristic' (Tversky & Khaneman, 1973) or with the most probable or truthful response (Meichenbaum & Buttler, 1979). In other words, self-reports usually require complicated transformations of stored primary information because they can refer not only to facts but also to inferences about facts. For example, 'I go to religious services' is a stored fact, but any question regarding new inferences ('do you think that going to religious services is. . .') about this fact require, to some extent, cognitive transformations of the fact already stored. As Nisbett and Wilson (1977) point out, subjects may be accurate in reporting facts, but they are not accurate when they have to talk about interpretations of those facts.

Moreover, the complex web of operations required of subjects when they have to respond to a self-report is further complicated by a *time factor* – the event about which information is required may be in the past, the present or even the future. Memory principles should be applied in trying to understand the process of recovering the information stored at different times, or the processes involved when subjects have to predict their own behaviours or other events in the future (Ericsson & Simon, 1980; Nisbett & Wilson, 1977).

Sometimes, questions are asked about what subjects *usually* do. In these cases, subjects must retrieve information about a set of events stored from the relatively distant past and make decisions about the generality of those events: are they 'usual', 'frequent', 'rare' during that past period of time? Self-report distortions function in these complex operations, leading to important biases

related to individual differences in self-presentation (see: 'Self-Presentation Measurement' and 'Self-Report Distortions').

Finally, self-reports not only have to retrieve specific information: they must also transform the retrieved event-information to fit the response format (list of responses, rating scales, etc.). Thus, once again, response tendencies affect the accuracy of responses with regard to the original 'facts'.

Thus, knowledge from the psychology of language, of memory and of learning is extraordinarily relevant for optimizing the accuracy of self-report information as scientific data. Self-reports differ insofar as the required information is easily accessible (codified in the same format as it is demanded) or needs transformation. Furthermore, self-reports differ in terms of whether they relate to present events (for example, in the case of self-observation or self-register), they refer to past events, or they require the subject to make an 'average' over a long period of time. The greater the elaboration of the codified event the subject is required to make, the greater the possibility of distortion.

INFERENCES ABOUT SELF-REPORTS

Verbal messages – whatever their content – can be used in two essentially different ways: (a) Verbal messages about a particular event (e.g. 'I'm afraid') can be taken in an 'isomorphic' way – that is, what is reported is occurring or has occurred (the reporter actually is afraid), and the verbal statement substitutes the event; (b) Social scientists – including psychologists – tend to consider self-reports not as a way of assessing specific events, but as a set of verbal behaviours from which to infer other psychologically relevant concepts (e.g. from the reported 'being afraid', to infer that the person has a problem of 'anxiety'). Thus, after mathematical manipulations a set of verbal responses from self-reports collected and analysed by using inter-subject designs can be considered as signs of a given psychological construct which, in turn, serves to predict (as its correlate) other relevant human behaviours (e.g. from the information that a person feels 'depressed', we can infer that s/he may commit suicide).

Trait theories, based on correlational approaches, have given rise to hundreds of self-reports that assess dimensions or factors of personality: in all of them, the reported information is used at a very high level of inference; in other words, the verbal messages are considered as phenotypic expressions of an underlying genotypic characteristic in the subject. Throughout the history of psychology there has been intense debate between behavioural psychologists and personality psychologists over the value of self-reports taken as behavioural data or as signs of the existence of underlying psychological characteristics (Mischel, 1968).

This is not the place to enter more deeply into this important issue (see Sundberg, Tyler & Taplin, 1973). It is important to underline, however, that self-reports present different forms of validation insofar as they are used from different theoretical perspectives with different levels of inference.

TYPES OF SELF-REPORT

We have already referred to the fact that the particular format of a self-report depends on the way the questions are formed and how the responses are elicited. Naturally, in any *interview* self-reports are required (that is, reports by subjects about themselves), in a quite unstructured way (see entry on 'Interview (General)'). Similarly, *self-observation* or *self-monitoring* can be considered as variants of the self-report, generally concurrent with the to-be-assessed event itself, but there is no standard format (see 'Self-Observation (Self-Monitoring))'. Nevertheless, both the interview and self-observation are considered as methods independent of self-reports. Self-reports as such are those with a format in which the questions and answers are previously structured.

Questions

The questions used for collecting information generally present the event about which information is required. These questions, stimuli or items vary not only according to the content we referred to above, but also on the basis of a series of characteristics among which some of the most important are the verbal tense used and the specificity of the situational and response format.

Zuriff (1985) called self-reports 'messages in the first person', and it is true that a large proportion of self-report responses are formulated in the first person singular ('I'm upset', 'I'm sad'). However,

this is not always the case, since other types of formulation are also common – for example, the second person singular ('Do you sometimes want hustle and bustle?') or the first person plural ('We're a very close-knit group'), or even, with the object of masking the 'examination' situation, the third person (singular or plural), so that self-reports can refer to what the subject says a third person (to whom the item refers) does, thinks or feels.

Linguists have stressed the importance of the verbal tense used when collecting information through self-reports, insofar as it affects the subject's degree of involvement, and therefore influences responses. Assessors should take note of basic research in this area before making decisions about the use of verbal tense in self-reports.

With regard to the *situational and response generality–specificity* of questions, variation is wide, and depends on the theoretical approach from which they have been constructed. In the trait approach, questions tend to be quite non-specific ('I feel nervous'), while behavioural self-report items tend to present situational and response specificity ('In social situations my heart races'). These differences are related to the differences between formats assessing 'states' or 'traits' (e.g. Spielberger, 1972).

These aspects affect the degree of precision with which stimuli elicit information on situations, events, etc., and they therefore determine the extent to which information on the reported event must be processed. Reports with greater specificity maximize the precision of what is reported, and correspondence between the self-report and the reported fact is therefore higher. In contrast, general self-reports – which tend to require more transformation of the reported fact – involve more interference by the so-called response set. In sum, when the aim of the self-report is to collect behavioural data, the greater the specificity, the greater the precision, while ambiguous and/or general descriptions tend to be preferable when personality characteristics are to be assessed and the involvement of the response set is maximized.

Responses

Variation in types of response alternatives is an important factor, and even forms the basis of the three most frequent types of self-report: *Questionnaires*, *Inventories* and *Scales* (the term *inventory* is sometimes used interchangeably with *questionnaire*). The difference between these three instruments lies in the fact that the response alternatives in questionnaires tend to have the dichotomic format Yes/No (e.g. 'I find it very hard to ask for favors'...Yes/No), inventories tend to present a list of formalized response alternatives (e.g. 'How do you like to spend your time? (a) going to an art gallery; (b) visiting a museum; (c) going to a library') and, finally, rating-scales involve giving scores on a scale (of 3, 4, or more response alternatives), whose levels may use adjectives ('I like going to the cinema': 1 = A lot, 2 = Quite a lot, 3 = Not much, 4 = Not at all) or adverbial constructions referring to frequency ('frequently', 'usually', etc.). Another variant, also with multiple response alternatives, requires the ranking of a series of items by means of ipsative scores (e.g. ranking list of professions: 1st, 2nd, 3rd, etc.) (see Fernández-Ballesteros, 1992, 2002).

The formulation of stimuli and the selection of response alternatives are important in that they can lead to bias; subjects may respond to the item not according to its content, but rather according to the response alternatives offered. Thus, for example, self-report items differ in terms of their greater or lesser *social desirability* – in the extent to which the behavioural description they involve can be considered socially acceptable or unacceptable, and this can affect the subject's response. As regards dichotomic alternatives, they exercise their influence given that there appears to exist a tendency for *agreement* or for *negation*. Finally, scalar responses are affected by the tendency in some subjects to respond on the mid-point of the scale (*central tendency*), or at one pole or the other (see also entry on 'Self-Report Distortions').

FUTURE PERSPECTIVES AND CONCLUSIONS

Self-reports provide useful information, in some cases difficult to obtain through other procedures. Various reviews have stressed that the self-report is – together with the interview – the most commonly used method in psychological assessment, and that with the widest spectrum in terms of data-collection, allowing the gathering of a great variety of types of information (from data on motor behaviours to physiological responses). Basic psychology presents a substantial body of knowledge on which to base self-reports, which permits us to

Table 1. General issues in self-reports

Contents	Operations	Inferences	Questions	Responses	Types
Motor	Accessibility	As data	Verbal tense	Yes/no	Questionnaires
Cognitive	Level of transformation	As sign	Generality vs. specificity	List of responses	Inventories
Physiological	Time: past, present, future, 'usually'			Rating-scales: numbers, adjectives, order	Scales
External events					
Subjective evaluations					

identify the circumstances in which self-reports can be reliable. Finally, we have examined different types of self-reports and their potential weaknesses. Table 1 presents a summary of the most important general issues with regard to self-reports.

It is important to emphasize that biases and sources of error in self-reports and their control, together with the validation of self-reports on non-verifiable events, are areas of research to which serious consideration should be given in the future (Fernández-Ballesteros, 1999, 2002).

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RELATED ENTRIES

Self-Report Distortions, Self-Presentation Measurement, Self-Report Questionnaires, Self-Reports in Behavioural Clinical Settings, Self-Reports in Work and Organizational Settings

SELF-REPORTS IN BEHAVIOURAL CLINICAL SETTINGS

INTRODUCTION

Self-reports have constituted basic procedures of psychological assessment. Self-reports have been used with different goals either in traditional or behavioural assessments. In the first case, the goal pursued is the study of the underlying personality. In the second, the goal to be reached is the measurement of manifested behaviour (verbalized).

Self-reports are widely employed assessment methods, consisting of the collection of verbal information provided by an individual about him or herself. Therefore, it can be considered as a variation of self-observation techniques. Information such as motor responses (avoidance behaviour, tobacco consumption, etc.), psychophysiological responses (tachycardia, sweating, etc.) and cognitive responses (sadness, insecurity, etc.) can be collected through self-reports. It is also the only available method to collect information about cognitive responses (for a review see Fernández-Ballesteros, 2002).

DEFINITION

The term *self-report* includes all structured instruments, generally printed on paper (currently some computerized proofs are available), that will provide information about the subject and his/her behaviour (see Table 1). This study will employ Hersen and Bellack's definition (1988) including questionnaires, inventories and scales, even though their terminology is controversial. Self-reports can be general (referring to the subject's general behaviour) or specific (focused on certain problems or behaviours). A subject's answers constitute a sample of their behaviour and never a sign of any internal element to be known through such answers. Self-reports, as an assessment tool

Table 1. Self-reports in clinical settings

General	Self-Reports	
25T-	General	• Biographical Questionnaire for Behavioural Analysis (Cautela & Upper, 1976) • Fear Survey Schedule I, FSS I (Lang & Lazovik, 1963) • Fear Survey Schedule II, FSS II (Geer, 1965) • Fear Survey Schedule III, FSS III (Wolpe & Lang, 1964) • S-R Inventory of Anxiousness (Endler, Hunt & Rosenstein, 1962) • Body Sensations Questionnaire/Agoraphobic Cognitions Questionnaire, (Chambless, Caputo, Bright & Gallagher, 1984)
Anxiety	Specific	• Questionnaire for Tension and Anxiety Schedule (Cautela & Upper, 1976) • Hamilton Anxiety Rating Scale (Hamilton, 1959) • State–Trait Anxiety Inventory, STAI (Spielberger, Gorsuch & Lushene, 1988) • Maudsley Obsessional-Compulsive Inventory (Hodson & Rachman, 1977) • Beck Depression Inventory, BDI (Beck, Rush, Shaw & Emery, 1979) • Hamilton Rating Scale for Depression, HRSD (Hamilton, 1960) • Modified Hamilton Rating Scale for Depression, MHRSD (Miller, Bishop, Norman & Maddever, 1985)
Depression		• Self-rating Depression Scale, SDS (Zung, 1965) • Attributional Style Questionnaire (Peterson, Semmel, Von Baeyer, Abramson, Metalsky & Seligman, 1979) • Automatic Thoughts Questionnaire, ATQ (Hollon & Kendall, 1981) • Automatic Thoughts Questionnaire-P (Ingram & Wisnicki, 1988) • Gambrill–Richey Assertion Inventory, GRAI (Gambrill & Richie, 1975)
Social skills		• Rathus Assertiveness Schedule, RAS (Rathus, 1973) • Problem Solving Inventory (McFall & Lillesand, 1971)

within clinical contexts, present several advantages that explain its popularity: facility of application, economy, systematizing, allowing results comparison both during the treatment procedure and the follow-up phase. On the other hand, self-reports save time, allowing the psychologist to detect with certain rapidity the areas where the subject may have problems. Consequently, psychologists can evaluate, with more detail, specific behaviours in such areas. In this sense, it allows obtainment of both quantitative and qualitative information that make it possible to design and perform the intervention or treatment. Above all, as it was previously said, self-reports constitute the only direct form of evaluation for subjective cognitive responses.

The studies on the reliability and validity of self-reports have been more frequent in the traditional assessment perspective than in the behavioural assessment field. Its measure presents some problems that may alter the reliability of the obtained data: the subject might distort voluntarily or involuntarily the information. In clinical contexts, the client wants to solve a problem and therefore a voluntary distortion of the data is more difficult. However, there are some factors that might be activated involuntarily such as reactivity and different expectations (the same factors take place within observation and self-observation techniques).

Self-report questionnaires were built by the following three strategies: rational (items are selected by the professional generally following a theoretical model); empirical (items selected showed their capacity to discriminate between different groups of subjects); and factorial (items selected through factorial analysis). The rational strategy is the most used within behavioural assessments.

Areas such as *anxiety*, in a second place *depression* and, in a third place, *social skills* have been developed in the greater majority of self-reports within clinical contexts. The election of the instrument to be used is based on the specific information previously obtained on the case, generally after the first clinical interview. Some self-reports have been elaborated to identify behaviour problematic areas, establishing only the presence or absence of problematic areas (check-lists). However, other self-reports are focused to obtain more specific information on the nature and intensity of the problem. There is a common agreement about the convenience of contrasting and completing the obtained data in self-reports by also obtaining information through direct methods.

Table 1 shows the most used self-reports in the clinical practice. The summary does not intend to be exhaustive, but to provide a small sample. General tools have the goal to identify possible problematic behaviours as well as to obtain information on various aspects that might help to explain the problem. One of the most used is the Biographical Behavioural Analysis Questionnaire (Cautela & Upper, 1976). This questionnaire can be used either as a guide for the interview or to obtain writing responses by the client. If the client responds to it by writing, his/her answers might serve to clarify information.

During the 1960s, several inventories were developed to assess general fears to attend different anxiety problems. They consisted of extensive lists of items to be answered by the client in accordance to the intensity of the fear experienced. These tools were criticized for being unspecific both in the stimulus and the response. These questionnaires are: the Fear Survey Schedule I, FSS I (Lang & Lazovik, 1963); Fear Survey Schedule II, FSS II (Geer, 1965); and Fear Survey Schedule III, FSS III (Wolpe & Lang, 1964) – this last one being the most used of them all. These general self-reports are quite accurate, with moderate convergent validity. Other specific self-report instruments have been developed in regard to anxiety problems to assess several phobias to animals, social phobia, agoraphobia and panic attacks, generalized anxiety, etc.

Other self-reports were developed for depression assessment, especially directed to assess the cognitive manifestations of this problem. The most employed instrument in this area is the Beck Depression Inventory (BDI) (Beck, Rush, Shaw & Emery, 1979). The BDI has been culturally adapted to several countries. Another popular inventory is the Hamilton Rating Scale for Depression (HRSD) (Hamilton, 1960) and its modified subsequent version (Miller, Bishop, Norman & Maddever, 1985), which mainly focused on the psychosomatic and motor components of depression. In addition, the new version includes some cognitive manifestations.

Finally, some self-reports were developed for the evaluation of social abilities, such as the

Gambrill–Richey Assertion Inventory (GRAI) (1975) and the Rathus Assertiveness Schedule, EVENNESS (1973). Both have demonstrated accuracy and validity in measuring assertive behaviour in clinical fields, especially in establishing pre-treatment and post-treatment measures in order to assess therapeutic progress.

FUTURE PERSPECTIVES

The employment of traditional tools (test) for behavioural assessments was rejected for a long time. However, several authors stress their potential usefulness when using the items as indicators of a deficit Basic Conduct Repertory and outlining, consequently, a behavioural analysis of such items. In this sense, the behavioural and traditional assessments could complement each other.

On the other hand, there is a recent tendency to improve psychometric properties of those self-reports employed in the clinical field. The studies that examine the reliability and validity of the different questionnaires, inventories and scales are growing up quickly. This is improving, undoubtedly, their quality as assessment instruments.

CONCLUSIONS

Self-reports were born to be a characteristic assessment technique within the traditional evaluation and personality study. However, the use of these instruments for behavioural assessment is perfectly legitimized since their construction as well as the employment of the provided information are part of radically different presuppositions.

Self-reports represent a great useful set of instruments in the clinical practice as long as they are selected in accordance to previous obtained data on the subject's problem. In addition, it should be understood that the provided information constitutes a sample and never an indicator of some underlying ailment. It is also essential to contrast the information with data provided through direct methods (especially the observation). Finally, the information obtained through self-reports should focus on the accomplishment of a functional analysis that will explain the occurrence of the problem to the clinician.

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RELATED ENTRIES

Applied Fields: Clinical, Theoretical Perspective: Behavioural, Self-Reports (General), Self-Report Distortions, Self-Presentation Measurement, Self-Reports in Work and Organizational Settings

SELF-REPORTS IN WORK AND ORGANIZATIONAL SETTINGS

INTRODUCTION

Self-report as a method of psychological assessment had its beginning in 1918, when Robert S. Woodworth published the first personality inventory, the Personal Data Sheet. The items (116) were questions to the respondents. For example: 'Do you feel well and strong?' (1) to 'Do you like outdoor life?' (116). The response format was Yes/No. The inventory was developed during the latter stages of World War I to aid mental health officers in the US Army to identify recruits who might be susceptible to psychometrics (Dubois, 1970). Later on, Robert G. Bernreuter modified the Woodworth inventory and applied it to US business and industry for the purposes of personnel selection, placement, transfer and retention–termination (Berneuter, 1931).

From these early beginnings throughout the 20th century to the present, self-report psychological assessment instruments have flourished; some with varying degrees of successes, and others with controversial criticisms. Among these measurement instruments predominantly have been personality questionnaires and inventories, interest inventories, social attitude inventories, adjustment inventories, character tests, scales to measure the self-concept and inventories of self-description as a report of typical behaviour of individuals (Cronbach, 1960: 442–444). Concurrent with the growth in development of self-report measurement instruments there has been a commensurate development in statistical methodology, psychometric methodology and measurement techniques. To name a few these are, not necessarily in any order of importance, 'response styles and bias', 'lie scales and honesty', 'ipsative scores', 'Q methodology as a method of factor analysis', 'faking and evasion', 'social desirability', 'forced-choice response categories' and 'preferences for behavioural styles'.

SOME SELF-REPORT INVENTORIES AND SCALES OF LONG STANDING

In this entry, self-report instruments are restricted to those assessing personality of normal people and behavioural types primarily, and those which have been in work and organizational settings over a reasonably long period of time within the 20th century. These assessment instruments are classified in normative (free response) versus adjective checklists and measures of behavioural types or styles.

The self-report assessment instruments that follow have been selected to be described and discussed because they are the ones that have a history of having been developed more than 50 years ago and/or are still widely used even if their development does not span the last half century. They are also the most popular non-clinical self-report instruments.

Response formats for these instruments vary among 'yes/no', 'check/no check', 'tetrad/pentad

forced-choice' and 'true/false'. These instruments focus on content, purpose, psychometric properties, dates of utilization, strengths, and weaknesses, measurement problems and special features as appropriate. In alphabetical order, the self-report instruments that are discussed include: Adjective Checklist (ACL), Activity Vector Analysis (AVA), California Psychological Inventory (CPI), Gordon Personal Profile Inventory (GPP-I), Guilford–Zimmerman Temperament Survey (GZTS), Hogan Personality Inventory (HPI), Jackson Personality Inventory (JPI), Jackson Personality Research Form (JPRF), Minnesota Multiphasic Personality Inventory (MMPI), Myers–Briggs Type Indicator (MBTI) and Sixteen Personality Factor Questionnaire (16PF).

Adjective Checklist

ACL (Authors: Harrison G. Gough & Alfred B. Heilbrun Jr.) is published by Consulting Psychologists Press (CPP). It is a self-concept measurement that CPP promotes as a personality tool for assessing a normal person's self-awareness and that person's perception by others. Two concepts of multiple inferential selves are measured by 37 scales, including measures of psychological needs, intellect and creativity and ego functioning (CPP, 2000). ACL is a free-response checklist consisting of 300 behaviourally descriptive adjectives from A to Z. The two self-concepts that are measured are the basic self and the ideal self. The ACL was originally developed as a research instrument for the US Airforce (Gough, McKee & Yandell, 1955). It became operational for civilian use a few years later (Gough, 1960) and yielded 6 scales. In the mid-1960s, the ACL was modified and extended to its present form yielding 37 scales (Gough & Heilbrun, 1965). Over the past nearly half-century, it has enjoyed wide acceptance and application in many fields of endeavour including business and industry in team building, personal and career development.

Activity Vector Analysis

AVA (Author: Walter V. Clarke), another early self-report adjective checklist, is a self-concept measuring instrument whose use and application is restricted to clients of the psychological management consulting firm, Walter V. Clarke Associates, Inc., currently located in Pittsburgh, Pennsylvania. Form A was released for operational use by its author in Providence, RI, in 1948, with accompanying reports of psychometric properties and preliminary manual. It was publicly announced to the psychology community 8 years later (Clarke, 1956). Form F is the current form of the checklist consisting of 106 adjectives in free-response format, yielding six scores and three four-factor profiles. The three integrative profiles that are interpreted are measures of the AVA based on the psychological personality theory of Lecky (1945) and the physiological emotions theory of Marston (1928). Respondents are first asked to check those words that they truly believe are descriptive of themselves. Details of the theoretical foundations and empirical applications of AVA are presented in Merenda (1990). For more than 50 years now the reliability and validity of this self-report system has been found to be useful in the world of work and organizational settings. The principal uses have been in pre-employment screening, job selection, personnel management and placement, and transfer and retention.

California Psychological Inventory

CPI (Author: Harrison G. Gough) is a psychological inventory developed more than 40 years ago to assess personality traits of normal persons and to complement or substitute for the primarily clinical MMPI which was designed to measure pathology in clinical settings (Hathaway & McKinley, 1940). Like the MMPI, the CPI in its current third edition has 434 items which are declarative sentences with true/false responses (in the MMPI, the response format was 'true', 'false' and '(?) cannot say'). The 2000 CPP catalogue states that the CPI instrument 'provides an accurate, complex portrait of a client's professional and personal style ... tool to find and develop successful employees, develop leaders, create efficient and productive organizations, and promote teamwork'. That it has survived having more than four decades of adoption and continued use is testimony to its sound psychometric properties.

Gordon Personal Profile Inventory

GPP-I (Author: Leonard V. Gordon) was developed half a century ago as two separate personality assessment inventories (Gordon, 1953, 1956), and they were combined into a single inventory in 1978. Together they measure the personality traits of Ascendancy, Responsibility, Emotional Stability, Sociability, Self-Esteem, Cautiousness, Original Thinking, Personal Relations and Vigour. The Catalogue for Psychological Assessment and Intervention Products (see Psychological Corporation) states that one of the special features of GPP-I is that the response format is forced-choice. This is debatable, and among many psychometricians it is faulty, as will be discussed and explained later on.

Guilford–Zimmerman Temperament Survey

GZTS (Authors: J.P. Guilford, J.S. Guilford & W.S. Zimmerman) is a non-clinical self-report instrument for measuring personality and temperament. Its early developmental beginnings date as far back as 1934 (Merenda, 1999: 910). The GZTS has been used in work and organizational settings since it first became operational more than 50 years ago (Guilford & Zimmerman, 1949). Developed by factor analysis, it yields ten measures of personality traits and three falsification (lie) scales. Over this long period, it has been used in employee and management development according to its current catalogue (CPP, 2000). A psychometric criticism of the affirmative items that comprise the survey is the response format similar to the inital MMPI of yes/no. A caution in the proper interpretation of the 10-score norms are based mainly on college students and have meaning primarily when interpreted ipsatively in relation to other scores in the profile.

Hogan Personality Inventory

HPI (Authors: Robert Hogan & Joyce Hogan) was designed by the authors as an instrument to measure the personality of normal persons primarily for use in personnel selection (Hogan, R., 1986; Hogan, J. & Hogan, R., 1989). The authors state that the HPI does possess similarities to clinical inventories such as the MMPI and NEO-PI. The HPI is a self-report instrument consisting of 206 true/false items that yield, through factor analysis, seven personality scales related to successful job performance.

Jackson Personality Inventory/Jackson Personality Research Form

JPI/JPR (Author: Douglas N. Jackson) are two separate personality inventories designed to be applied in business and industrial settings. JPI-R became operational in 1976 and comprises 300 true/false items. It yields 15 scales organized in five higher order clusters: Analytical, Extroverted, Emotional, Opportunistic and Dependable. The inventory is used widely in settings such as those of work, organizational behaviour or other interpersonal behaviours. JPI-R was preceded in 1964 by the Personality Research Form (PRF) which was designed primarily for personnel selection in industrial and business settings. The current form of PRF is Form E, comprised of 352 true/false items producing 22 scales measuring normal personality.

Myers–Briggs Type Indicator

MBTI (Authors: Isabel Briggs Myers & Katherine C. Briggs) is currently the most widely used as well as misused self-report personality inventory on a world-wide scale.

The instrument determines preferences for behavioural style on four bi-polar scales: Extraversion–Introversion, Sensing–Intuition, Thinking–Feeling, and Judging–Perceiving. The combinations of these four preference scales yield sixteen measures which are interpreted as personality types. Initial work on the development of the MBTI was begun in 1942, and continued until 1962, by the mother–daughter team of clinical psychologists when the Educational Testing Service published it as research instrument. In 1975, CPP became its publisher. Among its wide range of uses in work and organizational settings is management development. However, many business and industrial firms misuse it today for job selection and job placement (see: Merenda, 1990; McCaulley, 1991; Pittenger, 1993).

Personality Factor

PF (Author: Raymond B. Cattell) has been used operationally as an assessment self-report inventory questionnaire for the normal adult personality since 1949. The 16PF personality assessment instrument measures sixteen primary traits plus five second-order factors. It has been widely used in clinical and counselling settings, but just as frequently has been used in industry and business for selection, placement and promotion of personnel by predicting important job related characteristics.

STRENGTHS, WEAKNESSES AND PROBLEMS OF SELF-REPORT

This entry is focused on objective presentation of self-report measures of long-standing in work and organizational settings without evaluating the merits of each instrument or assessment system. However, the presentation would not be complete if attention of the reader were not called to the strengths, weaknesses and problems of self-report, which have only been alluded to so far. Among the strengths of self-report measures is the development of 'lie' or 'honesty' scales and other procedures to detect faking or evasion. Among their weaknesses, especially in the assessment of self-concepts, is the practical inability to control ambiguity in items and individual response styles and biases, particularly to dichotomies, e.g. yes/no, trichotomies, e.g. yes/no, and more so to forced-choice response options, tetrads or pentads. The latter precludes the legitimacy of employing factor analysis methods in the development of instruments and research with the individual items. (Normative measurements are required and it is wrong to use measures in constructing the matrix to be reduced.) Problems also arise with 2-point scores, e.g. yes/no (see Merenda, 1997). Finally, and briefly, many self-report questionnaires that have been developed for clinical use are still being applied in work and organizational settings without justification, thereby producing erroneous, misleading and dangerous interpretations (see: McCauley, 1990; Merenda, 1990; Merenda, 1997).

FUTURE PERSPECTIVES

Beyond the ninth decade of the 20th century, no instruments comparable to the above-mentioned nine have been developed and utilized (Merenda, 1999). This may have been due to two primary reasons: (1) the continuing success of the nine; and (2) the continuing decline of well-trained psychometricians in the USA. However, during this same period, some of the nine have been translated and renormed for application to other cultures with limited success due to inadequate and faulty adaptation procedures. But as expertise and funding in test adaptation methods increase, as they are bound to do as we progress in the 21st century, the future appears promising. At the same time, while the education and training in psychometrics in the USA is definitely declining, in other parts of the world it is steadily rising. It is predicted that in the foreseeable future, correct and effective test adaptation procedures will become a reality and that the influx of well-trained psychometricians outside the USA will result in individual and related cultures producing their own assessment instruments rather than depending on the cultural adaptation of those developed in the USA.

CONCLUSIONS

During the latter half of the 20th century, a number of useful self-report psychological assessment instruments were developed for application in work and organizational settings. Nine of these have been discussed. All have demonstrated their validities and reliabilities for the purposes for which they are intended, as evidenced by their long-standing applications. All nine have been developed and used primarily in work and organizational settings in the USA.

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Peter F. Merenda

RELATED ENTRIES

Applied Fields: Work and Industry, Applied Fields: Organizations, Self-Reports (General), Self-Report Distortions, Self-Presentation Measurement, Personnel Selection, Assessment in

SENSATION SEEKING

INTRODUCTION

The first sensation seeking scale (SSS) was based on the hypothesis that there were consistent individual differences in optimal levels of stimulation and arousal (Zuckerman et al., 1964). The construct of an optimal level of stimulation was first decribed by Wundt at the end of the 19th century and translated into physiological terms by Hebb in the middle of the 20th century. Hebb (1955) also developed an idea of an optimal level of arousal based on the interaction between sensory stimulation and the reticulocortical activation system, a homeostatic neurological system regulating the arousal level of the cortex needed for effective cue function. The development of the first form (II) of the SSS was based on Hebb's construct trying to translate it into behavioural and preference characteristics of individuals.

The development of further forms of the SSS, changes in the theory of sensation seeking, and the research using the scales or other similar scales has

been described in two major books (Zuckerman, 1979, 1994). The most recent definition of the trait from the 1994 book is: 'Sensation seeking is a trait defined by the seeking of varied, novel, complex, and intense sensations and experiences, and the willingness to take physical, social, legal, and financial risks for the sake of such experience' (Zuckerman, 1994: 27).

The earlier theory was based on the neurophysiology of the 1950s, centred around the discovery of the reticulocortical system. Advances in the neurosciences, particularly in psychopharmacology, and the use of animal models to define the trait has changed our conception of the biological basis of sensation seeking. These new models are described in more recent articles and books (e.g. Zuckerman, 1984, 1994, 1995).

DEVELOPMENT OF SCALES

The first experimental form of the SSS included many items that were rationally derived from the idea of a need for intense and varied stimulation. The items were written in a forced choice form with one option representing what was thought to be the choice of a high sensation seeker and the other the choice of a low sensation seeker. The forced choice form was used in an attempt to control the choices for their social desirability values. The items in form I were given to student subjects and their item responses were intercorrelated and factor analysed with the idea of finding one broad general factor from the unrotated item loadings. Form II was based on the items defining this general factor in both men and women.

Subsequent analyses of rotated factors in form II suggested the existence of narrower factors beyond the broad general factor. New items were added to amplify the suggested factors in the experimental form III. These items were again factor analysed but this time with rotation in order to define significant additional factors. Form IV consisted of the General Scale, confirmed by the unrotated first factor in the new study, and four scales consisting of the items loading most highly on each of the four factors. These factors are as follows.

Thrill and Adventure Seeking (TAS)

These are items expressing a desire to try sports or other physically risky activities providing unusual sensations or speed, such as parachuting or scuba diving. All items are expressed as intentions or desires rather than actual experiences. One attitude item that summarizes the factor is: 'I sometimes like to do things that are a little frightening.'

Experience Seeking (ES)

The items describe the seeking of novel sensations and experiences through the mind and the senses, as in music, art, and travel, and through association with unconventional groups and leading a non-conforming life style. An example is: 'I would like to explore a strange city or section of town by myself even if it means getting lost.'

Disinhibition (Dis)

These items describe the seeking as sensation through social activities, parties, social drinking, and sex. An item best describing the factor is: 'I like to have new and exciting experiences even if they are a little unconventional or illegal.'

Boredom Susceptibility (BS)

The items in this factor represent an intolerance for repetitious experience of any kind, including routine work and boring people. Illustrative items are: 'The worst social sin is to be a bore' versus the forced-choice alternative 'the worst social sin is to be rude'.

Form V was developed from form IV in order to provide a Total Score with an equal number of items from each of the four factors to substitute for the General SS score. A new factor analysis was done and the 10 items loading most highly on each of the four factors and not loading substantially on any other factor were included in the test. This last criterion was intended to lower the high correlations among the subscales. Form V consists of 40 forced choice items, 10 for each of the four factors, and a Total Score based on all 40 items or the sum of all four factor scores.

The most recently developed form of the SSS is called 'Impulsive Sensation Seeking' (ImpSS). It is a true–false test of 19 items, 11 of which are sensation seeking and 9 of which are impulsivity items. ImpSS is one of five scales in the Zuckerman–Kuhlman Personality Questionnaire

(ZKPQ, Zuckerman et al., 1993) based on factor analyses of scales and items believed to measure basic traits of temperament and personality. The association of impulsivity and sensation seeking items is a result of the close relationships of scales of both types in a reliable and replicable factor of personality. The sensation seekng items are from form V and some other versions of this type of scale (i.e. 'I like doing things just for the thrill of it'). Items containing mention of specific activities like drinking or parachuting were not included. The impulsivity items are mostly of the type reflecting impulsivity and lack of planning in new activities (i.e. 'I often get so carried away by new and exciting things and ideas that I never think of possible complications'). The two subscales, impulsivity and sensation seeking, may be scored separately.

The usual forms of the SSS are appropriate for older adolescents and adults but not for children. Russo et al. (1993) developed a children's version of the SSS including scales for: Thrill and Adventure Seeking, Social Disinhibition, and Drug and Alcohol Attitudes. Their scale is appropriate for children from 7 to 14 years of age. Various forms of the SSS have been translated into Arabic, Chinese, Dutch, Finnish, French, German, Hebrew, Italian, Japanese, Norwegian, Oriyan, Polish, Spanish, and Swedish. See Zuckerman (1994) for details and publication references or author sources for these translated tests.

Various scales similar to the SSS have been developed by other investigators. Among those correlating highly with the SSS or one or more of its four subscales are: The Change Seeker Index, Stimulus Variation Seeking, Venturesomeness, Reducing–Augmenting, Arousal Seeking, and Novelty Seeking. The last of these, Novelty Seeking (NS, Cloninger, 1987), deserves special attention since a large body of literature, involving psychobiology and psychopathology, is being developed using this scale. NS correlates about 0.7 with ImpSS.

RELIABILITIES

Factor Reliability

A number of studies have attempted to replicate the four factor results of the SSS. Very similar factor structures among the items have been obtained in studies done in Australia, Canada, Israel, and France. Factor reliability coefficients across samples of British and American men and women showed good correspondence of factors for all but the BS scale. Children's versions come up with somewhat different factors as might be expected from the changed nature of the item content. TAS and something like Dis are usually found in the children's versions as well as the adults.

Internal Reliability

Internal (alpha) reliabilities for the SSS V Total Score based on all 40 items range from 0.83 to 0.86 despite the low correlations between some of the subscales. The ranges of reliabilities of the subscales are: TAS, 0.77–0.82; ES, 0.61–0.67; Dis, 0.74–0.78; and BS, 0.56–0.65. BS is the weakest of the four factors, accounting for less variance among items than the others, and this is reflected in its lower reliability. Alpha reliabilities for the ImpSS range from 0.77 to 0.82.

Retest Reliability

Three-week retest reliabilites for the SSS V are 0.94 for the Total Score and 0.94, 0.89, 0.91, and 0.70 for TAS, ES, Dis, and BS respectively. The four-week retest reliability for the ImpSS is 0.87.

DEMOGRAPHIC DATA

Men score higher than women on the Total Score of form V and all of the subscales except Experience Seeking. Scores rise from 9 to 14 years of age, peak in late adolescence, and decline with age thereafter in both men and women. Gender and age differences on the subscales are most prominent on TAS and Dis.

VALIDITY

Phenomenal Expressions

High sensation seekers take many kinds of risk for the sake of novel or intense experiences. They volunteer for unusual experiments like hypnosis and sensory deprivation, engage in extreme or

risky sports like parachuting, hang-gliding, scuba-diving, mountain climbing, auto-racing, white-water canoeing, and fast down-hill skiing. In the military, they volunteer for risky service and are among those who win decorations for heroism during war. They are attracted to high stress jobs like air-traffic control and emergency room medical care. They tend to drive cars at high speeds, recklessly, and under the influence of alcohol.

They tend to take sexual risks, having sex with many partners with a greater variety of sexual activities. There is a high degree of assortative mating based on this trait and those who are markedly discrepant tend to predominate among those seeking marital therapy. Sensation seekers are more likely to be smokers, heavy drinkers, and users of all kinds of illegal drugs. Sensation seeking among preadolescents predicts later drug use. Among drug users, sensation seeking is related to the variety of drugs used rather than specific drugs used.

Sensation seekers are also characterized by preferences in non-risky activities. They prefer live entertainment rather than vicarious experience, but media preferences include films or videos involving sex and violence. They enjoy sex and nonsense humour. They like rock music and dislike blander types of music. In art, they like expressionist types of paintings whereas low sensation seekers prefer peaceful or realistic nature paintings.

Sensation seeking is a normal trait dimension but certain kinds of psychopathology seem to be characterized by high levels of the trait including: bipolar disorder, antisocial and borderline personality disorders, and alcohol and drug abuse. Unipolar depression and schizophrenia tend to be lower on the trait.

Biological Bases

Sensation seeking is based on a biosocial theory and therefore studies of its biological bases are fundamental for construct validity. The trait has a strong genetic basis (60–70%) as estimated from studies of twins raised together or raised apart. The remaining variance is not due to shared family environment but to specific environmental experiences not shared by members of the same family. Several studies have found a specific dopamine-receptor gene accounting for about 10% of the genetic variance, although replication has been spotty.

Psychophysiological studies (Zuckerman, 1990) have shown that high sensation seekers tend to have stronger heart rate orienting responses to novel stimuli but rapid habituation. Sensation seeking is related to augmenting of the cortical evoked potential in response to high intensities of stimulation whereas low sensation seekers tend to have reduced cortical reactions to intense stimuli, indicating a protective kind of cortical inhibition.

Biochemical studies (Zuckerman, 1995) have shown high testosterone levels in high sensation seeking males. High sensation seekers show low levels of an enzyme, monoamine oxidase (MAO), dedicated to the catabolism of brain monoamines, particularly dopamine. Although experimental studies of humans have yet to link dopamine activity with sensation seeking, animal models do indicate a dopamine reactivity in rats with the same physiological and similar behavioural traits.

FUTURE PERSPECTIVES

Use of the ImpSS scale within the framework of a five factor model puts the sensation seeking trait in a context with other basic personality traits. Interactions between traits are important in studies of the phenomena of personality. Sensation seeking continues to be a source of active interest in many areas. A recent computer search of PsyInfo using the term ‘sensation seeking’ yielded 384 abstracts between the last book (Zuckerman, 1994) and March, 2001. This is about the same number as the count between 1979 and 1990. New molecular genetic and biochemical findings confirm the idea that sensation seeking is an evolved, biologically significant trait.

CONCLUSIONS

The construct of sensation seeking has evolved with the continuing research over the last 40 years. Many types of phenomena involving risk-taking, as well as basic preferences in media, art, and music, have been shown to be related to this trait. The trait has shown a strong genetic basis and some of the biological traits that are

genetically transmitted have been discovered. The SSS has evolved along with the construct. Reliability is good and construct validity is broad and significant.

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RELATED ENTRY

PERSONALITY ASSESSMENT (GENERAL)

SOCIAL CLIMATE

INTRODUCTION

After introducing the conceptual and historical underpinnings of social climate, we describe three key sets of dimensions that characterize it, set out the development and psychometric procedures involved in constructing scales to assess social climate, and cover such issues as scale construction criteria, participants' and observers' perspectives, and environmental preferences. We then review applications, including comparing and contrasting environments and identifying determinants and assessing the impacts of social climate. Next, we consider broader issues involving cross-cultural generalizability, person–environment matching models, and viewing social environments in an ecological perspective. We close by noting that social climate assessment promotes a transactional perspective on the interplay between person and environment.

The social climate is the 'personality' of a setting or environment, such as a family, a workplace, a classroom, or a residential neighbourhood. Each environment has a unique 'personality' that gives it unity and coherence. Like people, some social environments are friendlier and more supportive than others. Just as some people are self-directed and task oriented, some environments encourage self-direction and task orientation. Like people, environments differ in how restrictive and controlling they are. Social climate measures differentiation among environments as personality inventories differentiate among individuals.

The concept of social climate and environmental demands or expectations has a long history. Henry Murray (1938) noted that individuals have specific

needs; the relative strength of these needs characterized personality. Murray's model focused on how the interplay between an individual's needs and an environment's demands influences the individual's behaviour and well-being. He selected the terms alpha and beta 'press' to describe the objective and perceived forces, respectively, that environments place on individuals. Murray's concept of needs led to the development of new procedures to assess personality; more recently there has been a parallel development of measures to assess social climate.

George Stern (1970) noted that descriptions of environmental demands are based on inferred continuity and consistency in otherwise discrete events. In this vein, people form global ideas about an environment from their perceptions of specific aspects of it. When employees help each other with work, take breaks together, and go out of their way to welcome a new employee, the social climate at work is friendly. When neighbours recognize and greet one another, watch one another's homes when they are away, and cooperate to improve the neighbourhood, the neighbourhood social climate is cohesive. Such everyday, real events contribute to people's judgements and impressions of the social climate.

Fundamental advances have been made in the assessment of social climate in the last 30 years. Integrated assessment procedures are available to identify the most important aspects of family, work, educational, and other social settings. Such methods can be used to describe social climates, examine how social climates influence individuals' well-being and performance, understand why some social settings are more cohesive, task oriented, and structured than others, and enable counsellors to help individuals select and create more satisfying and effective life contexts.

UNDERLYING DIMENSIONS OF SOCIAL CLIMATE

A wide variety of settings can be described in terms of three underlying sets of social climate dimensions: relationship dimensions, personal growth or goal orientation dimensions, and system maintenance and change dimensions (Moos, 1994). Table 1 depicts some of the specific dimensions that have been identified in family, work, educational, residential care and treatment facilities, and neighbourhood environments. Relationship dimensions assess the quality

Table 1. Underlying dimensions of social climate

Type of setting	Relationship dimensions	Personal growth dimensions	System maintenance and change dimensions
Family	Cohesion Expressiveness Conflict	Independence Achievement Intellectual–cultural Recreational Moral–religious	Organization Control
Work	Involvement Coworker cohesion Supervisor support	Autonomy Task orientation Work pressure	Clarity Managerial control Innovation Physical comfort
Educational	Involvement Affiliation Teacher support	Task orientation Competition	Order and organization Rule clarity Teacher control Innovation
Residential care and treatment facilities	Involvement Cohesion Support Spontaneity Conflict	Autonomy Practical orientation Self-disclosure	Order and organization clarity Resident influence Staff control
Neighbourhood	Sense of community Neighbouring	Privacy Organization efficacy Entertainment	Informal social control Disapproval of deviance

of personal relationships in a setting. They tap how involved people are, how socially cohesive they are, and how much they help and support one another.

Personal growth or goal orientation dimensions tap the directions in which an environment encourages personal change and development. Because the purposes and goals differ so much from one setting to another, the nature of these dimensions differs as well. In families, personal growth dimensions assess the emphasis on such areas as independence, achievement, intellectual and cultural interests, participation in social activities, and moral and religious values. In the workplace, these dimensions reflect the relative emphasis in such areas as autonomy, task orientation, and work demands. In classrooms, they focus mainly on task performance and competition. In residential care and treatment facilities, this set of dimensions taps treatment goals such as autonomy, practical orientation, and self-disclosure. In neighbourhood environments, they assess activity level, privacy, and the efficacy of neighbourhood organizations (Krupat & Guild, 1980; Perkins et al., 1990).

System maintenance and change dimensions include organization, clarity, control, and innovation. These dimensions measure how orderly and organized the setting is, how clear it is in its expectations, how much formal or informal control it maintains, and how responsive it is to change.

DEVELOPMENT AND PSYCHOMETRICS

Scale Construction Criteria

Researchers typically have used both conceptual and empirical criteria to select items and dimensions for inclusion in social climate scales. A standard set of scale development procedures encompasses (1) reviewing prior literature and research relevant to the specific type of social setting (the focal setting); (2) observing a representative set of relevant settings (e.g. families, work groups, classrooms, or treatment facilities) and conducting semi-structured interviews with participants in these settings; (3) identifying dimensions on the basis of the data and formulating items as indicators of the dimensions; and (4) using the conceptual framework of three sets of social climate dimensions described earlier.

Empirical scale development criteria generally involve the selection of items and dimensions that (1) have a reasonable response distribution; (2) discriminate significantly among the focal settings; (3) are relatively free of social desirability or acquiescence response set; (4) are positively correlated with other items on their dimension; and (5) correlate more highly with their dimension than with any other dimension. Each item also is conceptually related to its dimension and is included in only one dimension so that the dimensions are distinct.

These criteria help to develop internally consistent and reliable subscales that also have good content and face validity. Social climate scales discriminate significantly within each type of setting. They are related to similar constructs in expected ways and are related to external criteria in both concurrent and predictive studies. Social climate measures can stay very stable over time; however, they are quite sensitive to environmental change when it occurs.

Participants' and Observers' Perspectives

In general, researchers have defined and measured social climate in terms of the shared perceptions of the people in that environment. This has the advantage of characterizing the setting through the eyes of the actual participants and of soliciting information about its long-standing attributes in a manner more parsimonious than observational methods. This approach is in the tradition of phenomenological psychology and Murray's (1938) conceptualization of beta press, which reflects each individual's personal appraisal of an environment. It also makes it possible to compare the views of different groups of people, such as parents and children in a family, students and teacher in a classroom, or patients and staff in a treatment programme.

People who are not participants in a setting can also provide their views of what the setting is like. Thus, social workers who make home visits can record and evaluate their impressions of a client's family. Parents and administrators can observe a class and judge the characteristics of

a learning environment. With their impressions from a visit to a treatment programme, members of a patient's or client's family or community volunteers can provide their perspective of a residential facility.

Environmental Preferences

Scales that assess social climate have been adapted to enable respondents to describe their environmental preferences. A researcher can focus on how much people agree with each other about their preferred environment; for example, the family environment parents and children prefer, the type of workplace employees desire, the learning environment teachers and students want, or the areas in which patients and staff have similar goals. For example, the 'real' form of the social climate scales asks people how they perceive a current environment, such as their family or workplace; the 'ideal' form asks people how they conceive of an ideal setting (Moos, 1994). Comparing the real and ideal forms shows how well the current environment matches individuals' preferences, and highlights specific directions for change.

APPLICATIONS

Compare and Contrast Environments

One main application of social climate scales is to compare settings or groups of settings with each other. Usually, these comparisons are made within one kind of environment, for example, to identify differences between families who do versus those who do not have a child with behavioural or psychiatric problems, to see how learning environments in alternative schools differ from those in more traditional classrooms, to compare the environment of a workplace with fixed versus one with flexible scheduling, or to contrast self-help with psychotherapy groups. It is also possible to monitor the change in a setting over time, such as before and after a shift in the orientation and management of a treatment programme.

Although it is less common, some researchers have examined similarities and differences across different types of settings. For example, researchers have compared common aspects of classroom and family settings, such as their level of support and structure; searched for influences of work settings on the family; contrasted community-based and hospital-based treatment programmes; and focused on the links between treatment programmes and group processes.

Identify Determinants of Variations in Social Climate

Researchers have focused on why there is so much variation among social climates; that is, why settings differ in the quality of relationships, emphasis on specific goals and tasks, and level of organization and clarity. The main sets of determinants of social climate that have been examined are (1) the broader context, such as private versus public ownership; (2) physical features, such as the presence of physical amenities and social-recreational aids; (3) organizational structure and policies, such as clarity of rules and freedom of choice; and (4) suprapersonal factors – that is, the aggregate characteristics of the people in a setting.

Studies of how these determinants influence social climate show that, in general, private ownership is associated with more cohesion and organization than is public ownership, clearer, more flexible policies help to create more goal oriented and structured settings, and the presence of mentally and/or functionally impaired individuals dampens involvement and growth orientation. Better physical features tend to promote more cohesive social climates; for example, low-rise in contrast to high-rise housing is predictive of more community solidarity, identification, and involvement (Weenig, Schmidt & Midden, 1990).

Assess the Impact of Social Climate

The social climate of a setting is related to specific aspects of individuals' well-being, such as morale, self-esteem, physical and mental health, adaptation to transitions and crises, and recovery and relapse after psychiatric or medical treatment. Researchers have identified important consequences of family settings (Coon et al., 1990), work settings (Hopkins, 1990), learning environments (Manor, 1987), treatment programmes (Moos, 1997), and neighbourhood environments (Perkins et al., 1990).

In general, environments promote qualities that fit with their dominant aspects. For example, children in families that value independence, achievement, and intellectual and recreational pursuits are likely to show more personal and social competence. A learning environment that emphasizes task performance and academic pursuits tends to promote student achievement. Patients in treatment programmes that emphasize independence and practical orientation tend to improve in social and vocational functioning. Residents are more likely to participate in the activities and governance of neighbourhoods that are more cohesive and that have more efficacious community organizations.

The way social climate influences people is consistent across settings in that relationship dimensions influence each person's commitment to the setting, personal growth or goal orientation dimensions channel the directions of change, and system maintenance dimensions affect how much change occurs and the personal costs of it. For example, when a setting emphasizes relationship dimensions, people are more satisfied. Positive relationships foster commitment and motivation, reduce absenteeism and dropout rates, and make the setting more stable. Cohesion in particular strengthens the influence of personal growth dimensions.

BROADER ISSUES

Cross-Cultural Generalizability

Almost all of the scales that assess social climate were initially developed either in the United States or in other English-speaking countries. Accordingly, there was some concern that the conceptual and empirical rationale underlying these scales might have limited cross-cultural applicability. However, experience over the last two decades in more than twenty European and Asian countries indicates that, in general, the same underlying patterns of social climate dimensions can be identified in a variety of cultural contexts (for examples, see Asai & Bechtel, 1990; Harty & Hassan, 1983; Manor, 1987; Schneewind, 1987; Weenig et al., 1990). Overall, the concepts and methods involved in the assessment of social climate seem to generalize across diverse cultural contexts, but much more research remains to be done in this area.

Person–Environment Matching Models

As noted earlier, there are some important connections between characteristics of social settings and individuals' well-being, performance, and personal development. However, part of the influence of contextual factors depends on the personal orientation and preferences of the individuals who experience them. Pursuing this idea, some investigators have linked the congruence between individuals' preferences and social climate to individuals' outcomes.

The Conceptual Level (CL) matching model provides a developmental perspective for this area. The model posits that more mature individuals are able to organize their own environment, whereas those who are less mature need the stabilizing influence of a well-structured setting. For example, externally oriented individuals tend to adjust better in well-structured settings, whereas internally oriented individuals do better in more flexible environments. Similarly, people who want to explore and shape their environment and who exhibit a strong need for independence profit more from less structured environments.

These findings point to some potentially robust forms of person–environment congruence. As noted earlier, environmental systems tend to maintain or accentuate personal characteristics congruent with their dominant aspects. But when environmental demands either exceed individuals' preferences or tax their capacity to manage them, some personal dysfunction is likely to occur. Moderate emphasis on system maintenance factors helps to promote ego control among individuals who need or prefer a well-structured setting. But a strong focus on these factors, especially among developmentally mature and internally oriented persons, restricts individual growth and can foster passivity. Expressive relationships typically promote morale, but highly independent or introverted persons who prefer fewer social bonds can feel hemmed in or overstimulated by interaction-oriented settings.

Social Environments in an Ecological Perspective

To understand social settings, it is important to consider how the characteristics and influences of

one type of setting may be altered by other factors in individuals' lives. For example, the influence of the workplace is one important aspect of understanding family functioning in a broader social context (Eckenrode & Gore, 1990). In this respect, three patterns of work–family interface have been identified. One is a pattern of positive carryover, when personal gratification and information from work enrich the family. A more common pattern is one of negative carryover, in which work overload and job role conflict cause stressors that create tension in the family. The third pattern occurs when individuals try to conserve their energy and privacy and become less available to family members.

There are important connections between specific aspects of work, an individual's values and patterns of interaction in family and leisure settings, and his or her children's cognitive development and personal orientation. For example, persons who work in entrepreneurial settings value self-control, risk taking, and independent behaviour and socialize their children accordingly. In contrast, persons who work in bureaucratic settings value security and accommodation and teach their children to be obliging and to seek external direction.

Connections between family and school settings are as important as those between family and work, especially with respect to their influence on students' school-related attitudes and performance (Booth & Dunn, 1996). In this respect, some aspects of family and learning environments can amplify each other. Thus, students who are in family and classroom settings which are both high in support and structure tend to have the highest scholastic self-concepts. Stimulating home and learning environments that are more oriented toward learning each independently help to predict more positive attitudes toward school and better academic achievement.

Joint family and school effects are likely to be most powerful when there is psychological continuity between the home and the school. One line of research has shown that youngsters do better in classrooms with rules guiding interpersonal interaction that are similar to those they experience in their families. In addition, parents who are better educated are more likely to mirror the academic style of learning environments at home by praising and interacting with their child, modelling appropriate behaviour, and promoting initiative and independence.

FUTURE PERSPECTIVES AND CONCLUSIONS

The growth of a systems orientation and a focus on the connections between family, work, educational, and other social contexts is an important trend that complements the more established person-centred focus in psychology and the behavioural sciences. This systems perspective has led to an enhanced focus on the differential strength of contextual factors and how cross-situational influences can modify them. The more intensive, committed, and socially integrated a setting is, the greater is its potential impact, especially on personal factors that are changing developmentally. Cohesive, homogeneous settings tend to influence incongruent individuals to change in the direction of the majority, whereas those in the majority maintain or further accentuate their attitudes and behaviour in the relevant areas.

Another development involves examination of the mutual relationships between individuals and the environments they select and create. People actively avoid certain environments and, on the basis of their needs and dispositions, choose to participate in others; in turn, these chosen environments influence people to change in desired ways. In addition, individuals' mood and behaviour may shape their social context, such as when a depressed person's hopelessness and lack of interest leads to a reduction of family support. People construct characteristic microenvironments that then 'reciprocate' by fostering certain attitudes and behaviours. The processes involved in the choice and construction of social environments are closely interwoven with those involved in environmental impact.

Most broadly, social climate assessment has made important advances in the last three decades. From an idea that flowed from Murray's (1938) original concepts of alpha and beta press and the centrality of the social environment in shaping human behaviour, a number of reliable and valid scales have been developed to facilitate the routine assessment of social climate. These advances eventually may

enable psychologists to develop truly transactional models in which person and environment are on an equal conceptual basis as determinants of individuals' morale and well-being.

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RELATED ENTRIES

Applied Fields: Education, Applied Fields: Clinical, Applied Fields: Gerontology, Person/Situation (Environment) Assessment, Quality of Life, Perceived Environmental Quality, Self-Report Distortions

SOCIAL COMPETENCE (INCLUDING SOCIAL SKILLS, ASSERTION)

INTRODUCTION

Within the process of synthesis, the forming of new relationships among elements and the construction of more and more complex categories, which characterizes scientific behaviour, the social skills concept has evolved from being a molecular operationalization and has focused on overt behaviour to the molar and integrationist consideration of covert responses such as thoughts and feelings, which are, in turn, included within the macroconstruct 'social competence'. Social competence is conceptualized as the variable dependent on a double process of

individual and social evaluation, on the appropriateness of the subject's behaviour according to the demands of the social environment, cultural context, and developmental period.

SOCIAL COMPETENCE

Social competence refers to the general assessment of a person carrying out specific social tasks, with regard to the quality of his performance. In order for a subject to be assessed and graded as 'socially competent', a certain degree of mastery in the skills required to carry out specific social skills satisfactorily is required, but his performance does not have to be exceptional, just satisfactory.

Social competence is the result of the confluence of three sets of variables (Schneider, 1992): (a) *biological and environmental ones*, which influence individuals of the same group and culture in a similar way, so that the group may be perceived as a whole unit with a certain degree of uniformity; (b) *collective experiences*, which give a culture its values and rules, shaping social behaviour and explaining cultural differences, e.g. the Mediterranean culture's emotional expressiveness differs from that of the Japanese; (c) *individual learning*, which is probably the most important social functioning determinant in adulthood and the condition necessary for the development of social competence in childhood and adolescence.

In order to acquire a repertoire of social skills that make up the 'social competence' construct, a child needs to learn a set of basic responses from an early age. For this learning to be possible, on the one hand, conditions of biological normality that do not impose restrictions have to be present, and on the other, an environment that promotes this learning. Personal capacity and environmental resources make up the necessary conditions or requisites for the development of social competence and can be classified into four categories (Hops, 1993): (a) physical and motor, (b) relating to language, (c) relating to the establishment and maintenance of social contact, and (d) upbringing and educational patterns used by the child's parents or tutors.

Social competence depends on achieving three general aims: (a) reaching the goal set by the subject, (b) promoting positive relationships with other people, and (c) obtaining self-satisfaction from the action itself. However, it is not restricted to achieving relevant aims, i.e. affiliation and social support, but the explicit and/or implicit demands of the situation must also be taken into account for the aims to be achieved using socially permitted or positively valued means. The strategy concept referring to the most appropriate way of using social skills assumes that, on the one hand, strategical behaviour is learnt and, therefore, can be modified (Kazdin, 1985; Spivack & Shure, 1974) and, on the other hand, that subjects who relate to others in a socially competent way have the capacity for self-regulation. Both premises lead to the conceptualization of social strategies as a problem-solving process applied to social relationships.

Therefore, social competence not only implies the acquisition of social skills, but also of cognitive strategies directly related to the specific motivational and affective elements of each subject and culture. In this sense, social competence is defined as the learning that enables a subject to relate different cognitive processes to his social experience, which is responsible for beginning, developing, maintaining or modifying the cognitive processes according to the results generated by the subject and his social environment (Yeates & Selman, 1989). The product of this learning is known as 'sociocognitive skills', which, together with those of emotional self-control, are regarded as mediators of the subject's specific responses, in the social relationships process, and which must be assessed, both by the subject and others, as being appropriate, efficient and relevant, and promoting a healthy social adjustment.

Social competence, together with other types of competence (i.e. professional), is one more component within the general framework of personal competence; that is, it is regarded as being a necessary aspect for the development and maintenance of bio-psycho-social well-being, since it is a protection factor against the harmful impact of negative stress factors.

SOCIAL SKILLS AND ASSERTIVENESS

Whereas the term 'competence' refers to the overall assessment, 'skills' refers to the measurement of specific capacities. Research into social skills is

based on three sources. The first and most important contribution comes from *behaviour therapy*. In his book *Conditioned Reflex Therapy*, Salter (1949) used the expression 'excitatory personality' and proposed six exercises for treating subjects with social inhibition; these were (a) expressing feelings openly and without censorship, (b) expressing different emotions easily, (c) expressing opposing opinions when disagreeing, (d) using the first person pronoun 'I', (e) accepting compliments, and (f) improvising. Wolpe (1958), and his disciple Lazarus, carried on with this line of research, replacing the 'excitatory personality' concept with 'assertive behaviour'. Subsequently, Alberti and Emmons published the first book on assertiveness and social skills. In the 1970s, there was an important development in social skills training programmes. We can highlight authors such as Eisler, Hersen, McFall, Goldstein, Kazdin, to name but a few. The second line of research is based on *psychopathology*, with the pioneering contribution from Zigler and Phillips (1960, 1961). They discovered that a patient's level of social competence prior to hospitalization was the best predictor of this social adjustment after being discharged. An inverse relationship between the length of stay in hospital and the relapse rate was also noted. The last precedent is *social psychology*, in which British studies on man–machine relationships was extended to the analysis of man–man relationships (Argyle, 1967, 1969). The behavioural perspective, which highlighted the motor component, complemented the information processing component (perception, decision-making, etc.) so that the assertiveness concept was added to the social skills and sociocognitive concept, and these terms now coexist in scientific literature.

There are two kinds of social skills definitions. Some focus on the functional analysis of relationships between behaviour and their consequences, with social skills being understood as the complex capacity to emit responses with a high probability of obtaining reinforcement or to not emit responses, with a high probability of obtaining extinction or punishment. An example of this type of definition is to regard social skills as the degree to which a person relates to others so that his rights, needs, tastes, etc. are satisfied. Other definitions give priority to the topographical analysis of social behaviour, with emphasis being placed on the appropriateness of the responses (gestures, tone of voice, message, etc.), according to the evaluation by judges and experts. An example of this definition is the degree to which a person relates directly and honestly to others without showing anxiety and without coercion.

In our opinion, the quality criterion prevails over effectiveness, since the contingencies are administered by other people. Thus, whereas aggressive responses are frequently reinforced, i.e. a victim hands over money to a mugger who threatens him with a weapon, socially skilful responses may not have reinforcement, i.e. the boss who refuses to give an employee a deserved pay rise which he has asked for in the correct way due to the company's financial crisis. In any case, both dimensions are interrelated, i.e. quality responses are most likely to be reinforced. Besides, quality responses imply self-reinforcement, the type of reinforcement that depends on the subject.

Therefore, social skills are defined as the basic repertoire of behaviours emitted by an individual in social situations and consist of expressing and receiving opinions, feelings and desires, starting up, holding and ending conversations, defending and respecting personal rights, all in a socially acceptable way and thus maximizing the likelihood of reinforcement and minimizing the likelihood of problems in interpersonal relationships. The elements that integrate social behaviour are grouped into three categories: expressive, receptive, and interactive (see Table 1).

There is no widely accepted classification of social skills. One of the oldest is the one proposed by Lazarus in the early 1970s, which, based on clinical experience, singled out: (a) saying 'no', (b) asking favours and making requests, (c) expressing positive and negative feelings, (d) starting up, holding, and ending conversations. The most common social skills classifications consist of grouping molar behaviours into categories such as opinions, feelings, requests, conversations, or rights. Thus, declarations of love, showing anger, happiness, etc. are expressions of positive and negative feelings. Other classifications use the relationship's aim and the area of application as a criterion, with specific training programmes being set up for the following skills: dating, making friends, public speaking, communication, negotiation, and conflict-solving, etc.

Table 1. Elements of social conduct and inappropriate responses

	Elements	Inappropriate responses
EXPRESSIVE	Verbal	Vague expressions, one-word answers,
What do you say?	(message, speech content)	speaking too much, pet words, insults
How do you say it?	Paralinguistic	Trembling voice, stuttering, shouting,
	(volume, tone, fluency)	monotonous intonation
	Non-verbal	Not looking at the person you are
	(look, facial expression, gestures, posture, closeness, appearance, etc.)	speaking to, facial inexpressiveness
RECEPTIVE	Attention	Thinking about the response instead of
What did they say?	(paid to speaker)	listening to the person speaking
How did they say it?	Perception	Not perceiving the ironical tone in the
	(of the speaker's expressive elements)	speaker's praise
	Evaluation	Evaluating shouts as aggressive responses
	(of the speaker's social responses)	and not as signs of the speaker's nervousness
INTERACTIVE	Length of response	Monopolizing the conversation
How long do you speak for?	(or proportion of time)	
How do you speak?	Turn-taking	Speaking at the same time, frequently
	(regulated by signals such as eye contact, variations in intonation, etc.)	butting in

The terms 'social skills' and 'assertive behaviour' are often used indistinctly in specialized references. However, there is a slight shade of difference between the two concepts. The first one is a more general expression and refers to socially competent behaviour in any interpersonal situation; on the other hand, the meaning of assertiveness is more restricted and is limited to socially competent behaviour of a negative type (disagreement, displeasure, rejection, etc.), especially if a negative reaction or the speaker's opposition is expected, or of a positive type when there is a high degree of uncertainty as to the speaker's response. Having a good time chatting with friends and refusing to lend money to a mate who's a sponger, or successfully telling an attractive girl you love her in front of friends, are examples of social skills and assertive behaviour respectively. From the clinical point of view, deficits in social skills and assertion are extremely relevant due to their association with several disorders (schizophrenia, mental deficiency, delinquency, marital problems, social phobia, depression, etc.).

GENESIS AND MAINTENANCE OF SOCIAL COMPETENCE PROBLEMS

Méndez, Inglés, and Hidalgo (2001) explain the lack of social competence as the result of the interaction of *personal and situational factors* (see Figure 1). The former comprise biological determinants (i.e. hypoacusis), personality variables (i.e. introversion), and basic repertoires of behaviours deficient (i.e. deficit in social skills). The latter include social situation demands (i.e. unfounded criticism that requires an assertive response), another person's/other people's characteristics (i.e. the opposite sex) and the context of the interpersonal relationship (i.e. office). Thus, social competence problems are usually caused by the combined action of multiple factors that give rise to poor and/or disliked learning experiences.

The existence of a genetical predisposition in terms of an increased vegetative activation and avoidance behaviour to non-familiar stimuli (i.e. strangers) is assumed. This is known as behavioural inhibition and shows up early on as a difficult temperament and is related to personality variables such as introversion and neuroticism. Individual differences in reactivity to social stimulation in babies can be deduced from this hypothesis.

Social competence also depends on the situation. Thus, most adolescents report that they have more difficulty in asking a stranger on the bus to put out his cigarette because it is bothering him, than in thanking a friend for helping him with his homework (Inglés, Méndez & Hidalgo, 2000). It is therefore easier to carry out a task with social competence when the social situation

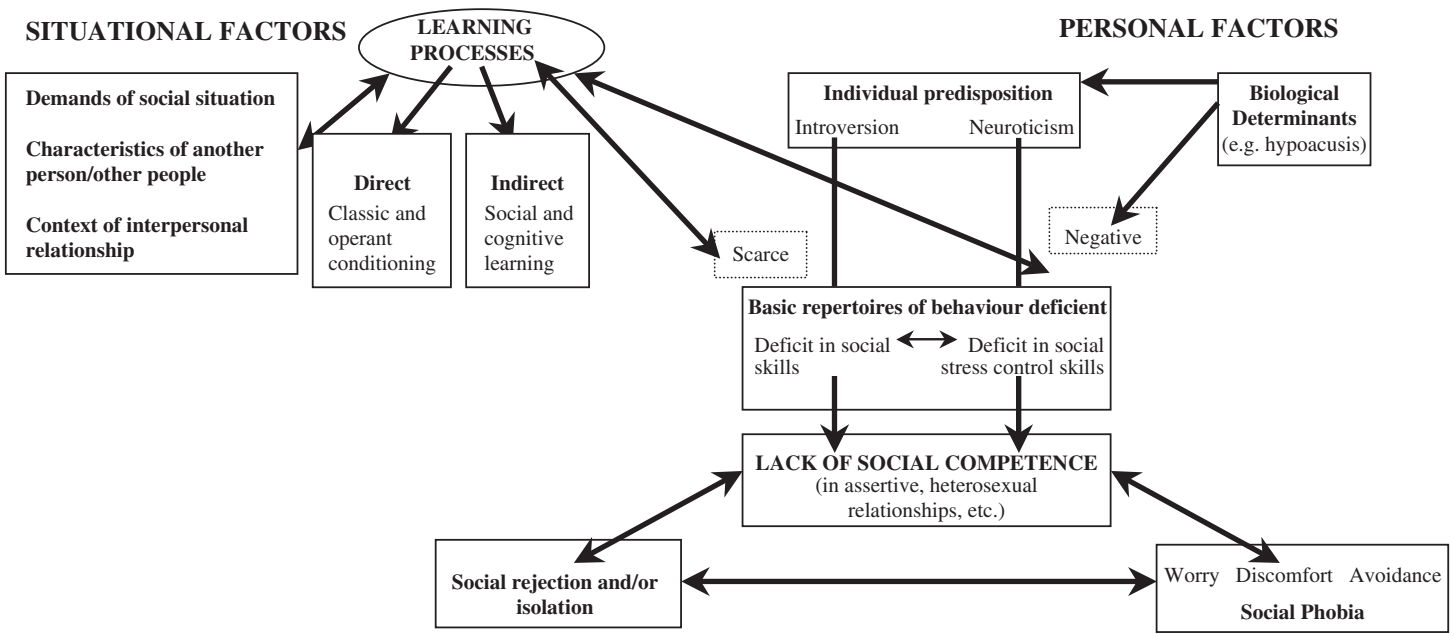

Figure 1. Variables and learning processes responsible for the genesis and maintenance of social competence problems.

demands positive behaviour, the speaker maintains a reinforcing relationship with the subject, and the relationship context is familiar.

The model combines the hypotheses of behaviour consistency and situational specificity, enabling both the specific problems of socially competent subjects, e.g. an adolescent shows anxiety on dates after an extremely negative first experience, and a certain degree of behavioural stability, e.g. a socially reserved adolescent tends to be inhibited in many different social situations, to be explained.

The interaction of personal and situational factors is reflected in the learning history, through direct processes (i.e. 'say please when you ask for something' and a smile after the polite request) and indirect ones (i.e. the model of a socially competent parent). The greater tendency of introverted subjects to avoid social situations results in fewer learning experiences, whereas the greater lability of emotionally unstable subjects increases the likelihood of negative learning experiences. These personal tendencies are greater in situations of isolation and social rejection (i.e. rural areas, ethnic minorities, immigration, etc.) and in environments unfavourable to social development (i.e. authoritarian and punitive educational style, aggressive classmates, etc.). Both poverty and/or aversion to learning experiences make the acquisition of social competence more difficult and lead to the risk of social phobia.

METHODS AND INSTRUMENTS FOR ASSESSING SOCIAL COMPETENCE

In order to assess an individual's social competence satisfactorily, a multimethod–multisource–multicontext assessment must be carried out and should include:

(a) different methods: interviews, questionnaires and scales, sociometric tests, role-play tests, natural observation, self-monitoring, etc.
(b) different sources: subject, partner, friends, parents, teachers, classmates, etc.
(c) different contexts: home, school, work, community, etc.

There are several reasons that justify this proposal. Firstly, the correlation among data obtained using different assessment methods and instruments and for different informants is low. Secondly, the social validity of some of the assessment measures is questionable since there is no agreement on which are the relevant behaviour skills and repertoires that define social competence. This fact makes the preparation of standardized tests for children and adolescents difficult since contrary to what happens with motor development, the development patterns depend on biological maturity to a lesser extent. Thirdly, social behaviour is strongly influenced by the microsocial context (family, friends, etc.) and the macrosocial context (culture, religion, etc.) and presents a high situational specificity.

Questionnaire scales enable relevant information to be collected through the sampling of overt and covert behaviours, in a variety of social situations, from a large number of subjects, in a short time and at a low cost. They are the most frequently used instruments in professional practice due to their efficiency and viability. Table 2 lists some of the most widespread questionnaires and scales in this field. Much information about assessment methods and instruments with children and adolescents can be found in Merrell and Gimpel (1998) and with adults in Caballo (1993).

The aim of social competence assessment is to obtain a subject's health or social adjustment index, i.e. to show to what degree a person can relate in his social context, if he perceives it as comfortable and beneficial, if he positively values it as a factor that promotes personal development and, in short, if he is satisfied with his social environment.

FUTURE PERSPECTIVES AND CONCLUSIONS

There are currently two positions regarding the scope of the 'social competence' construct. From a broad perspective, it has been proposed that the concept covers any activity directed towards survival and the subjects' independent adaptation in the social context, whereas from a stricter point of view, it is thought that it should be specifically limited to the area of the subject's social relationships and friendships. This controversy must be cleared up in the near future.

Table 2. Selected questionnaires for assessing social competence, social skills, and assertiveness

Questionnaire	Author	Age[a]
-Personal Report of Confidence as Speaker	Paul (1966)	1
-Wolpe–Lazarus Assertiveness Scale	Wolpe & Lazarus (1966)	1
-Fear of Negative Evaluation Scale	Watson & Friend (1969)	1, 2
-Social Avoidance and Distress Scale	Watson & Friend (1969)	1, 2
-Rathus Assertiveness Schedule	Rathus (1973)	1, 2
-Assertion Inventory	Gambrill & Richey (1975)	1, 2
-Social Phobia and Anxiety Inventory	Turner et al. (1989)	1, 2
-List of Social Situation Problems	Spence (1980)	2
-School-Related Social Behavior Questionnaire	Loranger et al. (1983)	2, 3
-Index of Peer Relations	Klein et al. (1990)	2
-Assessment of Interpersonal Relations	Bracken (1993)	2
-Scales of Social and Personal Competence Skills	Botvin et al. (1997)	2

[a]1 = Adults; 2 = Adolescents; 3 = Children.

Another outstanding question is the lack of consensus on behaviours considered to be socially skilful or competent in any one context. Clinical experience reveals how the same answer given by an adolescent is judged to be assertive by the professional and aggressive by the parent. The social validity problems are shown in the drawing up of standardized tests. How far are the scenes in role-playing tests or the questionnaire items representative of real-life situations of the subjects being assessed? On the other hand, methods such as self-monitoring and non-structured interview, which collect information about the subject's daily life, have the disadvantage of obtaining satisfactory psychometric guarantees.

The level of analysis also poses several questions. Which is the best indicator of social health? Molar assessment of social competence, social skills, or assertiveness? Molecular assessment of the responses, i.e. duration of eye contact? A combination of overall assessments and specific measures or an intermediate level of analysis somewhere between the two extremes is currently being proposed.

Finally, the assessment of motor responses has been developed much more than the assessment of the cognitive and psychophysiological ones. Most instruments assess the subject's verbal and motor behaviour. Less attention has been paid to worries, emotions, and sensations in social situations. Further research should be done into the use of assessing responses such as facial blushing, a characteristic of subjects with problems in this area (social reserve, social phobia, etc.).

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RELATED ENTRIES

Personality Assessment (General), Applied Fields: Clinical, Prosocial Behaviour, Emotional Intelligence

SOCIAL NETWORKS

INTRODUCTION

For most of Western psychology, the assumption is made that the person is a distinct and separable object of study. Our efforts to understand the human being and to predict human behaviour have focused largely upon attributes considered to be parts of the individual psyche. This has been true despite theory and confirming evidence to show how interdependent we are with our ecology, our attachments, and our relationships. The dominant approach fails to take cognizance of the degree to which people are in fact interdependent and that the boundaries of the person are actually quite fluid. A full understanding of the individual depends upon an appreciation of the nature, and of the degree, of a person's interdependence with a broader sustaining ecology and, particularly, with contacts with other people.

CONCEPT OF SOCIAL NETWORKS

Network analysis brings the connections among people to the fore. Its early use was in the study

of non-Western cultures. Some anthropologists recognized that their own assumptions about the nature of families, clans, or tribes created a bias in their observations. Rather than assume the nature of the social entity, they instead created a plot describing the actual transactions that occurred among people. Barnes (1972) studied a Norwegian fishing village examining actual interactions and found that they reflected kinship, social class, and work groups. He plotted circumstances in which one person communicated with another only through a third party. He documented occasions in which person A might have separate links with person B and person C, but the relationship between B and C could affect the A–B connection. Bott (1957) studied the marital and family relationships of people in a low socio-economic class. Her use of network analysis permitted her to show how the communication between wife and husband was directly related to the intensity of their separate involvement with their own families and friends. Network assessment has also been used for more general studies of communication and social class (Campbell et al., 1986).

The network is essentially a set of dots (or nodes) and connecting lines (or links). It borrows from an application of graph theory to the visual representation of sociograms or social network maps (Harary, Norman & Cartwright, 1965). The direction of the transactions across the line may be specified and the graph may cover every transaction that occurs, only those that affect a particular individual, or only those that involve a specific commodity such as money or affection. It might also be restricted to in-person exchanges or it may include those by telephone, mail or email. There are many ways to describe a network and many ways to tabulate what occurs within it. To gain a handle on how best to describe an actual network and to see what is revealed by its depiction it is useful to examine the field of network analysis. The theory is largely descriptive and can be useful in the design of surveys (Brugha et al., 1987). One major survey examined who among Canadian seniors provides what kind of help to friends and family members (Stone et al., 1988).

Network analysis can also be applied in the assessment of small group interaction, of organizational communication, and in the analysis of latent patterns or structures that might not appear obvious (Wasserman & Faust, 1994). Network analysis is particularly useful as a means to study the social integration of an individual or of a community (Brissette, Cohen & Seeman, 2000). Wellman (1988), for example, studied the pattern of transactions in an urban community in order to answer the question of just what degree of community existed, i.e. whether people were closely knit into an enduring network of family and friends, active in networks but with frequent changes depending upon circumstances that presented themselves, or relatively isolated from meaningful contacts with others.

Wherever social transactions occur the network can be plotted. This is of great value in social exchange theory where the balance between what is given and what is received is of primary significance (Thibaut & Kelley, 1959). The particular exchange may be considerate caring, the spread of a rumour, or the exercise of power. One study analysed all of the ties (represented by membership in the decision making body of every business, political, fraternal, and human service group) in a town of less than 50,000 people. The authors found a latent, interconnected structure including all the individuals of greatest influence. By examining the overlapping linkages, the authors were able to test the hypothesis that the town's decisions derived from an elite power structure rather than from a pluralistic one (Perrucci and Pilisuk, 1970). Political participation itself has been found to reflect the nature of network ties (Guest & Oropesa, 1986).

SOCIAL NETWORKS AND SOCIAL SUPPORT

The importance of integration into a social network was noted in Durkheim's classic study finding that suicide rates were higher among persons who were not married and who were not linked well to a church or community (Durkheim, 1897/1951). The relevance of social ties to mental health was subsequently noted. Tolsdorf (1976) documented the weak and fragmented networks of psychotic patients. Now, many studies confirm that people better integrated into a social network live longer and are less susceptible to infectious diseases. They are more likely to survive a heart attack and to avoid a recurrence of cancer (reviewed in Brissette, Cohen & Seeman, 2000). These effects appear even when controlling for risks associated with smoking,

blood pressure, and obesity (House, Landis & Umberson, 1988) and therefore highlight the importance of understanding and assessing networks.

Important as social support may be, its definition remains illusive. A comprehensive measure would need to include the quantity of social relationships, the formal structure observable in the pattern of relationships, and the content of these relationships; that is, just what is exchanged (House, Landis & Umberson, 1988). The number of assessment tools for studying social support is legion. Moreover, while measures purport to measure different aspects of support, many of them are actually interrelated (Sarason et al., 1987). Some focus upon the support as it is received or perceived (e.g. Seeman & Berkman, 1988) while others focus upon what is delivered or received (e.g. Barrera et al., 1981). This review deals only with efforts to assess networks but those interested in support measures should refer to a highly useful account by Wills and Shinar (2000) entitled, 'Measuring Perceived and Received Social Support'. Another chapter from the same text (Cohen et al., 2000) deals with the varied theoretical frameworks – social construction, social cognition, symbolic interaction, and relationships – which underlie different approaches to measuring support (Lakey & Cohen, 2000). Here the focus is upon measures that are designed to assess the network. In contrast to measures of received or perceived support, the network model is most appropriate to examine a person's integration within a group and the interconnections of those within that group (Sarason, Sarason & Pierce, 1990).

VOCABULARY OF NETWORKS

Pilisuk and Parks (1986) present a set of terms distinguishing structural qualities – that is, characteristics of the network itself – from functional or interactional terms that refer to what transpires across the links. Structural dimensions include size, composition, accessibility, density, and structural stability. *Composition*, or *source*, are categories identifying individuals in the network, e.g. members of family, attendees at a meeting, people appearing at a government office, or living in a defined neighbourhood. The network might be categorized by the degree of *homogeneity* and *dispersion* (the distance covered by the transactions). *Accessibility* measures the ease in reaching a person in the network. *Density* characterizes the degree to which all members of a network are linked directly to each other whereas *clustering* describes the degree in which members form cliques. *Structural stability* depicts the amount of change in a network over time.

The network is a simple and basic construct but one amenable to a great variety of applications. Network measures vary according to how specific a sub-population is targeted. For example, are only adults included? They vary also in how many network members the respondents are asked to identify and in the types of exchanges that are included (O'Reilly, 1988). Hence, the criteria for who is included will vary. Some identify membership by a minimum frequency of contact within a month's time (Hirsch, 1980). Others focus upon subjective criteria such as closeness, intimacy, or persons who mean a lot to you (Tolsdorf, 1976). Still others use the criterion of formally recognized roles; father, sister, daughter, employer, friend, student, church member, or neighbour (Hong & Seltzer, 1995). Even with discrete roles, the criteria for inclusion are likely to differ. Some measures include anyone cited as a friend or a neighbour. Others use a definition that includes a minimum number of contacts within a given time or add consideration of geographic proximity.

Who is to be included in the network reflects the purpose for which it will be used. House and Kahn (1985) suggest that going beyond a network of five to ten really close relationships yields little in predicting heath outcomes. On the other hand, others have indicated that while a small, densely connected network may be useful for emotional support at critical times, the ability to readjust and to make transitions to new circumstances may reflect the strength of weak, distant, and less homogeneous connections (Vaux & Harrison, 1985).

Functional and interactional qualities describe the relationship of pairs of individuals in a network. In this, we are looking not at the form of the web but at the qualities of the links. We examine such qualities as *frequency* and *friendship duration*. In addition, the *mode* of contact describes the way individuals communicate, such as directly face to face or via telephone or email. *Intimacy* refers to how an individual describes the closeness of a relationship. *Multiplexity* refers to

the number of different exchanges (emotional support, physical help, social contact, or money) that can occur between two individuals. *Symmetry* (see Barnes, 1972) refers to the degree of mutuality or reciprocity in any relationship. *Functional stability* describes changes in the way in which the network is used over time. Surely, ties may be strong or weak, intimate or formal, and reciprocal or unilateral. They may reflect single or multiple role relationships and may be hierarchically ordered in accord with power relationships. The links may be a source of companionship, emotional support, or instrumental assistance (Pilisuk & Parks, 1986). Various scales and measures select aspects of the network of greatest interest to particular assessments. In most cases the source of information about the network of an individual comes from that individual which raises the important issue of informant accuracy (Kilworth & Bernard, 1976).

OTHER NETWORK MEASURES

The concepts noted above have been used as scales and surveys to study neighbourhoods (Buckner, 1988) and urban environments (Wellman & Wortley, 1990). They have been adapted to study the caring for elders among informal and formal providers. One major survey of caregivers of elders was done in Canada (Stone et al., 1988). One scale developed by Antonucci and colleagues, *The social networks in adult life questionnaire*, measures the 'convoy' of continuing, emotionally significant contacts an adult has as she ages (Antonucci & Akiyama, 1987). One of the problems common to the assessment of network characteristics, whether they relate to the various types of social support perceptions and interactions or to other properties of relationships, is the matter of how to determine reliability about what has actually transpired. Coriell and Cohen (1995) draw attention to the disparity frequently seen in reports of supportive interactions by the person offering them and the person receiving them. Such differences, along with variations in the satisfaction people experience from their networks, play an important part in determining loneliness and other aspects of social adjustment (Stokes, 1985). Reis and Collins (2000) provide an excellent account of the issues involved in obtaining reliable indicators for a variety of social interactions and for examining differences between the network as depicted and the degree of satisfaction that occurs with it.

ILLUSTRATING A NETWORK MAP

Network assessment can have clinical uses as well. Among family therapists, one major direction of work has been the effort to plot and to rekindle relationships between the individual and the family of origin (Bowen, 1978). Also, family network therapy has aimed at rekindling the broader network as the actual agent for intervention at times of crisis (Speck & Attneave, 1973). A measure that is particularly well designed for use in clinical practice is the Personal Network Map. It was developed by Carolyn Attneave and reflects her work in developing family network therapy. Individuals list their known family and non-family acquaintances and then place their initials in a set of concentric circles according to their closeness. The links between identified persons are then drawn providing individuals with a graphic depiction of their own networks. The emerging web of connections suggests the presence of clicks or clusters as well as disparate transactions that may define different aspects of an individual's life. The exercise includes a piece of the pie reserved for those individuals perceived as a source of primarily negative interactions. Instructions may be modified to permit the entry of pets who often provide critical bonds to people. The entire exercise can be filled out again as an ideal type (or as a future prediction), to display differences between the actual and the ideal. The Personal Network Map is illustrated in Figure 1.

SUMMARY

Social network measurement is a tool for the assessment of connections. Numerous measures have appeared, sometimes assessing the network of a locality, sometimes of the connections of a particular individual. Their most frequent use has been in the assessment of supportive relationships that have been shown to weigh heavily upon an individual's health, well-being

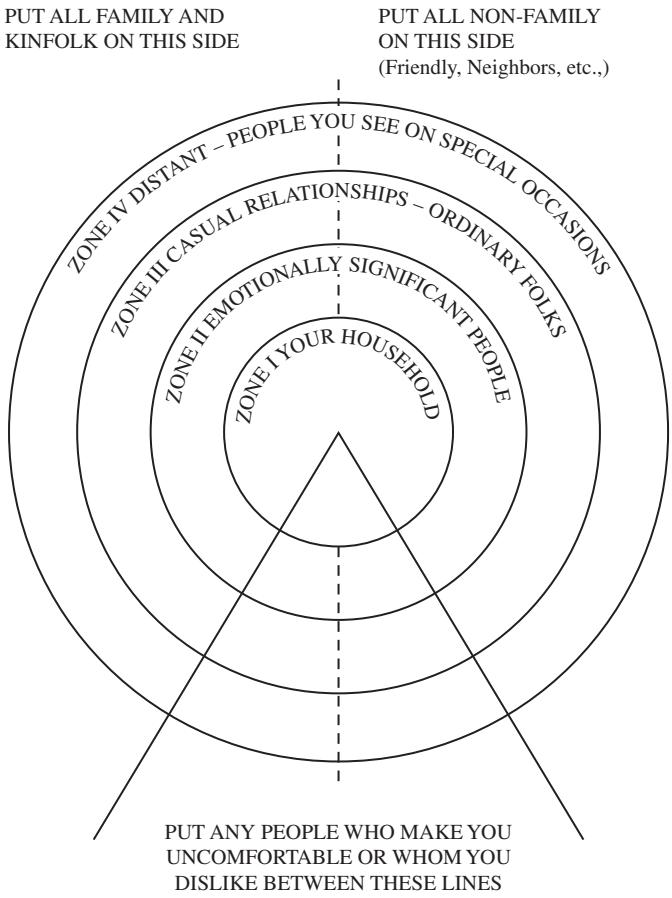

Figure 1. Personal Network Map. (Reprinted with permission from Carolyn Attneave, Department of Psychology, University of Washington, 1978. Distributed by Boston Family Institute, 55 Williston Road, Brookline, Massachusetts 02146.)

and resistance to illness. Other uses include the measurement of a sense of belonging. Community integration, diffusion of information, and political influence have also been studied as reflections of social networks. The major characteristics of social networks that have been studied are summarized in Table 1.

FUTURE PERSPECTIVES AND CONCLUSIONS

Because interdependence is a defining characteristic of the human condition, it is important that social networks be measured. As people become more mobile and distant from their kin, a greater proportion of contacts are transmitted via phone or Internet. The web of communicative contact across the Internet is a phenomenon ripe for network analysis, and studies of Internet support groups have begun. Hopefully, such studies will clarify for us the values unique to sustained face-to-face contacts over enduring periods of time. The plotting of the web of exchange tunes us to look at individuals both as recipients of activities generated by others and as generators of activity as well. It is also consistent with perspectives in feminist psychology and ecological psychology to view human development as a relational activity rather than as an acquisitive one. Concepts of

Table 1. Characteristics of network assessments

Units of study	Group or organization Community or neighbourhood Latent network of transactions Personal networks
Criteria for inclusion	Role relationships (Family member, co-worker, etc.) Formal membership Defined local resident Actual participation Frequent participation Supportive participation
Qualities of the linkage	Uniplex vs. multiplex (Varied transactions) Symmetry Stability Frequency
Functions met by linkages	Information Intimacy Appraisal Social contact Instrumental aid Socio-emotional sharing Negative or hostile contact
Network characteristics	Size Density Clusters Accessibility or Dispersion
Subjective attributes of networks	Embeddedness Satisfaction Sense of belonging Alienation
Mode of communication or contact	Shared membership Phone Mail Email Face-to-face

love, trust, kindness, caring, sharing, giving, receiving, influencing, teaching, belonging, and relating are important parts of the human condition that can only be studied, nurtured, or appreciated by examining an individual's connections to others. Social network analysis is a tool for this task. As network assessment becomes increasingly refined, it will need to sort out the particular network attributes that speak most strongly to richness of the relationships they describe.

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Marc Pilisuk and Angela Wong

RELATED ENTRIES

Applied Fields: Health, Applied Fields: Clinical, Applied Fields: Education, Social Resources

SOCIAL RESOURCES

INTRODUCTION

During the past 25 years, a great deal of attention has been paid to the role of the social environment in matters of health, disease, disability, and illness (Cohen, Gottlieb & Underwood, 2000). In particular, many investigators have narrowed their focus to the personal community in which people are enveloped, examining the ways in which family members, friends, neighbours, and co-workers exercise their influence on a multitude of health behaviours, on morbidity, and even on mortality. Persuaded by the evidence documenting the health-protective effects of these personal communities, researchers have designed a variety of social programmes aimed to remedy deficiencies

in certain aspects of the immediate social circle, to enrich its resources, or to compensate for deficiencies by mobilizing support from sources outside the natural network.

Whether conducting basic or intervention research, investigators require measurement tools that are capable of sensitively and reliably gauging relatively objective features of the personal communities that people inhabit, such as their structure and health-related interactions. In addition, there is a need for instruments that assess people's satisfaction with the resources they have received, and measures that tap subjective perceptions of the psychosocial provisions that are available from their social networks. Indeed, the stress-buffering effect of perceived social support has been firmly established in the literature (Cohen & Wills, 1985). In short, depending on the aims of the research, different measurement tools are needed, and each must meet psychometrically acceptable standards of reliability and validity.

Before reviewing specific measures, it is useful to provide an overview of the various dimensions or parameters along which social resources can be measured. Researchers can review these dimensions to identify those that are most relevant to their aims. One comprehensive scheme includes five parameters: (1) the sources of the resources; (2) the types of resources; (3) whether the resources are described or evaluated; (4) whether the resources are received or perceived; and (5) whether the resources flow unidirectionally or bi-directionally (Barrera, 1986).

The first parameter calls attention to the potential value of identifying the particular individuals in the network who actually extend certain resources or from whom the resources are perceived to be available. There is increasing recognition that network members specialize in the kinds of resources they provide, and cannot be substituted for one another in this regard (Cohen, Mermelstein, Kamarck & Hoberman, 1985). Moreover, many support interventions concentrate on improving the quality or augmenting the quantity of the resources provided by particular network members, such as efforts made by home visitors to improve maternal responsiveness to their infants (Olds, Henderson, Chamberlin & Tatelbaum, 1986). The second parameter refers to the varied types of resources and is conventionally designated by the term social support. According to House (1981), social support consists largely of aid, affect, and affirmation, referring to practical help, emotional support, and esteem-raising communications, respectively. In addition to these types of support, socializing and companionship and information and advice are two additional types of social resources that are often represented in measurement tools. Recognizing that different acute stressors or stages of chronic stressors call for different kinds of support, and that the process of stress moderation may differ depending on the kind of support that is measured, it is essential to distinguish among these types of supportive resources.

The third, fourth, and fifth parameters all centre on these types of support, calling for decisions about whether to obtain descriptions of support or to solicit the recipient's evaluations of its sufficiency and quality, whether to gauge the overt expression of support or its perceived availability, and whether to inquire only about the individual's receipt of the resources or about both their receipt and their provision, which reflects a reciprocal exchange of support.

MEASURES OF SOCIAL RESOURCES

The following four questionnaire measures are selected because they are widely used among diverse adult populations, consist of multiple items that demonstrate psychometric strength, and, collectively, cover all the parameters reviewed earlier. Although interview-based measures of social support have been developed, such as the Arizona Social Support Interview Schedule (Barrera, 1981) and the Interview Schedule for Social Interaction (Henderson, Duncan-Jones & Byrne, 1980), only questionnaires are reviewed below. More comprehensive reviews have been conducted by Heitzmann and Kaplan (1988) and Wills and Shinar (2000).

Measures of Perceived Support

Two widely employed measures of perceived support that tap several different types of resources are the *Interpersonal Support Evaluation List* (ISEL; Cohen et al., 1985) and the *Social Provisions Scale* (SPS; Cutrona & Russell, 1987). The former scale has a 40-item version for the general population that taps

esteem, practical/instrumental, informational, and companionship support with 10 items each, and a college student version that includes 48 items tapping the same four resources. Both the internal reliability (alpha) and the test–retest reliability of the general population version are high, in the 0.90 range, with sub-scale reliabilities in the 0.70–0.80 range. In addition to the fact that it does not tap informational support, the ISEL's limitations include the absence of any questions about sources of support and the adoption of a dichotomous (true/false) response format that precludes quantification of the available support and reduces the variance that may be needed to test for stress-buffering effects.

Cutrona and Russell (1987) developed the Social Provisions Scale to assess the six 'provisions of social relationships' proposed by Weiss (1974). It consists of 24 items tapping attachment (emotional support), social integration, reassurance of worth, reliable alliance, guidance, and opportunities for nurturance with four items each. Only practical/instrumental support is missing from this instrument, which also includes an index of reciprocity by inquiring about the respondent's involvement in nurturing others. Cutrona and Russell (1987) report an internal reliability of 0.91 for the entire scale, acceptable sub-scale alphas between 0.65 and 0.76, and a test–retest reliability of 0.75 (over one year). Like the ISEL, this measure does not tie support perceptions to particular network members.

Measures of Received Support

Perhaps, because stress-buffering effects have been largely produced by perceived rather than received support, there is a paucity of measures of the latter construct. Another possible explanation is that any measure of received support should be closely aligned with the demands and needs that arise in the particular stressful context that is being investigated, and such tailoring calls for more laborious instrument development. Whereas the first instrument described below is an example of a generic measure of received support, the second exemplifies a tailored measure.

Drawing on Gottlieb's (1978) classification scheme of informal helping behaviours, the *Inventory of Socially Supportive Behaviours* (ISSB; Barrera, Sandler & Ramsay, 1981) asks respondents about how much or how often they have received 40 kinds of help in the recent past. The 40 items were selected to gauge emotional, practical, and informational support, as well as companionship, but factor analyses suggest that there are five rather than four underlying dimensions, the fifth being support that communicates esteem. Both the internal consistency and the test–retest reliability of the full measure are high, in the 0.90 range. The ISSB does not inquire about the sources of support nor does it solicit the respondent's evaluation of support. Another limitation of the measure is that it does not inquire about whether the respondent needed each type of support before inquiring about its receipt. It is important to ask this question because it allows the investigator to distinguish between people who received low scores because they did not need certain kinds of support from those who failed to receive needed support. Finally, investigators who are considering adoption of this measure should first ensure that all the items are potentially relevant to the supportive needs of the respondents.

A highly tailored measure of support received from a partner or live-in close associate for smoking cessation was developed by Cohen and Lichtenstein (1990). The *Partner Interaction Questionnaire* (PIQ) not only includes 10 items that tap support that aids smoking cessation, but also includes 10 items tapping behaviours that undermine the quitter's efforts (e.g. 'Expressed doubt about your ability to quit'). The latter items spotlight another potential aspect of social resources that can be gauged, namely disagreement, conflict, and other types of unsupportive interactions with close associates. Although the measure mainly taps emotional and practical support and undermining, the two subscale scores that can be derived reflect positive and negative behaviours, yielding alphas of 0.89 and 0.85 respectively (Cohen & Lichtenstein, 1990).

Observational Measures of Supportive Interaction

Out of an interest in understanding how the support process unfolds and sometimes miscarries, and due to evidence that self-reports of perceived and received support are influenced by self-presentational needs (Schwarz, Groves & Schuman, 1998), a handful of investigators have developed tools for observing and recording support-related interactions (Barbee &

Cunningham, 1995; Bradbury & Pasch, 1994). For those planning interventions that mobilize, augment, or specialize the support rendered to others, information about the contextual, relational, and temporal influences on the expression of support is critical.

Based primarily on information obtained from married couples regarding the kinds of support they would appreciate receiving from their spouse when stressful events occur, Cutrona and Suhr (1992) developed the Social Support Behaviour Code (SSBC), comprised of 23 (mainly verbal) behaviours that reflect expressions of emotional, esteem, informational, tangible, and belonging support, along with codes for such negative behaviours as criticism and sarcasm. Application of the coding scheme has mainly occurred in the context of laboratory studies of married couples using a procedure that involves each partner airing a personal problem, which is discussed for 10 minutes, followed by the administration of a questionnaire that is completed by the would-be support recipient who rates the overall supportiveness of the partner's behaviours. The videotape of the support provider's behaviour is then coded by trained observers and yields scores reflecting the frequency of each type of supportive interaction. The mean interrater reliability across the six dimensions is 0.77 (Cutrona & Suhr, 1992), and substantial correlations between the total number of supportive behaviours and both observer and participant ratings of global supportiveness testify to the measure's construct validity (Cutrona, Suhr & McFarlane, 1990).

FUTURE PERSPECTIVES AND CONCLUSIONS

In future research, more attention should be paid to the development of brief screening tools that can be used to determine prospective participants' needs and preferences for extra support. Without such screening tools, intervention candidates may be assigned to a programme that provides types of support that are redundant with the support already extended by the natural network, or assigned to a strategy of delivery that is less acceptable, such as when people are assigned to support groups but prefer to interact with a single source of support (e.g. a home visitor). A second direction for the future is to develop more sensitive measures that are capable of documenting aspects of support that are expressions of the ongoing interdependence between people rather than reflecting the ways people help one another during periods of heightened stress. To date, very little is known about how support becomes part and parcel of everyday routines and interactions, giving rise to the perception of support. Equally important, little is known about how to measure the interpersonal processes that undermine this psychological sense of support. The development of measures capable of addressing both of these topics will enrich our understanding of the ways in which human attachments enhance the health and well-being of people facing a variety of challenging life circumstances.

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RELATED ENTRIES

Applied Fields: Health, Applied Fields: Clinical, Applied Fields: Education, Social Networks

SOCIO-DEMOGRAPHIC CONDITIONS

INTRODUCTION

The need for socio-demographic assessment derives from the fact that, in analysing the findings of social research, whether attitudes or behaviours, certain socio-demographic and socio-economic variables seem to have some explanatory power. Gender, age, occupation, family and/or household structure, education, income, rural–urban residence, and many other such variables, have shown to have a great importance because attitudes and behaviours generally vary according to the different categories in which groups of individuals tend to fall.

In this respect, it may be pertinent to recall that the concept of social status acquired a very concrete meaning in the social sciences after Ralph Linton defined it (Linton, 1936) as the position of an individual within a social system, to which society assigns certain attitudes and expectations of behaviour that are known and accepted by everyone. Thus, when in a particular culture somebody is assigned as a 'mother', everybody within that culture will immediately attach certain attitudes and expectations of behaviour that define that 'status-role', and that need not be specified because they are of general knowledge. Linton differentiated, besides, between 'ascribed' and 'acquired' status. Ascribed status (as gender or age) is easily recognizable and therefore easily and soon assigned to individuals, so that they can learn quickly the attitudes and behaviours that are expected from a particular status. Acquired status (as occupation) is assigned to individuals only after they have demonstrated certain skills or after they fulfil certain requisites. The conceptual pair 'status-role' has been of great importance in sociological theory in order to refer to the structural or dynamic aspects of any social position within a social system (Bendix & Lipset, 1953; Davis & Moor, 1945;

Homans, 1953; Hughes, 1945; Hyman, 1942; Tumin, 1953).

The concept of socio-economic status developed later, mainly as a response to the Marxist concept of social class, defined in many varied ways by Marx himself in different writings (Marx, 1849, 1852), though Dahrendorf (1959) synthesized them many years later. Marx's concept of social class was not only very ideological, but also a clear oversimplification of social reality, and in addition, not easily 'operationalizable'. Those reasons seem to explain why non-Marxist sociologists, and especially North American sociologists, preferred to use less ideological and easy to operationalize concepts, like 'subjective social class' (social class with which one identifies oneself), or the many variations of 'objective social class', or more specifically, social stratification.

More acceptable to North American sociologists was the concept of social class elaborated by Max Weber (1922), who distinguished between social class based in economic aspects (like Marxism) or social estate (or strata) based on the social prestige of the different status. Similarly, Warner (1941–1959) came to the conclusion, when studying the social stratification systems in American cities based on the social relations of individuals, that there is no single system of stratification that might be universally applicable.

MEASUREMENT

Empirical social research during the past fifty years has demonstrated the great difficulties encountered in the operationalization of the Marxist concept of social class (even in agreeing on the abstract meaning of that concept). But there have been many attempts to operationalize the subjective concept of social class self-identification (based on the assessment made by the individual himself) and the more objective concept of socio-economic status (based on the supposedly more objective assessment made by the researcher).

Subjective Assessment

It has become a common practice in social research to use subjective and objective assessment of the different statuses of an individual. Thus, subjective assessment has become increasingly used to supplement the objective assessment of many social positions (statuses) of individuals. Certainly, gender and age are objectively defined in most researches, but other statuses have been measured not only through objective indicators but also through more subjective indicators.

One example might be social class. Independently of a more objective attempt to define the social class to which an individual apparently belongs, it is increasingly common to recur to a subjective definition, that generally consists on asking the individual to identify him/herself with a particular social class. This is generally called subjective social class, and it may consist of a scale with three to seven or even more categories, depending on the researcher's preferences. Place of residence may also be defined subjectively, when the respondent is asked to answer whether he/she lives in an 'urban, semi-urban, or rural area', though the categories may vary in number and complexity.

Self-anchoring scales of ideology are generally preferred to more objective measurement of an individual's ideological orientation. Seven or 10-point scales, ranging from 'extreme left' to 'extreme right', are usually employed. Religiosity self-assessment scales are increasingly used in addition to more objective indicators of a person's religiosity or degree of religious practice. And a similar practice is also increasingly used for assessing the ethnic or 'national' self-identification of the respondent with a particular social group.

But subjective measurement has also a great significance in some apparently very objective socio-demographic assessment, as the employed–unemployed status. It is true that in most researches the respondent is asked to define him/herself as employed (part or full time) or unemployed according to very specific rules (hours worked per week, per month), but it is not less true that many respondents do not comply to those rules. A similar situation has also been found with respect to marital status, if some social and/or economic benefits depend from being married or unmarried. In all those cases the individual may be tempted to give a not very correct answer if some benefit may be derived from it.

Objective Assessment

In spite of the fact that subjective self-assessment by the respondent him/herself are increasingly

frequent, researchers use more objective indicators to assess most socio-demographic statuses of the respondents. Thus, even though gender is not any more the absolute 'ascribed' status that it was many years ago (individuals may identify themselves with a social gender different from the natural or physical gender, or they may even change their gender physically during their life time), gender is generally an objective status, especially at birth, when roles are assigned for early socialization.

Age continues to be a very objective status, though the concept of cohort or age group, or even generation, may have a more subjective component. Education is usually measured through several indicators, like total number of years of formal education, educational levels or degrees attained, age at which the individual stopped receiving formal education. Income is usually measured also through several indicators, like exact income received (annually, monthly) by the respondent (before or after taxes), family income, income categories, and the like. Place of residence may be objectively assessed on the basis of the number of inhabitants, population categories, social categories (village, town, suburb of big city, slum of big city, central city, and other categories). Occupation is measured, more and more frequently, through the ISCO coding categories, which may use up to four digits (9999 potential different occupations).

Very frequently compound indicators or indexes have been constructed on the basis of several indicators. One of the most common is the Socioeconomic Status index. In most cases this index is built on the basis of educational level, occupational prestige and individual's income, though some researchers also include some assessment of life styles (household appliances, house property, second residences, and the like). Each researcher will combine the categories of each individual indicator in a different manner, generally in accordance with his/her research goals.

Another widely used compound index is the Social Position index, developed by Galtung (1976), which combines eight dichotomized socio-demographic characteristics (gender, age, educational level, income level, occupation, sector of the economy, urban–rural residence, geographical centrality) in order to build a scale with nine categories. The peculiarity of this compound index is that it is very much linked to a theory (centre–periphery theory), though other socio-demographic indicators, simple or compound, are also generally related to some theoretical construct.

FUTURE PERSPECTIVES AND CONCLUSIONS

Socio-demographic and socio-economic variables are important for analysing and interpreting survey findings on attitudes and behaviours. Their assessment, however, may be objective or subjective in most cases, as the examples given below show, and it is up to the researcher to decide which he/she prefers to use in each case. Both types of assessment are usually included in the same research, in many cases to show the correlation that may exist between the objective and the subjective measurements (see Table 1). But many socio-demographic variables are usually defined objectively, as happens with gender and age, among others.

The difficulties in the assessment of socio-demographic characteristics are, however, quite varied. In the first place, there is the difficulty of defining theoretically meaningful categories for each indicator and that of deciding whether to use objective or subjective indicators. Researchers will find a great variety of categories used in the literature for each particular indicator, regardless of it being objective or subjective. Secondly, as international comparative research is increasingly used, researchers find it difficult to agree on variables and categories for each variable that are comparable across countries. This is particularly true with respect to educational level, income level, ethnic or 'national' groupings, religious affiliation and practice, and the like. Third, even within a single country one may find that the operationalization of a particular concept has varied through time (the concept of primary education, for example, may mean a certain number of years of education for individuals pertaining to a particular cohort, but it may mean a different number of years for those belonging to another cohort, simply because the length of primary education may have changed through time) and therefore the meaning may be different for different respondents, without the researcher being aware of that problem. In fact, the main problems that researchers will find in assessing socio-demographic or socio-economic status are the general problems that have always

Table 1. Correlation between objective and subjective measurements

Abstract concept	Subjective assessment	Objective assessment
Social class	Self-identification with a social class, subjective social class	Socio-economic status Social position
Religiosity	Self-evaluation of religiosity	Church attendance, frequency of praying, etc.
Ideology	Self-anchoring scale of ideology	Ideological orientation to specific issues
Place of residence	R's definition	Size of place based on population
Ethnicity, national sentiment	Self-identification	Definition based on objective aspects
Employment status	Self-assessment	Defined on the basis of specific requirements

faced social scientists; that is, going from abstract concepts to concrete indicators, and trying to increase the scope of generalizations both in time and space.

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RELATED ENTRIES

FIELD SURVEY: PROTOCOLS DEVELOPMENT, SELF-REPORTS (GENERAL), SELF-REPORT DISTORTIONS, SELF-PRESENTATION MEASUREMENT

SOCIOMETRIC METHODS

INTRODUCTION

Sociometric methods are concerned with the study of the ways people interact with one another in groups. The way in which people in groups choose one another for different activities gives us relevant information about the social status of individuals and about the structure of the group. This technique goes back to Moreno's (1934) original work. Nowadays, a renewed interest in these

methods has emerged due to its rich potential as a measure of social competence and the predictive value of the knowledge of the individual's position in the group in cases of risk behaviours.

The main construct evaluated by the sociometric test is the *social status* or popularity, and it has been defined as 'a general, group-oriented construct that represents the view of the group towards an individual' (Bukowski & Hoza, 1989: 19). The test also allows for the analysis of some group properties that is facilitated by the *sociogram*.

THE SOCIOMETRIC TEST

Sociometric Questions

In its original form, the sociometric test, or nominations technique, was too simplistic. An individual should nominate a number of partners to carry out some activities such as study, work, etc. Sometimes the social status is defined simply by social acceptance or the number of peer nominations to the question *Who do you like the most to ... (LM)?* and sometimes is combined with a measure of social rejection, defined by the number of nominations to the question *Whom do you like the least to ... (LL)?* Northway (1967) suggests that in any test, three or four criteria should be used as the bases for the choices, limited in number, and the questions should be formulated in the conditional mood. Terry (2000) emphasizes that an unspecified number of choices are necessary to locate the full range of choice patterns.

There have been many variations on the sociometric questions. One of them has been the *self-rating* method whereby the subject predicts who s/he will be chosen by. Another method is the *rating-scale* (Maassen et al., 2000) that consists of a 5-point scale next to the name of each group partner. More complex approaches have combined choices data with behavioural descriptions or psychosocial attributes (Coie et al., 1982). In the latter, the individual should nominate the partners who exhibit the target behaviour or attribute (e.g. Who is the most aggressive one in the group?).

Measures Derived from Sociometric Methods

The earliest approach to the quantification of sociometric data was the socio-matrix whereby all the choices are recorded and then added. The number of choices given to the whole criteria provides an indication of the sociometric status. Other indices frequently used to characterize an individual were: rejection, positive expansion, negative expansion, affective connection, perceptive attention, and perceptive realism. Probabilistic models have been also considered to identify individuals who receive greater or fewer choices than they would receive by chance.

The social status definitions vary depending on whether acceptance or rejection scores are combined or whether acceptance alone is used. Peery (1979) emphasizes that the positive and negative nominations should be combined into two new dimensions of sociometric status: Social Impact (SI) and Social Preference (SP). The SI score, which is a measure of social salience, is obtained by adding up the LM and LL nominations ($SI = LM + LL$). An individual's liking score minus his/her disliking score yields a score called *Social Preference* ($SP = LM - LL$). Coie et al. (1982) and Newcomb and Bukowski (1983) refined Peery's system. Coie et al. proposed the *standardized approach* that consists of standardizing the scores within each group. Newcomb and Bukowski (1983) offered an alternative procedure based on binomial probability.

It is also possible to identify groups of individuals. Previous classification systems were based exclusively on the social preference dimension, and they identified two or three groups (i.e. popular/unpopular; high-status, mild-status, low-status). The missing element in these models is a measure of social salience. Coie et al. (1982) addressed this limitation by using both social impact and social preference measures, and they proposed a classification system in five groups: popular, rejected, controversial, neglected, and average.

There are also some interesting indices that reveal some properties of the group structure: cohesion, conflict, and mutual connection.

Graphic Representation of Sociometric Data

The *sociogram* provides a two-dimensional display of the sociometric data. It is constructed on the basis of the choices between individuals, may

be symmetric, asymmetric, or non-existent. In its original form, group members were designated by symbols with lines and arrows to indicate the direction of the choice. Northway (1967) introduced the notion of target sociogram, which contained four concentric circles, based on the four levels of probability: significantly above chance, above chance, below chance, and significantly below chance, from the inner to the outer circle. The stars are located in the inner circle and the isolates in the outer one.

Recent usage of sociogram has tended to focus on cliques rather than individuals. An early example is found in Coleman's (1961) analysis of adolescent groups. As we move towards the entire set of relations among individuals that define the group, we turn to quantitative methods used by *social networks analysis*. Many of the methods developed within this methodology can be applied to the analysis of the interactions among the people in a group (Frank, 1998; Wasserman & Gulaskiewicz, 1994).

FUTURE PERSPECTIVES

There are some problematic questions related to the sociometric data which require further research: the relative advantages of peer nomination and rating-scale techniques, the use of limited versus unlimited nominations, and the reliability and the stability of peer status. It is also necessary to explore the relations between data derived from measures of positive and negative nominations, which may not be linearly related.

Recent works from Zachriski et al. (1999) have focused on using the sociometric measures with smaller than usual groups and with a child-focused approach. They demonstrated the clinical relevance of these data.

Some authors find the traditional quantitative techniques of sociometric analysis too weak for an adequate analysis of the complexity of group behaviour. They propose the use of more advanced mathematical methods (Markov chains, graph theory, game theory) and statistical methods (multidimensional scaling, cluster analysis, and logit models) for expanding sociometric applications. Besides, the analytical developments in the social network framework will facilitate the analysis of sociometric data.

CONCLUSIONS

The sociometric methods can be applied in any settings: school, army, sports, companies, etc. However, the main applications are in the areas of Developmental Psychology, Clinical Developmental Psychology, and Educational Psychology (Newcomb et al., 1993). The two-dimensional approach to the study of popularity has proved an important point of departure for a rich empirical research. A substantial body of literature has documented a variety of relationships between cognitive, behavioural, and emotional difficulties and the experience of being rejected by one's peers. Numerous studies agree that childhood peer rejection predicts future psychosocial problems such as delinquency, poor academic performance, bullying, dropping out of school, loneliness, substance abuse, and other indices of disorder.

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RELATED ENTRIES

Applied Fields: Education, Applied Fields: Organizations, Applied Fields: Work and Industry, Leadership Personality, Leadership in Organizational Settings

STANDARD FOR EDUCATIONAL AND PSYCHOLOGICAL TESTING

INTRODUCTION

In late 1999, the fourth version of the *Standards for Educational and Psychological Testing* was released by the three organizations responsible for this and previous versions, the American Educational Research Association (AERA), the American Psychological Association (APA), and the National Council on Measurement in Education (NCME).[1] Previous versions had been released in 1966, 1974, and 1985 under the same or a very similar title. The stated purpose of the 1999 *Standards* is as follows:

> The purpose of publishing the *Standards* is to provide criteria for the evaluation of tests, testing practices, and the effects of test use. Although the evaluation of the appropriateness of a test or testing application should depend heavily on professional judgement, the *Standards* provide a frame of reference to assure that relevant issues are addressed. (p. 2)

Work on the fourth version of the *Standards* actually began in late 1993. The three sponsoring organizations assembled a joint committee of sixteen measurement experts in psychology and education and commissioned them with the task of revising and updating the 1985, or third, version of the *Standards*. The focus of this joint committee's task was not on a complete rewriting of the 1985 *Standards*, but rather on the making of changes in order to reflect recent advances in testing and the expanded use of tests into a number of new areas, such as the use of test results for setting public policy. Noteworthy among these advances or developments the joint committee needed to consider were: (1) increased emphases on the role of consequences of test use in the area of validity; (2) an increased degree of emphasis on performance assessment, and, in particular, on portfolio assessment;[2] (3) the current role of generalizability theory when thinking about issues in the area of reliability; (4) the widespread use of item response theory (IRT) in the processing of examinee responses to test items; and (5) the increased use of the computer in the testing process and in the production of diagnostic feedback information for examinees. In addition, one other important development that was to greatly influence the preparation of the 1999 *Standards* had to do with the use of the 1985 *Standards* on a number of occasions in court litigation. The joint

committee saw no reason to believe that this trend would not continue or even escalate in the first decade of the 2000s, and, hence, needed to be extremely careful in drafting the wording of the 1999 document.

CONTENT OF THE *STANDARDS*

The 1999 *Standards* contains fifteen chapters organized into three parts, as follows:

Part I Test Construction, Evaluation, and Documentation

- Chapter 1 Validity
- Chapter 2 Reliability and Errors of Measurement
- Chapter 3 Test Development and Revision
- Chapter 4 Scales, Norms, and Score Comparability
- Chapter 5 Test Administration, Scoring, and Reporting
- Chapter 6 Supporting Documentation for Tests

Part II Fairness in Testing

- Chapter 7 Fairness in Testing and Test Use
- Chapter 8 The Rights and Responsibilities of Test Takers
- Chapter 9 Testing Individuals of Diverse Linguistic Backgrounds
- Chapter 10 Testing Individuals with Disabilities

Part III Testing Applications

- Chapter 11 The Responsibilities of Test Users
- Chapter 12 Psychological Testing and Assessment
- Chapter 13 Educational Testing and Assessment
- Chapter 14 Testing in Employment and Credentialling
- Chapter 15 Testing in Programme Evaluation and Public Policy

Each of the fifteen chapters of the *Standards* begins with a background section, which contains an up-to-date discussion of the issues in testing related to the title of the particular chapter. The background section also provides an overview of the material to be addressed in detail in the individual standards of the chapter. Following the background section in each chapter are the individual standards for that chapter, and they are printed in boldface type. In many cases, a comment follows the standard, which helps by providing further clarification as to the intent of the standard. Following the standard chapters is an up-to-date glossary of terms used in the preceding text and standards. In total, the 1999 *Standards* comprises 194 pages (including preface, introduction, and index) and contains 264 individual test standards organized within the fifteen chapters.

The joint committee made a number of changes to the 1999 *Standards* when compared to the 1985 version. Noteworthy among these changes are: (1) a new chapter on fairness (Chapter 7) was added; (2) the separate chapters on employment testing and on testing for licensure and certification were merged into one chapter (Chapter 14); and (3) the separate chapters on clinical testing and test use in counselling were merged into Chapter 12 on psychological testing, although part of the material on counselling was included in Chapter 13 on educational testing. These changes were made because (1) the joint committee wanted to emphasize the centrality of fairness issues to the 1999 *Standards* by creating a separate chapter; (2) employment testing and testing for licensure and certification share a common bond in that both in general are related to the workplace and hence could be merged; and (3) the joint committee felt it was important to expand on the varieties of psychological tests listed in the 1985 *Standards* and then to treat all such testing in a single coherent chapter.

One other major change in the individual standards in 1999 when compared to 1985 is that the categories associated with the standards in 1985 (primary, secondary, and conditional) were dropped in 1999. This may have been the most controversial change brought about in the 1999 *Standards*, and the 1999 joint committee went to great length in the introduction to the *Standards* to explain why this was done. Basically, the 1999 joint committee felt they had built sufficient qualifying phrases and caveats into the text of each standard so that categories were no longer necessary.

A procedural change brought about by the 1999 joint committee had to do with the increased level

of involvement of outside organizations in the review process for the *Standards*. At each instance when a draft version of some or all of the chapters of the 1999 *Standards* had been prepared, written comments were solicited from outside organizations and individuals with an interest of any sort in the *Standards*. In total, nearly 8000 pages of comments were received and subsequently reviewed. While this process clearly lengthened the amount of time needed to prepare the 1999 *Standards* for publication, the feedback gained from the process proved to be invaluable to the joint committee and users of the *Standards* ended up feeling more involved in the overall process. The preface to the 1999 *Standards* contains a list of organizations, boards, agencies, publishers, and academic institutions that were heavily involved in the review process.

FUTURE PERSPECTIVES

It is the plan of the three sponsoring organizations that the *Standards for Educational and Psychological Testing* continue to be updated and revised on a regular basis. While at this point no specific date has been set for commencement of activities of a new joint committee, it is unlikely that the sponsoring organizations will again allow 14 years to transpire between versions as was the case between the third and fourth versions. This is because advances in testing are occurring at an extremely rapid rate. For instance, as the 1999 *Standards* was being published, a number of individuals were already finding the validity chapter lacking, and were calling for the articulation of procedures or programmes for conducting validation research that will clearly support the transition of the current conception of validity from theory to practice. This is but one of a number of concerns or issues that are bound to arise as the 1999 *Standards* are used in a variety of testing contexts.

CONCLUSIONS

Over the years, the *Standards for Educational and Psychological Testing* has become the critical document for the codification of the critical fundamental elements in need of consideration in the area of psychological and educational testing and assessment. Regardless of the rapidity of changes in testing theory and practice and the need for further versions of the *Standards*, the basic intent of the *Standards* will not change. According to the 1999 joint committee: 'The intent of the *Standards* is to promote the sound and ethical use of tests and to provide a basis for evaluating the quality of testing practices' (p. 1).

Notes

1 During the period from 1993–1999, the author served as NCME liaison to the joint committee charged with revising the 1985 *Standards for Educational and Psychological Testing* and from 1991–1999 as member and then chair of the NCME Standards and Test Use Committee.
2 A portfolio is a systematic collection of educational or work products that has been compiled or accumulated over time, according to a specific set of principles.

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RELATED ENTRIES

Theoretical Perspective: Psychometrics, Ethics, Report (General), Assessment Process, Validity (General), Reliability

STRESS

INTRODUCTION

According to the relational, or transactional, stress concept favoured by most researchers in the field, stress is a process in which external or internal demands are interpreted by persons in relation to their own resources, values, and goals. Stress occurs if demands are appraised as taxing or exceeding the person's abilities or resources to cope with those demands. The most widely examined manifestations of stress are emotional and biological responses, particularly neuroendocrine, cardiovascular, and immune responses. Furthermore, stress is expected to lead to attempts at coping with the situations perceived as stressful (Cohen, Kessler & Underwood Gordon, 1997; Herbert & Cohen, 1996; Lazarus & Folkman, 1984).

Based on the relational stress concept, assessment of stress includes four main components: (1) environmental demands, usually termed stressors; (2) an individual's subjective evaluations of potentially stressful situations, or subjective appraisals; (3) stress-related emotional responses; and (4) biological stress responses. This entry focuses on approaches to measuring the *psychosocial* components of the stress process, including environmental demands, subjective evaluations of stress, and emotional stress responses. Comprehensive reviews of the measurement of biological stress responses are provided by Cohen, Kessler, and Underwood Gordon (1997).

ASSESSMENT OF ENVIRONMENTAL DEMANDS

In measuring environmental demands, three types of stressful events are usually distinguished: major life events, minor life events, or daily hassles, and chronic stressors.

Major Life Events

The most influential approach to measuring life events was developed by Holmes, Rahe, and colleagues (Holmes & Rahe, 1967). In this approach, major life events are defined as events that require increased efforts to readjust to the changes they induce. The stress potential of life events is particularly seen in the cumulative amount of change brought about by successive events occurring within a relatively short period of time. Accordingly, life event measures usually assess the occurrence of life events over a specified time frame, mostly six months or one year, by means of checklists or interviews.

Checklist Measures

The earliest and most widely used checklist measure is the Social Readjustment Rating Scale (SRRS; Holmes & Rahe, 1967) that contains 43 events such as marriage or retirement. Each event is assigned a standardized weight – called 'life change unit' – based on ratings of the degree of readjustment assumed to be required by the event. The sum of 'life change units' over a given period of time is assumed to represent the environmental stress that a person has experienced. Since the publication of the SRRS, a wide array of different life event inventories has been developed for children, adolescents, adults, and aged persons (Turner & Wheaton, 1997).

Though the checklist procedure is the dominant method for assessing life events, it has spawned serious critique (Herbert & Cohen, 1996; Thoits, 1983; Turner & Wheaton, 1997). One objection concerns the event list *comprehensiveness*. Checklists have been criticized for omitting certain types of events, in particular socially sensitive events, 'non-events' such as not having children, and events that are common in certain socioeconomic and ethnic groups. Given that the social construction of what constitutes a life event varies with sociocultural groups, it is recommended that in addition to including universally important events, event lists should be representative for the particular sociocultural setting under scrutiny.

A second critical issue is the use of event-specific *weights* that are assumed to reflect the events' stress

potential in terms of severity or induced change. In the tradition of Holmes and Rahe (1967), event-specific weights are used that are based on groups of raters. An alternative approach to using social judgements is to ask persons to *subjectively* rate the stressfulness of the events they have experienced (e.g. Sarason, Johnson & Siegel, 1978). Subjective ratings are expected to more fully represent the personal impact of the events and their ramifications. However, the personal perception of an event may be confounded with an individual's psychopathology, and his/her assessments of the outcome (Dohrenwend et al., 1993). Furthermore, subjective weights may confuse stress with a person's coping capacity (Turner & Wheaton, 1997). Generally, empirical findings indicate that the use of either socially derived or subjective weights does not increase the predictive power of event lists compared to simply weighting each experienced event by one. With large samples, the use of regression-based weights is an alternative to using social judgements or subjective ratings (Herbert & Cohen, 1996).

A third argument against life event checklists focuses on the problem that event measures may be *confounded* with outcome variables. Events like 'change in sleeping habits' may themselves be symptoms or indicators of the physical or mental disorders they are intended to predict (Thoits, 1983; Dohrenwend et al., 1993). The methodological problem of confounding notwithstanding, empirical findings suggest that deleting confounded items has little influence on the stress–health relationships. Furthermore, deleting potentially confounded events may alter the psychometric properties of the scale and may lead to the exclusion of events that – while indicating a current disorder – also have a causal impact on a later disorder (Herbert & Cohen, 1996; Turner & Wheaton, 1997).

A fourth argument concerns the *psychometric properties* of checklist measures. Reliability, measured either by the 'fall-off' rate (the distribution of recalled events over time) or by test–retest correlations, has been found to be only moderate. Internal consistency has also been estimated, but it is questionable whether internal consistency is an appropriate measure of life event scales' reliability, because life events cannot necessarily be expected to intercorrelate.

Validity of life event measures has usually been assessed by the degree of agreement between respondents and informants. Interrater agreement was mostly obtained from interviews, showing moderate to high agreement (Thoits, 1983). Generally, reports of life events were found to be influenced by current mood and by personality characteristics, particularly neuroticism that is associated with the perception of more events. Another problem with regard to validity is that experiences might be misclassified in order to fit the life event categories (Herbert & Cohen, 1996).

Interview Measures

Given the methodological problems of checklists, interview measures of life events are usually considered to be preferable to checklist measures. Intensive personal interview techniques incorporate qualitative probes that elicit more precise descriptions of events and their contexts. Interview techniques have been found to yield higher retest–reliability and to be more comprehensive with regard to covering the full range of experienced events than are checklist measures (Herbert & Cohen, 1996; Wethington, Brown & Kessler, 1997).

The most widely used interview methods are the *Life Events and Difficulties Schedule* (LEDS; Brown & Harris, 1978), and the *Structured Event Probe and Narrative Rating Method* (SEPRATE, Dohrenwend et al., 1993). The LEDS is a semi-structured interview used to elicit comprehensive descriptions of life events and chronic difficulties and the circumstances surrounding these events. The interview allows for intensive probing. In addition, social and biographical background data are gathered. Independent raters then evaluate the degree of the long-term contextual threat of discrete events and the severity of chronic difficulties given the nature of the events and the individual context. In the SEPRATE interview, structured probes are used to yield comprehensive descriptions of the experienced events. Each event is then abstracted from the interview material and rated by two independent judges on different dimensions such as desirability and severity. While providing a reliable and valid assessment of life events, interview techniques are extremely costly. The amount of time required for conducting the interviews and rating the answers clearly militates against the use of personal interviews, especially in large samples.

Daily Hassles

In the early 1980s, Lazarus and colleagues began to study relatively minor, but more frequently experienced stressors, termed 'daily hassles', and their positive counterparts, called 'daily uplifts' (Kanner et al., 1981). Respondents are instructed to report the hassles they experienced in the previous month and to rate their severity. Since the publication of the Hassles Scale, other daily event checklists have been developed (review Eckenrode & Bolger, 1997).

Daily hassles are expected to have a stronger relationship to health outcomes than do major life events, because daily hassles are regarded as proximal measures of stress, whereas major life events are distal. However, the methodological and psychometric problems discussed in regard to the major life event checklists also apply to the minor event checklists. These problems include lack of representativeness of the sampled events among varying sociodemographic groups, recall biases, and the problem that some hassles are symptoms of physical and mental disorder.

A theoretically and methodologically attractive alternative to minor event checklists that usually cover a longer time period are *diary designs* that require regular, usually daily, reporting (Eckenrode & Bolger, 1997). The methods used include interval-contingent, signal-contingent, and event-contingent recording. A major advantage of daily records is that they can be used in longitudinal designs, thus providing reliable information about a person's exposure to stress, the interrelationships between events, and the temporal relationships between daily events and daily outcomes. Diary designs also minimize the problem of retrospective recall. However, methods based on daily event recording may be reactive, i.e. they might modify the behaviour they should assess.

Chronic Stressors

Chronic stressors are usually defined as stressful events or conditions that persist over time (Lepore, 1997). Distinct from major and minor life events, chronic stressors comprise the more structured and persistent social and economic conditions that may lead to stress (Pearlin, 1983).

Self-report measures of chronic stress focus on family- and work-related conditions (Lepore, 1997; Herbert & Cohen, 1996). Family and work are the major sources of 'role strain', defined as the persistent duties and conflicts people experience in their engagement in normal social roles (Pearlin, 1983). Generally, role stressor questionnaires are valuable for providing information about subjective perceptions of work or marital roles, but they are inappropriate if used as measures of objective role stressors. As is the case with life events and daily hassles, the methodological problems inherent in self-reports include subjective biases, confounding, and measurement errors due to forgetting stressors, particularly if retrospective measures are used. Furthermore, in existing self-report measures of chronic stress, duration, and frequency of exposure to stressful conditions are seldom measured directly.

Some of the enduring or recurring stressful conditions, especially environmental stressors such as crowding, noise, or crime, and economic conditions such as unemployment, can be assessed by *objective measures*, using archival materials or electronic recording devices. Objective estimates of chronic stressors may also be gained by observational techniques, especially in the work setting. However, observational measures are very time consuming and labour-intensive. Moreover, access to participants may be difficult to achieve, particularly in natural settings. Alternatives to naturalistic observation are laboratory-analogue techniques and informant-based techniques (Lepore, 1997).

ASSESSMENT OF SUBJECTIVE EVALUATIONS OF STRESS

Subjective appraisal of potentially stressful situations is the core concept of the relational, or transactional, stress concept (Lazarus & Folkman, 1984). According to this perspective, environmental demands are not stressful per se, but only if they are perceived as stressful by the individual experiencing those demands. Two types of appraisal processes are distinguished: primary appraisal involves the evaluation of situations in regard to the person's well-being, whereas secondary appraisal pertains to the evaluation of coping capabilities.

Although appraisal is the key concept of the relational stress model, very few measures exist to assess stress-related appraisals. Monroe and Kelley (1997) attribute the paucity of measures partly to the ongoing debate over the theoretical

implications of the appraisal concept. Problems for measurement are due in particular to the assumption that appraisal processes are dynamic in nature, involving the initial perceptions of a situation and the permanent reappraisals resulting from efforts to cope with the situation. The most serious problem raised by the transactional stress concept is that appraisal can hardly be differentiated from other constructs, especially coping and distress. For example, appraising a situation as stressful implies the perception of deficient coping abilities and the experience of negative emotions. Furthermore, subjective appraisals may reflect already existing psychopathology rather than independent processes that precede mental health outcomes.

Two types of appraisal measures are currently used (Monroe & Kelley, 1997). The first consists of *single-item* measures that assess an individual's reactions to a specific situation. Such ad hoc, single-item measures possess face validity, and studies have also attested to their predictive validity. They are useful for assessing immediate responses to a potentially stressful situation, especially in laboratory studies or in the context of daily event reporting.

The second type of appraisal measures includes *multiple-item* scales. The *Perceived Stress Scale* (PSS; Cohen, Kamarck & Mermelstein, 1983) is the most widely used *global* measure of perceived stress. The 14-item PSS was developed to measure the degree to which situations in one's life are appraised as stressful. The PSS has adequate reliability, and empirical findings have confirmed its concurrent and predictive validity. Distinct from the PSS, the 37-item Stress Appraisal Measure (Peacock & Wong, 1990) was developed to assess primary and secondary appraisal with regard to a *specific* anticipated stressful event. An alternative way to measuring the subjective evaluation of stressful events is provided by life event measures that incorporate individualized event ratings.

ASSESSMENT OF EMOTIONAL STRESS RESPONSES

According to the relational stress model, stress appraisal results in negative emotional responses, with the possible exception of appraising a situation as challenging (Lazarus & Folkman, 1984). In this theoretical perspective, affective reactions are indicators or manifestations of stress. At the same time, emotional responses are also commonly used as stress outcome variables, indicating subjective well-being (Stone, 1997). The problem of overlapping constructs that is inherent in the relational stress model is perhaps nowhere more obvious than in the double use of emotional responses as indicators of *stress* and as indicators of *stress outcome*.

Stress-related emotional responses are usually assessed by multidimensional mood adjective checklists that include a number of adjectives describing emotional states. In these assessments, respondents are asked to indicate whether the adjectives reflect their feelings experienced in a given period of time. There exists a wide array of different mood adjective scales. Frequently used examples of multi-dimensional mood adjective checklists are the *Profile of Mood States* (POMS), and the *Positive and Negative Affect Schedule* (PANAS; overview Stone, 1997). Besides the multidimensional mood checklists, measures of specific emotional states, particularly anxiety and depression, are also used. In addition, stress-related emotional responses and general psychological distress can be assessed by widely used multidimensional clinical self-report inventories such as the MMPI-2 (Butcher, Dahlstrom, Graham, Tellegen & Kaemmer, 1989) and the SCL-90-R (Derogatis, 1977, 1983).

Strong emotional responses such as anxiety, anger, guilt and grief may be part of the symptoms of the Posttraumatic Stress Disorder (PTSD). DSM-IV criteria for PTSD include physiological reactivity, cognitive intrusions, anxiety, anger, phobic avoidance of trauma cues, and estrangement from others. Diagnoses of PTSD usually are based on clinical interviews, such as the DSM-IV-related Structured Clinical Interview (SCID; First, Gibbon, Spitzer & Williams, 1996). Frequency and severity of posttraumatic stress symptoms can be assessed by self-report measures such as the *Impact of Event Scale* (Horowitz, Wilner & Alvarez, 1979), the *Trauma Symptom Inventory* (Briere, 1995), or the *Posttraumatic Stress Diagnostic Scale* (Foa, Cashman, Jaycox & Perry, 1997).

CONCLUSIONS

The relational, or transactional, stress model provides the theoretical basis for a detailed and

comprehensive assessment of constructs that are conceptualized as the main components of the stress process, including environmental demands, subjective evaluations of stressful situations, and stress-related emotional responses. The major problem inherent in the relational stress model is that concepts overlap, thus resulting in confounded measures. To deal with these problems, it is strongly advisable to precisely define and specify the research question and the assessment goals and to carefully select appropriate measures. Second, given the specific problems inherent in objective and subjective measures of stress, the use of *multiple* measures is recommendable. A third conclusion that can be drawn from the methodological concerns raised by stress-related measures is the need for *longitudinal* designs in order to fully acknowledge that stress is conceptualized as a process.

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Hannelore Weber

RELATED ENTRIES

Applied Fields: Clinical, Applied Fields: Health, Stressors: Physical, Stressors: Social, Job Stress, Risk and Prevention in Work and Organizational Settings

STRESSORS: PHYSICAL

INTRODUCTION

This entry describes the measurement of physical environmental stressors and design elements that affect human well-being. We discuss stressors encountered in both outdoor and indoor environments, including residential and work settings.

First, we will describe the three most commonly recognized environmental stressors – noise, crowding and air quality (see Table 1) (Evans, 1999). Second, we will discuss measures of overall housing or building quality. Finally, we will describe specific design characteristics that may have an impact on health or well-being. These features include floor height, architectural depth, and characteristics of floor plan (e.g. enclosure and proximity).

NOISE

Exposure to noise has been empirically linked to both auditory and non-auditory effects. *Non-auditory effects* of noise include physiological detriments (increased heart rate or blood pressure), low motivation, and poor cognitive or attentional performance (Evans & Lepore, 1993; Evans, 2001). *Auditory effects* of exposure to loud sound include short term acuity loss ('temporary threshold shift') and, over time, permanent hearing loss ('permanent threshold shift') (Kryter, 1994). Noise is defined as unwanted sound. In other words, while sound is a physical phenomenon, noise is a psychological phenomenon – bothersome or annoying sound. Typically, noise is measured using the logarithmic decibel (dBA) scale. An increase in

Table 1. Noise, crowding and air quality: measurement summary

Physical stressor	Definition	Measures/metrics
Noise	Unwanted sound	dBA, Leq, Ldn
Crowding	Insufficient space	People/room
Air quality		
Volatile organic compounds	Chemical compounds containing carbon, hydrogen and oxygen	TVOC
Radon	Colourless, odourless, radioactive gas. Part of decay chain of uranium.	picocuries/litre Screening Test, Alpha Track Detector, Grab Sampler
Carbon Monoxide	Colourless, odourless, poisonous gas produced when fuel is burned	ppm (parts per million)
Suspended particulate matter	Mix of solid particles & liquid droplets in the air	ppm
Photochemical smog (ozone)	Produced through a reaction between hydrocarbons and sunlight	ppm

10 dBA is perceived as approximately twice as loud. Exposure to noise is measured over a period of time, often 24 hours. Because noise at nighttime is generally more annoying to people, another strategy is to weigh nighttime noise exposure more heavily than daytime noise (Ldn).

CROWDING

The distinction between density and crowding parallels that between sound and noise. Density is a physical index, whereas crowding depends on an individual's cognitive appraisal of need for space (Stokols, 1972). Often, however, density is interpreted as a measure of crowding. There are two types of density – interior density and exterior density. Exterior density refers to the number of people in a geographic area, such as a square mile, an acre or an urban block. Interior density, in contrast, is typically measured by the number of residents per room in a household. There is considerable evidence that interior density is a more meaningful measure with respect to human health than is exterior density (Baum & Paulus, 1987). Customarily, people-to-room ratios exceeding 1.0 are considered 'crowded', but it is also common to question occupants regarding their perceptions of crowding.

AIR QUALITY

Together outdoor air pollution and indoor air quality constitute another type of environmental stressor: air quality. Indoor air quality issues include volatile organic compounds (VOCs), radon, carbon monoxide, and suspended particulates. A source for air quality information is the Environmental Protection Agency's (EPA) website (www.epa.gov/ebtpages/aindoorairpollution.html).

Volatile Organic Compounds

Volatile Organic Compounds, or 'VOCs', are chemicals (any compound containing carbon, hydrogen, and oxygen) released from building materials, cleaning supplies, paints, paint strippers, aerosol sprays, dry-cleaned clothing, and furniture and finishes. Among the most common VOCs is formaldehyde. Health consequences of VOC exposure include eye, nose, and throat irritation; headaches; loss of coordination; nausea; and damage to liver, kidney, and central nervous system. Often, VOC levels are highest just after a building is constructed and furnished, when 'off-gassing' from carpeting, fabrics, caulking, and other materials occurs. Levels also peak in residential environments due to hobbies such as stripping or painting furniture. Measurements of VOC levels can be taken at several locations within a residence or workplace by taking air samples. The samples are later analysed to yield the total VOC level (TVOC). State Cooperative Extension websites and publications are a good source of information regarding volatile organic compounds and other indoor air quality issues (e.g. www.fcs.uga.edu/pubs/current/R059.html).

Radon

Radon is a colourless, odourless, radioactive gas. It is a part of the decay chain of uranium and can enter a building where the foundation is in contact with contaminated soil. Because radon decay products are solids, they can become attached to dust in the air and be inhaled. The health hazard associated with radon exposure is lung cancer. It is estimated that radon results in 20,000 lung cancer deaths per year in the United States (Brookins, 1990). Radon contamination can be measured using a simple 'screening test' available at hardware stores for about $20. The problem with this technique is that radon levels are only measured for a few days and radon levels vary depending upon factors such as wind conditions and whether the ground is frozen. If radon levels are thought to be high, a better instrument is the 'Alpha Track Detector' (about $30). This can be put in place for 3–12 months for more reliable readings. The least reliable measurement instrument is the 'Grab Sampler', which is favoured by real estate professionals due to its speed and ease of use. The average indoor radon level is 1 pCi/L (picocuries per litre). Laquatra (1998) provides further information regarding radon.

Carbon Monoxide

Carbon monoxide is a colourless, odourless, poisonous gas produced by incomplete combustion. Indoor sources of carbon dioxide include

leaking chimneys and furnaces, back-drafting from furnaces, gas water heaters, wood stoves and fireplaces, automobile exhaust from attached garages, and environmental tobacco smoke. Outdoors, highway vehicle exhaust is the primary source of CO emissions. Vehicle exhaust contributes 60% of all CO emissions nationwide, and as much as 95% of CO emissions in urban areas. In the bloodstream, carbon monoxide reduces oxygen delivery to the body's organs and tissues. At low levels, carbon monoxide causes fatigue. At high concentrations, carbon monoxide causes headaches, dizziness, irregular breathing, confusion, impaired vision, loss of coordination, nausea, and flu-like symptoms. At very high concentrations, carbon monoxide is fatal. Carbon monoxide levels are measured using a carbon monoxide monitor. A special issue of *Indoor and Built Environments* is a resource for information regarding carbon monoxide (Descotes, Crépat & Hoskins, 1999).

Suspended Particulates

Particulate matter is a mix of solid particles and liquid droplets found in the air. Outdoors, fine particles (less than 2.5 micrometres) come from the fuel combustion of motor vehicles, power generation and industrial facilities as well as from residential wood stoves and fireplaces. Coarser particles typically originate from crushing and grinding operations or wind-blown dust (www. epa.gov/oar/aqtrnd97/brochure/pm10. html). Indoors, the primary sources of particulate matter is tobacco smoke. Homes with smokers are likely to have particle levels several times higher than outdoor levels. Both fine and coarse particles can accumulate in the respiratory system and lead to an aggravation of respiratory condition; irritation of eyes, nose, and throat; lung cancer; and premature death. Children, the elderly, and those with asthma are particularly vulnerable to the effects of particulate matter. Suspended particulate levels can be measured using an airborne particle counter.

Photochemical Smog

Photochemical oxidants are produced through a reaction of sunlight with hydrocarbons. The most common of these is ozone. Ozone is a gas that forms in the atmosphere when three atoms of oxygen combine (O_3). Ozone is created at ground level by a chemical reaction between oxides of nitrogen (NO_X), and volatile organic compounds (VOC) in sunlight. While ozone in the stratosphere (a layer 10–30 miles from earth) protects life on the planet from the sun's harmful ultraviolet rays, ozone on ground level or in the troposphere (to 10 miles up) can be harmful to human health as well as to vegetation. Ozone is a major contributor to urban smog. The causes of ground level ozone that contribute to smog include motor vehicle exhaust, industrial emissions, gasoline vapours, and chemical solvents. Exposure to ozone may cause chest pain, coughing, nausea, congestion, and throat irritation. Over a long period of time, ozone exposure may cause permanent damage to lungs (EPA, 1997). Data regarding levels of ozone and other air pollutants in regions throughout the United States can be accessed through the EPA's Automated Information Retrieval System ('AIRS') (see www.epa.gov/airsdata).

HOUSING QUALITY

Housing Quality Scales

Housing quality issues have been linked to health and injury as well as psychological well-being outcomes. Several housing quality scales exist (see Table 2). Bradley and Caldwell (1987) developed a set of home inventory scales (HOME) to measure aspects of the residential environment thought to affect the development of infants and children. There are four versions of this scale – appropriate for various age levels (i.e. infant/toddler, early childhood, middle childhood, early adolescence). The versions of the scale include a modest set of items addressing the physical environment (for example: building appears safe, outdoor play environment appears safe, neighbourhood is aesthetically pleasing, house has 100 square feet of living space per person, rooms are not overcrowded with furniture, house is reasonably clean, house is not overly noisy).

The Purdue Home Stimulation Inventory (PHSI) (Wachs, 1986) consists of several subscales coded by a trained observer. One section specifically addresses the physical environment including interior density, sound levels, room

Table 2. Housing quality and environmental design characteristics: measurement scales

Physical stressor	Relevant domains	Scales	Specific population
Housing quality	Privacy/crowding, infrastructure, hazards, indoor climate, etc.	HOME Inventory Scales (Bradley & Caldwell, 1987)	Children
		Purdue Home Stimulation Inventory (Wachs, 1986)	Children
		American Housing Survey (U.S. Census)	–
		Kasl, Will, White & Marcuse (1982)	–
		Evans, Wells, Chan & Saltzman (2000)	–
		Moos & Lemke (1994, 1996)	Elderly
		Norris-Baker, Weisman, Lawton, Sloane & Kaup (1999)	Alzheimers patients
	Home safety	Consumer Product Safety Commission	Elderly
		Wells & Evans (1996b)	Elderly
Design characteristics	Enclosure, visual access, proximity	Early Childhood Physical Environment Scale (Moore, 1994)	Children

decorations, visual access to the outdoors, and the existence of a stimulus shelter where a child can go to be away from noise and activity. Both the PHSI and the HOME scales primarily focus on parenting and on the social environment within the home.

Several other housing scales specifically address the adequacy or inadequacy of housing conditions that might function as physical stressors. Kasl, Will, White, and Marcuse (1982) developed a 29-item housing quality index based on the American Public Health Association's Housing Survey. The scale developed by Kasl and his colleagues involves residents' ratings regarding the adequacy of basic facilities (e.g. heating) as well as items regarding structural deficiencies rated by trained observers.

The American Housing Survey contains dichotomous questions that are used to designate housing as adequate or inadequate. Items address structural adequacy (e.g. plumbing, heating, electricity) and maintenance quality (roof upkeep, wall or floor conditions, plaster and paint condition, presence of rodents). These panel data target specific addresses (rather than occupants) and are collected every other year by the Bureau of the Census for the Department of Housing and Urban Development (see www.census.gov/hhes/www/ahs.html).

A recently developed housing quality scale was developed with mental health outcomes in mind. The scale includes six housing quality subscales: cleanliness and clutter, hazards, structural quality, indoor climate, privacy, and child resources (Evans, Wells, Chan & Saltzman, 2000). Questions regarding housing quality are coded by a trained rater using a three-point rating scale. For example, the structural quality subscale includes: 'Rate the worst ceiling/wall surface in the room, 0 = more than 1 square foot loose or missing, 1 = less than 1 square foot loose or missing, 2 = good.'

Some housing quality or environmental quality scales measure the adequacy of a setting for a specific population. Moos and Lemke (1994, 1996) developed a detailed instrument for the assessment of the designed environment for older adults. Eight subscales, consisting of 153 dichotomous items, evaluate community accessibility, physical conditions, social and recreational facilitation, prosthetic aids, spatial orientation support, safety hazards, staff support facilities and spatial adequacy. A specialized scale exists for the evaluation of facilities for people with Alzheimer's disease (Norris-Baker, Weisman, Lawton, Sloane & Kaup, 1999).

Home Safety

Safety issues can be particularly a concern for parents with young children (Gärling & Gärling, 1991) and for the elderly (Wells & Evans, 1996a) within the home environment. Potential hazards include uneven or broken stairs and steps, faulty

electrical wiring or space heaters, as well as trip and slip hazards such as electrical cords in walkway, loose rugs or carpets, and wet or slippery bathroom, porch, or balcony flooring. Several scales are directed to the homeowner to assist in self-assessment and remediation of home hazards. Home safety checklists are available from the Consumer Product Safety Commission (CPSC) (for example, regarding older adults, www.cpsc.gov/cpscpub/pubs/701.html) and through Cooperative Extension (e.g. Wells & Evans, 1996b). Data from the CPSC's National Electronic Injury Surveillance System (NEISS) indicate the number of annual injuries involving consumer products – from aerosol cans to zippers. The National Safety Council's (1999) annually published *Accident Facts* is also an excellent source for injury statistics.

ENVIRONMENTAL DESIGN CHARACTERISTICS

Floor Level

There are a variety of environmental design characteristics which may act as stressors on the occupants of a space. Among these possible stressors is *floor level* or *floor height*. Research has focused primarily on the effects of living on higher levels of apartment buildings on the psychological and social well-being of women and their children. Studies suggest that living on higher floors is associated with poor social and psychological well-being of mothers, as well as the disruptive behaviour of children (Evans, Wells & Moch, in press).

The measurement of floor height would appear to be straightforward, but has in fact been approached in various, non-equivalent ways. In some cases high-rise buildings are compared to low-rise buildings. Because this research design includes lower floor residents within the high-rise sample, it may not be equated with a comparison of higher floor residents with lower floor residents within the same building. Typically 'lower' floors are defined as floor four or five and below and higher floors have been variably defined as five and above, or 7 to 10, for example.

There are several environmental design characteristics related to the floor plan of a building and the configuration of furniture or partitions. These include architectural depth, enclosure, and proximity.

Architectural Depth

Architectural depth is defined as the number of spaces that a person must pass through to reach a particular room (Hillier & Hanson, 1984). For instance, if reaching a specific room requires passing through four rooms, the architectural depth of that room is five. Research suggests that architectural depth may be related to environmental stressors due to its potential to moderate the negative effects of crowding on social withdrawal (Evans, Lepore & Schroeder, 1996). Spaces with low levels of architectural depth may exacerbate the effects of crowding, while spaces with high levels of architectural depth can help to mitigate the negative effects. Depth can also directly influence social interaction and privacy.

Enclosure

Enclosure refers to the degree to which a space is open or closed. This concept has been particularly relevant in work environments since the 1960s when open-plan offices or 'Burolandschaft' were introduced by the Schnelle brothers from Germany (Sundstrom, 1986). The intention of this design is to reduce physical barriers (i.e. doors and walls) and thereby increase communication, improve the flow of work and enhance teamwork. Such a reduction in enclosure remains controversial, however. Some argue that it contributes to the environmental stress of a setting by increasing the *visual access* (able to see others) and *visual exposure* (able to be seen by others) of the occupant (Archea, 1977). This makes the regulation of social interaction difficult, increases the likelihood of disturbance due to conversation and noise from others, and may lead to territory or boundary regulation disputes. In school environments, open space plans have been found to elevate levels of distraction due to problems with noise and the frequent lack of a stimulus shelter where children can retreat (Moore, 1987).

Proximity

Proximity issues are similar to those associated with enclosure. While being near to those with whom you work or near to traffic flow or a lounge

area may foster some desired communication, it is also likely to contribute to distraction, unwanted social interaction, and ultimately, stress. The notion of *functional inconvenience* (Festinger, Schacter & Back, 1950) suggests that having some distance between work-mates may promote serendipitous contact and contribute to the generation of new ideas.

One scale that measures several environmental design characteristics of a space is a part of the Early Childhood Physical Environment Scales (Moore, 1987, 1994). This scale focuses specifically on the degree of enclosure (closedness or openness) of day-care settings and other educational facility floor plans, but includes the themes of visual access and proximity as well. The 10-item scale includes visual connection between spaces, closure of spaces, spatial separation between spaces, mixture of large open and small, enclosed spaces, separation of staff areas from children's, separation of functional areas from activity areas, separation of different age groups, and separation of circulation from activity spaces.

FUTURE PERSPECTIVES

Future work addressing the measurement of environmental stressors should focus on the further development of holistic scales that address a wider array of potential physical stressors. In addition, attention ought to focus on the continued development of population-specific (children, elderly, disabled) and on setting – or context-specific (e.g. rural/urban, home/workplace) scale instruments. Research on scale development also needs to consider conceptually relevant processes vis-à-vis the outcome of interest – an index for housing quality to predict respiratory health would likely differ from an instrument used to predict mental health. Furthermore, more attention is warranted regarding the interplay between the social and physical environments we inhabit (Evans, Johansson & Carrere, 1994; Moos & Lemke, 1994).

CONCLUSIONS

This entry provides a brief overview of the measurement of a variety of physical environmental stressors. These include noise, crowding, and air quality as well as housing quality and environmental design characteristics. Due to space limitations we have not covered the assessment of several other settings where physical stressors are salient. These include work environments and healthcare facilities. Furthermore, increasing evidence points to the role of natural settings such as parks, gardens, and wilderness settings to curtail cognitive fatigue (Kaplan, Kaplan & Ryan, 1998).

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RELATED ENTRIES

Applied Fields: Clinical, Applied Fields: Health Stressors: Social, Stress, Job Stress, Risk and Prevention in Work and Organizational Settings

STRESSORS: SOCIAL

INTRODUCTION

Environmental social stressors include both personal and societal factors. To provide a basic grounding in this field, we begin with a brief overview of definitional issues and theoretical perspectives. Specific illustrative examples of environmental stressors are considered next, followed by an overview of several illustrative assessment techniques, including a summary of their strengths and weaknesses. Finally, we conclude with some thoughts about possible directions for future research.

DEFINITIONAL AND THEORETICAL PERSPECTIVES

'Stress' can be described variously but is most often defined as person–environment demands that tax or exceed the individual's ability to adapt. A 'stressor' is an environmental, social, or internal

demand that requires readjustment and becomes a chronic stressor if present for an extended amount of time (Thoits, 1995). 'Distress' refers to a physical or psychological reaction, that may or may not be brought about by stress. Notable in all definitions of stress is that people respond differently to the same objective events. The nature, cause and effects of those differential reactions is the target of most empirical research on this topic. 'Environmental social stressors' include chronic and ongoing stressors (e.g. chronic strained social relations, chronic illness, and caregiving) which influence the health and well-being of the individual's current and evolving life course. Although the bulk of the literature on stress and coping has focused on life events, recent research suggests that chronic stressors may be more critical in terms of well-being. Thus, the focus of this entry is on chronic stressors.

To fully understand how an environmental social stressor can impact the individual, it is critical to place these experiences within a life span context. Individuals grow and develop over time and are influenced both positively and negatively by their experiences. These experiences often, but not always, have cumulative, both additive and multiplicative, effects on their health and well-being. When considering those factors that influence the occurrence and experience of stress it is critical to take into account those antecedent circumstances, history and life span events that have influenced the existing individual. These include gender, age, socio-economic status (SES), culture, race, ethnic, and religious background as well as historical period.

Thus, we know that children of the Great Depression as adults respond quite uniquely and negatively to stressful events such as job loss and job insecurity. Similarly, adults with a history of child or spousal abuse and other negative social relations may, as adults, react to stressful circumstances in a manner most familiar to them, i.e. by abusing others either socially, physically, or psychologically. But on the positive side, it is also the case that those with uniquely positive social interactions over the course of their life are most likely to engage in similarly positive exchanges as well as to expect support from others in times of stress. While recognizing the potential for life span consistency, one should also note that individuals can and do sometimes actively work to avoid consistency and stability in interactions and exchanges especially when past experience has been negative. Thus, the adult who experienced a childhood of poverty or racism might make especially certain that their own children are protected as much as possible from similar experiences.

Several prominent researchers have offered important theoretical perspectives updating traditional theoretical views of stress. Aldwin (1994) notes that stress and coping research most often focuses on psychosocial adaptation. She urges a recognition of the dual importance of both environmental context as well as personal skills and resources. It is this combination which produces maximum and optimal adaptation. Brown has provided clear and compelling evidence of factors which leave certain people most vulnerable to stress. He has noted that those with early childhood experiences of neglect or abuse, combined with a lack of protective factors (e.g. supportive relationships) and the presence of risk factors both personal and environmental (e.g. low self-esteem, poor marriage), resulted in greater vulnerability to stress and consequent depression. Recently, Brown and Moran (1997) have observed that societal events change circumstances. Thus, poverty during the Great Depression is different than poverty during years of affluence; war torn London is different from London today, and New York is forever changed by the recent World Trade Center terrorist attack.

Moos (e.g. Moos & Schaefer, 1993) has made important contributions to our views of stress which also complement the work of Brown. Most recently his work involving longitudinal designs has reiterated earlier findings indicating that life stressors can be offset by personal and social resources, while the use of certain types of coping such as avoidance coping is now known to be much less adaptive than approach or active coping. These findings are evident in cross-sectional studies but have also been found to predict both vulnerability to and remission from depression. Pearlin's (Pearlin, 1989) work has focused on the stress process. He cautions that we must include background factors such as SES, personal and family history, other resources such as coping and social support as mediators to better understand both primary stressors and secondary stressors as well as the individual's reaction to them. His application of this model to the caregiving situation has offered important insights about why some people are able to successfully cope with the burdens of caregiving

while others are not. Indeed, as Pearlin has shown, context is a critical determining element.

CHRONIC SOCIAL STRESSORS

There are several types of chronic environmental social stressors. Chronic stressors may exist in several domains such as work, financial, housing, relationships, health, and social life (Wheaton, 1994). These chronic stressors could be societal, e.g. racism and discrimination, or they could be individual, e.g. negative social interactions. Chronic stressors from different domains often occur simultaneously with a complex intertwining of several stressors.

Chronic illness, such as arthritis, can be considered a stressor in the health domain. Combine this health stressor with strained family relations, and complex relationships can be assumed to result. For example, chronic social stress may occur for a middle-aged woman balancing multiple roles (worker, spouse, mother) along with pain and difficulty performing everyday activities due to arthritis. These stressors can become overwhelming with the addition of excessive absences from work due to illness and the possible loss of income thus resulting in financial strain. Since chronic stress does not occur in a vacuum, the consideration of independent and interactive effects of multiple chronic stressors is important.

Rather than consider the complex web of stressors in several domains, it is sometimes useful to take a comprehensive look at an individual chronic stressor. Several investigators have focused on the negative stressful interactions that may occur in the caregiver relationship (Parris-Stephens, Townsend, Martire & Druley, 2001; Pearlin et al., 1990). Relationships can be strained when family members have a history of discord or when they cannot agree on how to care for a loved one. A child caring for a parent with Alzheimer's disease may have strained relations with siblings who are perceived as not doing their part. Negative social relationships can coexist with caregiver burden, thus becoming a secondary stressor that can be even more detrimental to well-being than the original stressor (Pearlin et al., 1990).

Another way to look at chronic social stress is in terms of ongoing negative social interactions, possibly as a result of a history of strained relationships among family members (Suitor, Pillemer, Keeton & Robinson, 1995). Early patterns of interaction stemming from childhood can influence relationships over the life course (e.g. parental favouritism, disappointment that a child did not fulfil expectations). It is also often the case that parents and adult children have different perceptions about the quality of their past and current relationships. For these reasons, assessing family conflict from the point of view of both the parent and individual adult children can be especially valuable (Suitor & Pillemer, 2000). Examples of negative stressful interactions include interactions which are overly critical, smothering or overwhelming, make too many demands, and interactions which get on your nerves. Network members can be a source of stress when expectations for support are not met and not having a confidant can be particularly stressful especially in the face of adversity such as financial strain or chronic illness.

SPECIFIC INSTRUMENTS FOR MEASURING CHRONIC STRESS

The measurement of chronic social stress is a critical issue. Table 1 summarizes several key measures. A wide variety of approaches are available to assess chronic social stress including use of self-report measures, structured or semi-structured interviews, and the daily diary method. An array of stress measures are available and described in detail in Zalaquett and Wood (1997; see Derogatis & Fleming and Moos & Moos below) which provides psychometric information for chronic stress measures and for other types of stress measures as well (e.g. daily hassles, major life events). Cohen, Kessler, and Underwood Gordon (1995) also provide a useful guide for measuring various types of stress, including chronic stress. Further, the *Encyclopedia of Stress* (Fink, 2000) is a 3-volume series which details stress across a broad variety of topics and issues.

In this entry, we focus on chronic stress measures. Measures in four areas of chronic stress research are reviewed: (1) comprehensive measures of chronic stress in multiple domains, (2) global chronic stress measures, (3) comprehensive measures of particular interpersonal stressors (e.g. caregiver stress), and (4) global

measures of chronic negative social interactions. The measure should be chosen after careful consideration of the purpose of the study, rather than on any specific or absolute criterion. However, the use of comprehensive, multidimensional measures of chronic stress, whether across multiple stressor domains or within one particular stressor, is generally the preferred method of assessment.

Comprehensive Measures of Chronic Stress in Multiple Domains

The investigator wishing to focus on the contribution of various domains of chronic stressors to well-being should use a comprehensive, multidimensional measure. Moos and Moos (1997) describe the 207-item Life Stressors and Social Resources Inventory (LSSRI) which assesses physical health status, housing and neighbourhood, finances, work, relationships with spouse/partner, children, extended family, and friends and social groups. The LSSRI includes measures of both life stressors and social resources. This measure is somewhat time consuming with the self-report format taking about 30 minutes and the structured interview format taking 30 to 60 minutes to administer. This measure is available in adult form and youth form, thus allowing an examination of chronic stress across a broad age range. Further, the multidimensional nature of this measure allows the assessment of chronic stress across a variety of domains. This measure shows good reliability on both the adult and youth form with alphas ranging from 0.79 to 0.84 for life stressors and social resources. Moos and Moos provide extensive reliability and validity information in Zalaquett and Wood (1997).

The Derogatis Stress Profile (DSP; Derogatis & Fleming, 1997) is a 77-item measure including three overall domains each with several subdomains. The domains are environment (domestic, vocational, and health), personality mediators (time pressure, driven behaviour, attitude posture, role definition, and relaxation potential), and emotional response (depression, anxiety, and hostility). This measure is relatively quick and easy to administer, taking approximately 12 to 15 minutes. The DSP shows good reliability with internal consistency measures ranging from 0.79 to 0.93 for the sub-domains and from 0.83 to 0.88 for the three overall domains. Extensive information is provided on reliability and validity in the Zalaquett and Wood (1997) volume.

Brown's Life Event and Difficulties Schedule (LEDS; Brown, 1989) is yet another useful general chronic stress measure that allows for the examination of multiple domains, such as work and family. This semi-structured interview is particularly useful in its use of contextual ratings from the researcher. Wethington, Brown, and Kessler (1995) and Lepore (1995) provide an overall review of this instrument. The LEDS allows for investigation of select stressors (e.g. work stress), but it is time consuming, and is somewhat controversial in the use of contextual ratings (Lepore, 1995).

Wheaton's (1994) chronic stress scale is a 51-item measure that assesses financial, general/ambient problems, work, marriage, and relationships, parental, family, social life, residence, and health. This measure captures chronic stress across multiple domains, yet is relatively short and easy to administer. See Wheaton (1994) for a detailed description of this measure and its validity, and Turner, Wheaton, and Lloyd (1995) for the actual measure.

Global Chronic Stress Measures

If time is an issue, a shorter, global stress measure may be appropriate. Cohen's Perceived Stress Scale (PSS) is a 14-item measure of appraisal of life stress. This global stress measure assesses the perception that life is unpredictable, uncontrollable and overloaded. The PSS is quick and easy to administer. It is most appropriate for studies on chronic stress in general and less useful in terms of capturing chronic stress in a specific domain. The PSS showed good reliability in 2 college samples and a smoking cessation study sample with alphas equalling 0.84, 0.85, and 0.86, respectively. Further psychometric information is available from Cohen, Kamarck, and Mermelstein (1983).

Comprehensive Measures of Particular Interpersonal Stressors

To assess multiple aspects of a specific stressor (e.g. caregiver stress), comprehensive, domain-specific measures are available. Pearlin et al. (1990) has developed reliable and comprehensive measures of

family conflict related to caring for a loved one with Alzheimer's disease. These measures assess background and context variables, primary and secondary stressors, social support and coping mediator variables, secondary intrapsychic strain, and multiple outcomes as well as family disagreement about issues of safety, affection and appreciation. Similarly, Parris-Stephens and colleagues (2001) used reliable measures to assess instrumental stress (stress related to helping with transportation, shopping etc.), behavioural stress (stress related to dealing with a parent's emotional and memory problems and agitation etc.), and interrole conflict (not enough time/energy, too many demands). See Table 1 for alphas on these two measures.

Global Measures of Chronic Negative Social Interactions

There are several issues to be considered in assessing the effects of chronic negative social interactions on health and well-being. Although not framed explicitly as chronic stress in the literature, many investigators are studying the impact of negative social relations which are often chronic in nature. Several investigators use global, source-specific measures to focus on specific aspects of social relations and these studies make important and unique contributions. Some focus on both positive and negative aspects of support (e.g. Antonucci, Lansford, & Akiyama, 2001; Reinhardt, 2001; Rook, 2001) as well as the source

Table 1. Key/illustrative measures

Authors	Measure	Item description	Use
Antonucci, Lansford & Akiyama (2001)	Negative and positive social relations	Example item: 'My friend/spouse gets on my nerves.'	Quick and easy to administer Global measure
Brown & Harris (1989)	Life events and difficulty schedule	Interviewer's contextual ratings of chronic stressors (e.g. work)	Part of multidimensional assessment of stressors: severe events, financial hardship, work experience, childhood adversity
Cohen et al. (1983)	Perceived social stress	Example items: 'How often have you felt nervous and stressed?' $\alpha = 0.84$ to 0.86	Global stress measure Quick and easy to administer
Derogatis & Fleming (1997)	Derogatis stress profile	Environment $\alpha = 0.85$ Personality mediators $\alpha = 0.88$ Emotional response $\alpha = 0.83$	Multidimensional measure Assesses outcome
Moos & Moos (1997)	Life stressors and social resources inventory	Physical, housing, finances, work and relationships αs range from 0.79–0.84	Multidimensional measure Adult and youth forms
Parris-Stephens, Townsend, Martire & Druley (2001)	Parent care stress	Instrumental stress $\alpha = 0.79$ Behavioural stress $\alpha = 0.74$ Interrole conflict $\alpha = 0.74$	Multidimensional measure of parent care stress and role conflict
Pearlin et al. (1990)	Family conflict	Issues of seriousness/safety of loved one $\alpha = 0.80$ Attitudes and actions toward patient $\alpha = 0.86$ Attitudes and actions toward caregiver $\alpha = 0.84$	Comprehensive measure of family conflict
Rook (2001)	Daily social exchanges – positive and negative	Example items: Asked if someone 'Made them angry', 'Hurt their feelings' $\alpha = 0.81$ aggregated over 14 days	Daily diary study – difficult and time consuming but can assess chronic stress on daily basis
Turner, Wheaton & Lloyd (1995)	Chronic stress	Example items: 'You want to change jobs but don't think you can.'	Multidimensional measure

of support (such as spouse, children, friend) (e.g. Antonucci, Lansford & Akiyama, 2001; Reinhardt, 2001). Reinhardt (2001) assessed positive and negative support *provided* and *received* thus illustrating another facet of measuring social relations. Furthermore, sociodemographic characteristics including age, culture and gender influence positive and negative social relations. See Table 1 for examples of these kinds of measures.

FUTURE PERSPECTIVES AND CONCLUSIONS

Research thus far indicates that stress is fundamentally affected by individual and environmental issues and needs to be considered within a lifespan perspective. While recent evidence makes it increasingly clear that longitudinal research is critical, also important is the use of multiple assessment methods ranging from detailed qualitative interviews of special populations to quantitative assessments based on representative samples.

Lepore (1995) suggests the use of naturalistic observation, informant-based observations and laboratory analogues of conflict. It might be informative to combine several measures including self-report. The daily diary approach offers an interesting way to capture the chronicity of negative stressful relations, as well as other stressors. Participants typically complete a daily checklist to assess positive and negative stressful social exchanges (e.g. Rook, 2001). Alternatively, qualitative studies offer rich information about the history of stressful relationships among adult children and their parents.

Wheaton (1994) suggests measuring several types of stress such as chronic stressors, life events, and daily hassles. This strategy will allow for a more complete assessment of stress as well as the independent or interactive effects of stress on well-being. Similarly, Thoits (1995) suggests that instead of debating the value of measuring life events versus chronic stress, it may be useful to examine event/strain sequences and how they work together to influence well-being.

Lepore (1995) points to two technical challenges in stress research. First, the need to disentangle subjective and objective stress measures. There is a tendency to rely on self-report measures of stress and conceptualize the same measure as both objective and subjective. Second, it is critical to assess the duration and onset of chronic stress which is not an easy task. Illness duration is especially important in relation to health outcomes; however, it is often neglected in research. The chronic nature of the stressors discussed above has the potential to lead to poor psychological and physical health. However, most studies assume chronicity without actually assessing duration and onset of social stress (Pearlin, 1989; Lepore, 1995). Due to the ambiguous nature of social stress it is difficult to determine when it began. However, it is important to measure onset and duration to truly understand the relationship between chronic stress and physical and psychological health over time (Lepore, 1995).

Thoits (1995) provides several suggestions for future research. First, much stress research focuses on psychological well-being while assuming the results apply to physical health outcomes as well. Research needs to focus on which types of stress are related to which outcomes. A second area that needs further exploration involves the carry-over effects of stress across individuals, roles, and stages of life. Does work stress carry over to affect one's spouse? Does stress from childhood have important implications for well-being in adulthood? Finally, most research assumes that stress is inherently negative. However, stress may be harmful to well-being in the short-term but valuable in the long-term.

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RELATED ENTRIES

Applied Fields: Clinical, Applied Fields: Health, Stressors: Physical, Stress, Job Stress, Risk and Prevention in Work and Organizational Settings

SUBJECTIVE METHODS

INTRODUCTION

The term subjective methods refers to a series of methods aimed to assess the psychological structure, content, and processes of individuals' subjective views, or personal meanings, about themselves and the world. These methods have been created and used by researchers more interested in the personal constructions of subjects than in classifying or locating them along theoretically pre-established dimensions or constructs (e.g. extraversion, locus of control). Typically, subjective methods are employed within orientations that place an emphasis on

the subject's personal constructions such as constructivist (Neimeyer, 1993; see entry on 'Theoretical Perspective: Constructivism'), hermeneutic, and narrative approaches. In this entry we will briefly describe the Repertory Grid Technique (RGT), the semantic differential, and provide a broad perspective on adjective lists, narrative methods and hermeneutics, although we recognize that, in their practice, psychologists have used a wider array of other less structured subjective methods.

REPERTORY GRID TECHNIQUE (RGT)

In the context of his 'Personal Construct Theory' (see entry on 'Personal Constructs'), George Kelly (1955) created the Role Construct Repertory Test, or reptest, and also its grid form. Since then, it has evolved not as a test but as a methodology known as RGT (for a review see Feixas & Cornejo, 1996; Fransella & Bannister, 1977; Rivas & Marco, 1985) with a variety of formats and applications which not only assess various issues in clinical psychology but also cover vocational assessment, education, business practice/management, and other more remote areas such as landscape appreciation and the study of urban tribes or anthropological investigation of folk beliefs of primitive tribes, with more than 2000 publications (Neimeyer, Baker & Neimeyer, 1990).

Defined broadly as 'any form of sorting task which allows for the assessment of relationships between constructs and which yields this primary data in matrix form' (Bannister & Mair, 1968: 136), the RGT assesses the dimensions and structure of personal meaning, usually in the subject's own terms. Thus, it aims at grasping the way an individual (although it has also been applied to the study of groups and institutions) makes sense of him or herself and others. The RGT explores the structure and content of the construct systems, implicit theories or meaning structures with which people construct their experience, perceive and act.

The administration of the RGT involves four stages (Feixas & Cornejo, 1996) in the context of a structured interview. First, a grid format must be adapted to the specific aims of the assessment as applied to a particular subject or group. Second, a set of usually 10–20 elements must be selected from the subject's world. Often, these elements represent various 'role titles' of significant others (heading columns in the example shown in Table 1) who play a part in the person's life (e.g. family members, employer, friends, a disliked figure) including his or her present self and the ideal self. However, a wide array of phenomena have been used as elements, including parts of one's body, self-roles, countries, occupations, and situations involving death and dying. Third, in order to elicit the constructs (which will be written in the rows, as in Table 1) the individual is asked to concentrate on pre-selected groupings of two or three elements and to construe them in terms of their similarities and/or contrasts, which requires the subject to provide the meaning dimensions that make these elements similar or different. In so doing, this interview elicits the personal templates by means of which the person interprets that particular domain of her or his experience. In the fourth stage, usually employing a rating system (Likert-type scale), the subject is required to allocate the remaining elements to the elicited constructs which takes a grid form with the elements as columns and the constructs as rows. Thus, by applying (rating) all the constructs across the entire set of elements a grid data matrix is created (see Table 1). This matrix can be analysed in a variety of ways ranging from qualitative appreciation of the nature and quality of the constructs used to the statistical analysis of the data using cluster analysis or factor analytic methods. Finally, a number of cognitive measures can be extracted (differentiation, cognitive complexity, self-esteem, conflict analysis, extremity of ratings, etc.) which can serve both to generate clinical hypotheses and to look for individual differences.

SEMANTIC DIFFERENTIAL (SD)

This instrument was created in the context of Osgood's (e.g. Osgood, Suci & Tannenbaum, 1957) mediation theory. According to this, 'words represent things because they produce in human organisms some replica of the actual behaviour towards these things, as a mediation process' (p. 7). To study the structure of meaning Osgood and his colleagues carried out a series of experiments which were to be the basis of the SD. A large number of subjects were provided with lists of, for example, 50 adjectives randomly

Table 1. An example of a client's repertory grid (translated from Feixas & Cornejo, 1996)

Date : Jan. 4th. 1990. Name: Daniel X.		1 Self now	2 Mother	3 Father	4 Brother	5 Sister	6 Spouse	7 Grandmother	8 Male friend	9 Female friend	10 Non-Grata	11 Therapist	12 Self before problems	13 Ideal self
1. anxious	1. relaxed	1	2	4	2	2	2	1	3	1	3	6	3	7
2. no bother	2. committed	4	5	2	5	6	7	4	3	7	3	7	5	6
3. sex drive	3. no sex drive	1	7	1	1	4	4	5	4	4	4	4	7	4
4. adjusted	4. unmanly	7	4	2	2	4	4	4	2	4	4	1	3	1
5. dreamer	5. realistic	1	4	7	7	3	6	4	6	2	1	4	1	4
6. idealist	6. materialist	5	4	6	4	1	2	7	5	2	4	4	6	4
7. responsible	7. irresponsible	7	2	2	3	1	1	6	5	1	7	1	6	1
8. understanding	8. intolerant	5	5	5	2	4	2	6	2	2	5	1	6	1
9. perverse	9. sexually healthy	4	4	3	2	4	7	4	4	4	1	7	4	7
10. worried	10. happy	1	2	4	2	3	4	3	4	1	1	7	4	7
11.	11.													
12.	12.													
13.	13.													
14.	14.													
15.	15.													

1 VERY MUCH SO
2 QUITE A LOT OF
3 A LITTLE
4 MIDDLE POINT
5 A LITTLE
6 QUITE A LOT OF
7 VERY MUCH SO

chosen from a thesaurus in the form of 7-point scales (e.g. rough–smooth). On each of these scales, subjects were asked to rate a number of concepts (such as boulder, father, sin, Russian, me, etc.). These procedures produced large amounts of data that were factor analysed, which in different studies tended to yield what was called an *evaluative* factor, which usually accounted for 35% of the total variance. A second factor that emerged was termed *potency*, and the third one, *activity*. These were assumed to be the basic dimensions of meaning, defined as a semantic space in terms of which an individual could plot a particular concept.

For application to an individual case, the usual procedure is to select a number of scales which previous studies have shown to be relevant for the purpose of the study, and to ask the subject to apply them to a set of selected concepts representing the topic of the study. The SD offers then the opportunity for cross-comparison of the meanings of two different words for one subject, or the meanings of the same word for a number of subjects, by enabling the experimenter to sum ratings in terms of three allegedly major dimensions of meaning.

ADJECTIVE LISTS (AL)

As in the above methods, this heading does not refer to one single instrument but encompasses a variety of procedures that have in common the presentation to the subject of a list of adjectives for application to her or himself or to others using a given rating scale. ALs can be constructed for a specific case in a particular situation according to the purpose of the assessment; however, with time more and more standardized lists have appeared. Some are suggested for use as instruments to assess a particular condition (e.g. depression) while others have been used since the 1940s (Allport, Cattell) as a method for the study of personality. The idea of using ordinary language for the study of personality is based on the so-called 'lexical assumption' according to which the ideas or individual differences which people consider important will eventually become encoded into words.

One of the most used ALs is Wiggins' (1995) Interpersonal Adjective Scales which measures Dominance and Nurturance, which are viewed as important dimensions of interpersonal behaviour. Respondents rate themselves on a list of 64 pre-established adjectives using a 8-point Likert scale according to how each adjective best describes them.

NARRATIVES AND HERMENEUTICS

The use of narrative texts has been proposed as a complement to traditional methods of psychological assessment and, in some cases, as an alternative. Allport (1942) was perhaps the first to call attention to the psychological value of texts such as diaries, letters, memoirs, and life stories (interview transcripts might also be added to the list). But it has not been until the last two decades of the 20th century that the use of narratives has acquired prominence. Its psychological value is based on the hypothesis, maintained by Bruner (e.g. 1991), and other authors such as Howard, Mitchell, Polkinghorne, and Sarbin, that construction of experience is of a narrative nature.

Narratives have been used as a means for assessment not only in psychology but also in sociology, education, and anthropology, as well as medicine for diagnosis, to evaluate issues of gender, race, religion, social class, etc., and also aspects related to development in infancy, adolescence, and old age. Narratives have become particularly relevant in psychotherapy after the work of White and Epston (1990).

Work with narratives has a hermeneutic character, since these texts must be considered themselves a hermeneutic product or construction. Many studies have directed their attention to the structure or the content of narratives. Thus, a possible focus would be centred on the study of the script (plot analysis), each story following a progressive, regressive, or stable line. The protagonist, appearing as a victim or a hero, can also be the object of the analysis. The story can be considered fragmented or coherent, open or closed. In any case all stories follow a narrative scheme that obeys the invariable structure of narrative grammar, constituted by a context, a beginning, movement leading towards an established goal, an outcome, and an ending.

A distinctive perspective can focus on the categories of the contents, applying, for example, attribution styles (internalization, stability,

globality) to the narrated episodes. In turn, Angus and Hardtke's (1994) coding system provides three codes for processing narratives: external, which supposes/consists of a description of events, internal, which refers to subjective experiences, and reflexive, which involves analysis of those experiences. Another system is that of McAdams (1993) who proposes the categories of communion (love/friendship, dialogue, care/help, and community) and agency (self-mastery, status, achievement, and empowerment). The researcher may either use these or other existing categories or employ *Grounded Theory* as the frame to derive categories directly from the text.

Some authors, however, believe that the models described thus far do not respect the 'autonomy of the text', in that for their analysis they introduce external categories, or fragment or isolate the text from the context in which it was produced. For example, Villegas (1993) postulates a textual hermeneutics on the basis of linguistic concepts, such as text and context, coherence, relevance, macrostructures, and macropropositions. Utilizing these concepts, he attempts to extract from the text's own structure the hermeneutic keys for its interpretation, paying more attention to the discursive aspects of the text.

FUTURE PERSPECTIVES

Subjective methods, in comparison to traditional approaches to psychological assessment, have always had a marginal impact on mainstream psychological practice. Recently, however, with the increase in theoretical interest in postmodern thinking, complexity, and constructivism (and some dissatisfaction with conventional assessment approaches), subjective methods may find their way in the psychological arena. Particularly, in the area of psychotherapy (e.g. Feixas & Villegas, 2000), these approaches are becoming more influential, probably because more traditional, often simplistic, models do not deal adequately with the complexity encountered in clinical practice.

The future might provide varying perspectives for the different methodologies described. With respect to the RGT, its use has already been quite extensive in terms of the number of studies and the topics covered but its impact as an assessment tool of choice among practitioners is still limited. The proliferation that has occurred in the last 15 years of computer programs for both the administration and analysis of repertory grids may prelude a substantial growth both in psychological practice and research. In particular, the availability of information through various university based websites (e.g. www.ub.es/personal/pcp.htm or www.med.uni-giessen.de/psychol/pcpmain.htm), and even the possibility to access these computer programs through the Internet (www.repgrid.com or www.terapia-cognitiva.net), might facilitate the dissemination of this approach. In any case, we can count among the major potential drawbacks of RGT its complexity and its mainly idiographic focus (see entry 'idiographic methods') – precisely (and paradoxically) those aspects which constitute also its strength. RGT is not a quick and ready-to-use instrument, rather it needs to be adapted to the assessment purposes for which it is to be used. The data analysis (involving some interpretation of statistical analysis) is not a simple task either. For this reason, some training is required in order to develop the necessary skills to apply the RGT with a certain degree of success. Finally, the preference of RGT for using the subject's constructs and for adjusting the grid format to the individual makes the generalizability of the results a complex task. In sum, RGT accumulates a number of substantial advantages for those seeking a systematic instrument to investigate the structure of personal meanings provided that they want to take the effort to study with detail the issues regarding administration and analysis, and the theoretical context in which it is embedded.

The SD has received a certain amount of attention in the field of social and personality psychology. The possibility of selecting a set of scales to evaluate some target concepts make this instrument a reasonable choice for investigating a variety of research topics. In the past we have not witnessed, however, an increase in the number of studies using SD. Reasons for this can be found in the absence of theory development related to the instrument, or the little interest that it has provoked in applied contexts (either clinical or educational). SD appears to be half-way between entirely idiographic and traditional methods. Maybe we can attribute to this characteristic the present situation and future perspective of this technique.

With respect to AL, a continuously growing trend can be identified in the existing literature. Starting with the industrious studies involving hundreds of adjectives with large samples, the use of AL has evolved via a series of instruments for assessing personality-related and clinical issues. In all likelihood, these two areas represent the more promising perspectives for this approach. In the area of personality assessment, ALs have been part of the development of the big five factorial and the interpersonal circumplex models (see De Raad, 1999); developments that can be located within the mainstream lines of this area. In the clinical context, a number of specific ALs have appeared and are being used for research and practical purposes in areas of enormous relevance such as depression, and personality disorders. As said, all these developments provide the basis for the prospect of substantial growth of AL-based instruments in the future of personality and clinical psychology.

Finally, as suggested, hermeneutic and narrative methods grew out of a long tradition in psychology and, at the same time, are gaining more and more interest not only in psychology but also in other disciplines. Probably these methods will gain momentum when implemented in conjunction with computer programs that facilitate and normalize the tasks involved in performing such analyses. In fact, nowadays this is beginning to happen already with software such as *Nudist* or *Atlas-TI* designed to analyse texts. Perhaps, among the major disadvantages of these methods, we can count its great diversity and the amount of work in detail required to work with narratives.

CONCLUSIONS

Subjective methods, and the theories from which they derive, have always been a marginal trend in psychology, in a broad sense, and in psychological assessment, in particular. However, this has not led them to 'extinction' but rather to an impressive development across the years in a variety of different directions. These varied groups of techniques have informed theoretical issues in personality as well as applied ones in psychological practice (assessment and psychotherapy). In fact, the range of application of these methods is so broad (as with, e.g., narrative methods) that they have been used by other disciplines. Perhaps the diversity of existing subjective methods might be its central, more distinctive quality. One of the dimensions along which we can plot the different approaches to psychological assessment covered in this entry is related to the degree the researcher uses the subject's own constructions or wordings (as in RGT and narrative/hermeneutic methods) or rather asks the subject to rate him or herself in pre-established categories (as in AL and SD). We can also find intermediate solutions to this question when looking at particular procedures.

In sum, in this variety lies the richness and the major difficulties of subjective methods. The degree to which psychology practitioners will be able to deal with this complexity will determine the value and the future of these methods.

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RELATED ENTRIES

Theoretical Perspective: Constructivism, Personality Assessment (General), Autobiography, Idiographic Methods, Qualitative Methods, Personal Constructs

SUBSTANCE ABUSE

INTRODUCTION

Substance abuse is not only a behaviour referring to the occurrence and/or frequency of drug use, but it also supposes a particular lifestyle. Drug use, which may or may not lead over time to abuse, is one more behaviour of the many carried on by an individual in the process of adaptation to the environment in which he or she lives. It does not necessarily have to mean a change in lifestyle; it may affect just one specific area and be limited to that. On the other hand, development of an addiction is associated with a radical change in the individual, which is far greater in the case of illegal substances. An evaluation of addiction must also involve an assessment of all the variables potentially involved in the development of the addiction. Addiction appears to be an interactive product of social learning in a situation involving physiological events: both the social and psychological factors, and the physiological elements are indispensable features of the total experience and process of addiction. In this entry, we will refer in general to the assessment of consumption of illegal drugs, in the belief that all the variables evaluated in legal drug use are included here (Table 1).

THE EVALUATION PROCESS

An approach like this involves the use of multiple assessment procedures and a focus on multiple target behaviours. This means that we have to know the topography and functionality of self-administration of a psychoactive substance, and all the behaviours which are included in this lifestyle, as well as the areas which have been affected and the aspects of the context and of the subject which may have effect or be affected, in order to decide whether they are or are not problem behaviours, the variables to be modified or the points of support or of departure in the rehabilitation process. The characteristics of the

Table 1. Psychoactive substances

Psychoactive substances	Legal substances	Tobacco
		Alcohol
	Illegal substances	Cannabis-related
		Cocaine-related
		Opiates
		Psychotropics and barbiturates
		Hallucinogenics
		Chemical products and precursors
		Others

substance are important in trying to explain the addiction to consumption of that product (whether tobacco, alcohol, opiates, designer drugs or any other), but there are other variables which are just as important in the explanation of the addiction, such as basic repertoires of behaviour of the individual, the learning history, or the risk variables of the context. In short, the evaluation process, to be implemented, must have an integrating effect and make possible the use of a variety of sources and techniques which allow its reliability to be enhanced. In this sense, account is not only taken of information provided by the consumer, by also that from family members and peers. The aim of the assessment must be to decide on the functional relations in place between the different variables involved (of the behaviour, the subject and the context), so as to design the most appropriate intervention procedure for the particular case. Functional analysis allows the following:

- Detection of the problem behaviours.
- Knowledge of the function variables making up the interaction.
- The other variables, not part of the interaction or specific to it; they are, rather, facilitating variables as much of the individual as of the surroundings, and affecting the likelihood that the interaction will happen.
- Design of a specific intervention for each individual; to establish targets: to choose the most suitable device; to decide whether support resources are needed; to select the therapeutic programmes; and to determine the specific intervention techniques.

Addictive conduct is highly complex and requires multiple interventions from a number of standpoints, depending on the aim of the intervention to be carried out, and the timing (e.g. a drug-free programme or a damage-limitation programme). The decision-making assessment for this decision is different, as is the weighting of the variables: this means that if a decision is to be made as to the most suitable detoxification procedure, biological and social variables will have greater weight. However, it will be particularly the biological and social variables which will decide on the treatment procedure and the specific intervention programmes in the phase for escape from the habit.

In an initial detoxification phase, there must above all be an evaluation (apart of course from the essential medical assessment) of the self-control skills, including previous attempts at detoxification (how many, when, the procedure, result, etc.), the information the subject has on withdrawal symptoms and the detoxification process, and the fears and skills for confronting it.

Once detoxification has been achieved, the assessment follows for the design of the treatment. Separate consideration will be given to the topographic analysis of consumption behaviours and its functional analysis, as shown in Figure 1.

INSTRUMENTS AND TECHNIQUES OF ASSESSMENT

The most-utilized assessment techniques and tools are the interview, observation, self-reports and self-registers, peer registers and reports, and physiological records and biochemical analyses. Most of the tools used in the evaluation of drug use have not been scaled: they have been developed and used for specific samples, making it difficult to compare and generalize results (except with reference to medical analyses and tests). We also consider it necessary to make a clarification concerning the aims of some drug-dependence assessment tools: since 1977, the WHO has proposed the so-called 'bi-axial concept' of addiction, whereby a distinction has to be made between what is referred to as the 'substance-dependence syndrome' and the problems related with consumption. The dependence syndrome is made up of a set of symptoms making up a common psycho-biological process forming the theoretical basis for current DSM and CIE nosological criteria. For their part, the problems related with drug consumption refer to the bio-mental-social deterioration associated with the use of substances, separating them from the nosological entity of 'dependence'. The tools for the assessment of each of these two aspects differ, as will be shown below. At all events, we cannot ignore the fact that the purpose of psychological assessment must always be a functional analysis of the specific case, irrespective of whether it is in line with a particular diagnostic classification, or the problems go beyond the pure consumption of drugs.

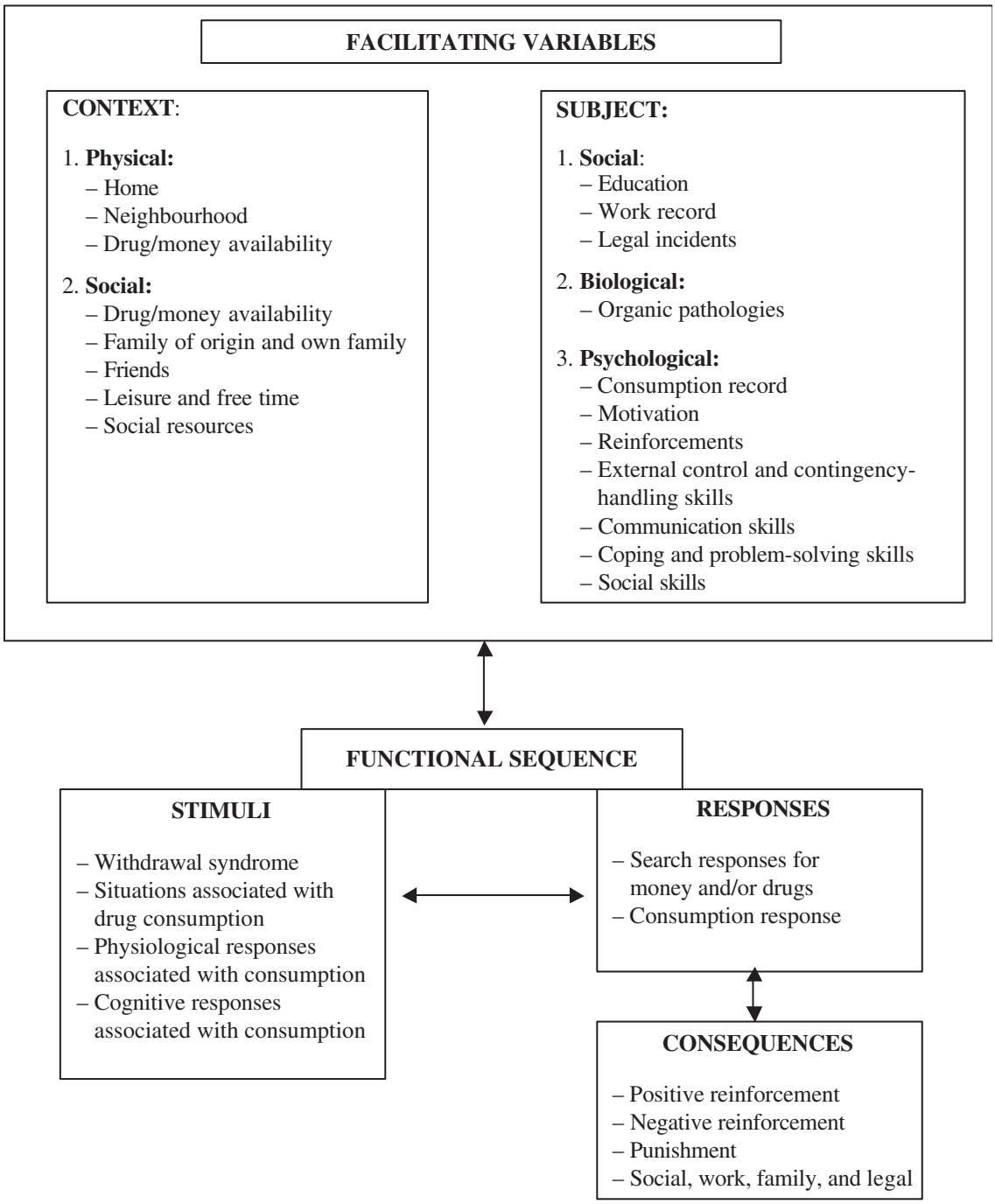

Figure 1. Functional analysis of drug-consumption behaviour.

A psychologist is interested in explaining why that consumption behaviour occurs in that particular individual, and then to use this explanation in the design of the specific treatment which will make it possible to modify the variables underpinning the problem in question. We will examine some of the current most-used tools, which are summarized in Table 2.

Table 2. Specific addictive behaviour assessment tools

Interviews		Self-reports	Physiological records and biochemical analyses
Assessment of the degree of dependence • CIDI-SAM (Cottler et al., 1989) • SCDI (Spitzer et al., 1990) • SCAN (Wing et al., 1990)	Assessment of consumption-related problems • ASI (McLellan et al., 1992) • OTI (Darke et al., 1992)	• SDS (Gossop et al., 1995) • SODQ (Sutherland et al., 1986, 1988) • CCQ (Tiffany et al., 1993)	• Urine analysis • Serological analysis • Toxicological analysis

Interviews

Most interviews used in drug-consumption assessment follow a semi-structured format aimed at securing data on virtually all the variables involved in drug-consumption: consumption record, previous abstinence attempts and periods, the motivation for the change, self-control, leisure and free time, social skills, etc. Interviews which assess dependency DSM-IV, according to the CIE-10, are the *Composite International Diagnostic Interview – Substance Abuse Module* (CIDI-SAM, Cottler et al., 1989), the *Structured Clinical Interview for DSM-III-R* (SCDI, Spitzer et al., 1990) and *Schedules for Clinical Assessment in Neuropsychiatry* (SCAN, Wing et al., 1990). Such interviews are aimed at evaluating all symptoms defining the dependence diagnosis, and they are the reference tool in research projects using APA or WHO criteria. On the other hand, the *Addiction Severity Index* (ASI, McLellan et al., 1992) is a semi-structured interview designed to evaluate consumption-related problems; in each area assessed, the interviewer establishes a severity index between 0 (the absence of a real problem, suggesting no need for treatment) and 9 (extreme likelihood, treatment absolutely essential). An adaptation has been developed for the European situation (*Addiction Severity Index – EuropAsi*, Kokkevi & Hartgers, 1995), which is currently being validated in a number of countries in the community. A similar line is followed in the *Opiate Treatment Index* (OTI, Darke et al., 1992).

Self-Reports

In addition to the usual self-reports assessing the psychological variables involved in the addiction process, and which are summarized in the corresponding sections of this project (personality variables, anxiety, social skills, self-efficiency, etc.), there are some tools specifically designed to evaluate consumption behaviour. Some seek to assess dependence both in terms of category (presence or absence) and of scale (seriousness), irrespective of the inclusion of all the elements of diagnosis or the definition of a notion of dependence other than those established by the most accepted criteria. One is the Severity Dependence Scale (SDS, Gossop et al., 1995); it consists of five questions with Likert type answers, giving a total score of the sum of each item. This scale has been the subject of an internal consistency analysis, an analysis of the main components and the correlation of some consumption variables, in a sample of heroin- and amphetamine-dependent subjects. Another commonly used tool is the Severity of Opiate Dependence Questionnaire (SODQ, Sutherland et al., 1986, 1988), which is almost exclusively aimed at evaluating withdrawal syndrome and tolerance. For its part, the Cocaine Craving Questionnaire (CCQ, Tiffany et al., 1993) seeks a multidimensional assessment of the craving for cocaine, in two versions: *Now* (immediate craving) and *General* (craving during the last week).

Physiological Records and Biochemical Analyses

While not psychological tests, they are also fundamental to the performance of functional analysis. There are a large number of tests which drug-dependent subjects must complete prior to the onset of any treatment (NIDA, 1986); urine

analysis (costly, like the radio-immune test – RIA – or gas chromatography/mass spectrometry (CS-SM), or low-cost such as fine layer chromatography or the immune-enzymatic test), serological analysis, and toxicological analysis (including immunological, spectrophotometric and chromatographic procedures) are all designed to evaluate the individual's general state of health, the presence of all forms of organic pathologies, and the actual consumption behaviour, by analysis of the metabolites the substance leaves in the body. In this sense, it is a standard practice that the information given by the individual or by peers on the consumption behaviour is compared with the results of the analyses, making it possible to identify precisely the presence or otherwise of the consumption of a variety of substances.

FUTURE PERSPECTIVES

The development of the psychological assessment of addictive behaviour is very slow, and is conditioned by the difficulties inherent to such conduct (confusion about the models for the genesis and maintenance of drug consumption, the illegal nature of the conduct, penalization of the individual if undergoing treatment and he or she consumes drugs, etc.). In recent years, there has been almost no alteration to the assessment process used in drug-consumption, nor in the techniques applied. With the progressive introduction of damage-limitation programmes (methadone or naltrexone maintenance, etc.) which have gradually replaced drug-free schemes, the main advances in assessment have been in urine-detection tests for the presence of methadone and other drugs, and we believe that it is in this area where the most significant advances will take place.

Another developing line refers to the evaluation of so-called *Personality Disorders* and their influence on the treatment of addictive behaviour. While this category is more than questionable as such, it is true that recent years have seen a sharp trend in the assessment and treatment of addiction behaviour aimed at examining the comorbidity between substance abuse and personality disorders, and their possible repercussions in the development and the results of intervention. Along these lines, the use is becoming established of the International Personality Disorders Examination (IPDE, Loranger et al., 1994) to identify relevant behaviours for the assessment of the various personality disorders according to DSM-IV and/or CIE-10 criteria, and their connection with addictive conduct. This tool is the result of the efforts of the World Health Organization (WHO) and Alcohol, Drug Abuse and Mental Health Administration (ADAMHA) to create universally applicable standardized assessment instruments.

CONCLUSIONS

The assessment of addictive behaviour is a very complex matter, not just because of the large number of variables involved defining a complete consumer lifestyle, but because of the features of the behaviour as such; drug consumption is illegal and so its assessment confronts difficulties outside the strictly psychological and/or technical realms. As with any other behavioural problem, the ultimate aim of assessment must be the functional analysis allowing the problem in question to be explained. There must be assessment of the variables of the subject, the behaviour and the context, not just those which may be considered to facilitate the conduction, but also those making up the functional sequence. The elements used in the evaluation of the variables other than consumption itself are those which are habitual in the psychological assessment of any problem: the specific means of consumption are characterized by the fact that they have been developed and used for specific samples, making comparison and the generalization of results difficult (except in respect of medical analyses and tests). Apart from psychological assessment, medical-biological evaluation is essential in the problems of addiction in order to identify possible organic pathologies, and for the detection of metabolites of the substances consumed.

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María Xesús Froján Parga

RELATED ENTRIES

Applied Fields: Clinical, Applied Fields: Health

TEMPERAMENT

INTRODUCTION

Most researchers in the domain of temperament agree that temperament refers to basic, relatively stable, personality traits present from early childhood and they have their counterpart in animals. There is, however, no consensus about such issues as the biological bases of temperament, the quality and number of traits of which the structure of temperament is composed, and hence there does not exist a commonly accepted view on how to measure temperament, and what has to be measured (see Strelau, 1998; Teglasi, 1998). Whatever the difference between researchers on temperament, three methods have been applied in assessing this phenomenon: observation, interview, and questionnaires (inventories), whereby the latter gained the highest popularity.

ASSESSMENT OF TEMPERAMENT BASED ON OBSERVATIONAL DATA

One of the methods for assessing temperament, applied mainly to infants and children not exceeding kindergarten age, is observation of behaviour in natural settings, of which the home environment is most typical (e.g. Ricciuti & Breitmayer, 1988). Home observations are based on the assumption that home is the most natural and influential environment for children until they reach school age. Parent–child interactions, with the distinctive role of the mother, are essential for the behavioural expression of the child's temperament and for the way it is perceived by parents.

Depending on the goal of the study home observation procedures differed. Several studies have shown high inter-rater agreement depending on the kind of behaviour being assessed. On the average, inter-rater agreement of temperament characteristics based on home observation is about 0.80 (Frankel & Bates, 1990). Intersession stability, as well as split-half reliability of temperament measures based on observational data, was usually much lower, probably not exceeding on average scores between 0.20–0.30 (Ricciuti & Breitmayer, 1988; Rothbart, 1986).

The fact that home observation is conducted under the most natural environment has its price, mainly in lack of or little control of the situation in which children's behaviour is recorded. Coding behaviour is imprecise, and biased by the observer's limited capacity to grasp the whole range of relevant behaviour (see Rothbart & Goldsmith, 1985).

Observation under laboratory conditions that allow for control not only of behaviour but also of the specific stimuli and situations expected to provoke behaviour in which temperamental characteristics reveal themselves has recently gained considerable popularity among child-oriented temperament researchers.

In laboratory assessment of temperament, different episodes are arranged depending on child age and specific goal of the study. These

episodes are often divided into smaller units during which infant responses (e.g. smiling, crying) are recorded. The assessment procedure is conducted in a typical developmental research laboratory with standard settings and equipment (see Kagan, 1994; Matheny, 1991).

Observation in the laboratory setting has also several shortcomings (see Rothbart & Goldsmith, 1985). For the child, a laboratory setting is a new environment that may evoke avoidance behaviour or inhibit typical reactions. Some parents are reluctant to agree to laboratory assessment, which results in selected samples of children for study.

Observational methods, whether at home or in the laboratory, are based on the premise that temperamental characteristics are revealed in behaviour typical for natural or semi-natural settings. This assumption is only partially satisfied because behavioural observation is biased by so-called reactivity effects which occur when the observing process alters the behaviour of individuals observed. Observation is a time-consuming procedure, requires individual contacts between observer and observant. The variety of behaviours available for assessment during observation is very limited. Reliability estimation can be properly done only when more than one observer takes part in the assessment procedure (for details, see Rothbart & Goldsmith, 1985).

INTERVIEW AS A SOURCE OF INFORMATION REGARDING TEMPERAMENT

Interview, along with observation, has an old tradition in clinical practice. It is a method for collecting information about the patient's health status, well-being, family, environmental settings, etc. As distinct from observation, which permits only to recording overt behaviour, interview allows collection of information about covert (internal) reactions and states. Whether applied directly to individuals or to partners, parents, and teachers assessing others (mostly children), interview is always based on retrospective data which are essentially subjective.

Interview for diagnosis of temperament has been used in the first place by psychiatrists and paediatricians (Garrison, 1991). Interview questions, mostly face-to-face, are often unstructured. Even when structured and answered in terms of quantitative rating, they are destitute of psychometric properties typical for questionnaires.

In the domain of child temperament, Thomas and Chess (1977) introduced the interview method in the New York Longitudinal Study (NYLS) initiated in 1956. Interviews may be regarded as an important source of information about temperament characteristics when personal contact with individuals (patients, parents, teachers) is possible. Structured questions about temperament and parental perceptions in the face-to-face interview allow for more in-depth probing of responses and the elicitation of information not captured through paper-and-pencil techniques alone (Garrison, 1991).

Because this procedure requires much time from the interviewer, the number of interviewed persons is, as a rule, rather small. Questions formulated during interviews often served as the basis for generating questionnaire items, as was the case in the Thomas and Chess (1977) NYLS project.

TEMPERAMENT QUESTIONNAIRES

The questionnaire method used for assessing children's temperament is based on retrospections given by parents, other caretakers, and teachers. In the case of adolescents and adults, questionnaires refer to self-report, although rating by others (partners, peers) gained popularity. Taking the 'who' criterion as point of departure, issues relating to questionnaire assessment of children's and adult's temperament will be presented separately.

Questionnaire Approach to the Study of Temperament in Infants and Children

The number of inventories for diagnosing infant and children temperament has grown, a complete record of which would probably extend to over half a hundred. Hubert, Wachs, Peters-Martin, and Gandour (1982), in their analysis of the psychometric properties of temperament instruments designed for infants and children, listed 26 such instruments. A review made 9 years later (Slabach et al., 1991) added 7 new questionnaires. Table 1

presents an updated review of temperament inventories most often used in recent studies separately on infants and children, and on adolescents and adults (see also Teglasi, 1998). The list comprises exclusively those inventories constructed for English-language populations.

The inventories presented in Table 1 illustrate the diversity of approaches in the construction of questionnaires in terms of such criteria as theory underlying the instrument, population of respondents being addressed, age of infants and children for whom these instruments are designed, strategies utilized in constructing inventories, the answering format, and the number and kind of traits being measured.

Questionnaires designed for parents refer mainly to child behaviour observable at home or in surroundings where parents are together with their child. To study the functional significance of children's temperament in kindergarten and school activity, inventories have been developed for teachers. They are composed of items which refer to behaviours observable in the school environment.

Two questions were critical in the discussion regarding assessment of children's temperament by raters, namely: (1) to what extent the assessment of a child's temperament depends on who is the rater: mother, father or teacher (interscorer reliability), and (2) what do we measure by means of inventories – the child's real temperament or the perception of temperament by mother, father, and teacher (validity issue).

Numerous studies have shown that the correlations between mother and father temperament ratings are only moderate, at best in the range between 0.40 and 0.60, depending on the scale taken into account (for a review, see Strelau, 1998).

Considering these moderate, or even less than moderate, correlations between mother–father ratings from a reliability perspective, presumably the same measure is not the same for mothers and fathers. There are several variables that contribute to the reliability of parents' temperament assessment (see Hubert et al., 1982; Slabach et al., 1991). For example, parents use different criteria in judging the inventory items, and to mother and father for whom different behaviours of the assessed infant and child are available, they ascribe different weights to different behaviours.

In some inventory studies, parent (mostly mother) rating was compared with teacher rating. Goldsmith and Rieser-Danner (1986) summarized correlations for mother and teacher agreement taking into account nine studies from the Austin Day Care Project, in which eight different temperament inventories were applied (IBQ, ITQ, ICQ, TTS, EASI-III, TBAQ, BSQ, and DOTS). The ranges of correlations between mother–teacher ratings varied from −0.49 to 0.55, with negative correlations representing the extreme scores in six studies, which questions the generalizability of temperament assessment.

The moderate agreement between parent ratings, and even poorer agreement between parent–teacher ratings, prompted researchers to ask whether the phenomenon to be measured can indeed be identified as children's temperament. Two most radical positions have been taken by Thomas and Chess (1977) and by Bates (1980). According to the first, inventories allow for measurement of real temperament modified by parents' attitudes and behaviour. In turn, Bates postulates that questionnaires measure only the perception of children's temperament by parents and other raters.

Several authors (e.g. Goldsmith & Rieser-Danner, 1990) postulate that assessment of temperament is an outcome of a variety of interactions between the assessed child and the rater, including the social context, the actual situation, accumulated experience, and the raters' own personality-temperament characteristics.

Slabach, Morrow and Wachs (1991) summarizing their review regarding reliability and validity data of infant and child temperament inventories arrived at several conclusions, some of which are worthy of mention. First, the 1991 review confirms that moderate internal consistency is the norm for most temperament inventories, with some scales from CCTI, MCTQ, IBQ, TBAQ, DOTS-R, TAB, and TTQ-S demonstrating levels of internal consistency higher than 0.80, or at least 0.75. By the way, the recently developed SATI shows reliabilities in the range of 0.85–0.90 (McClowry, 1995). Second, most temperament questionnaires for assessment of infants and children show, in general, satisfactory short test–retest reliability and moderate cross-time stability. Third, several instruments, for example TTQ-S, RITQ, IBQ, TTS, BSQ, show satisfactory external and/or convergent validity, measured by such criteria as behaviour disorders, behaviour in classroom, at home, and relationship with attachment.

Table 1. Selected questionnaires aimed at assessing temperament

Inventory and References*	Scale	Format
Infants and Children		
Behavioural Style Questionnaire (BSQ)		
McDevitt and Carey, 1978	Activity	3–7 years
	Rhythmicity	100 items
	Adaptability	6-point scale for parents
	Approach–withdrawal	
	Threshold level	
	Intensity of reaction	
	Mood quality	
	Distractibility	
	Persistence	
Children's Behaviour Questionnaire (CBQ)		
Rothbart et al., 1995	Approach	4–7 years
	HiPleasure	195 items
	Smiling	7-point scale for parents
	Activity	
	Impulsivity	
	Shyness	
	Discomfort	
	Fear	
	Anger	
	Sadness	
	Soothability	
	Inhibitory control	
	Attention	
	LoPleasure	
	Perceptual sensitivity	
Colorado Childhood Temperament Inventory (CCTI)		
Rowe and Plomin, 1977	Sociability	1–6 years
	Emotionality	74 items
	Activity	5-point scale for parents
	Attention span-persistence	
	Reaction to food	
	Soothability	
Early Infancy Temperament Questionnaire (EITQ)		
Medoff-Cooper et al., 1993	All BSQ scales	1–4 months
		76 items
		6-point scale for parents
EAS Temperament Survey (EAS-TS) – for children		
Buss and Plomin, 1984	Emotionality	1–12 (?) years
	Shyness	20 items
	Distress	5-point scale for parents
	Fearfulness	
Infant Behaviour Questionnaire (IBQ)		
Rothbart, 1981	Activity level	3–12 months
	Smiling and laughter	87 items
	Fear	7-point scale for parents
	Distress to limitations	
	Soothability	
	Duration of orienting	
Infant Characteristics Questionnaire (ICQ)		
Bates et al., 1979	Changeability	4–6 months
	Soothability	24 items

(*continued*)

Table 1. Continued

Inventory and References*	Scale	Format
	Fussiness Sociability	7-point scale for parents
Middle Childhood Temperament Questionnaire (MCTQ) McClowry, 1993	All BSQ scales	8–12 years 99 items 6-point scale for parents
Parent Temperament Questionnaire (PTQ) Thomas and Chess, 1977	Activity level Rhythmicity Adaptability Approach–withdrawal Threshold level Intensity of reaction Quality of mood Distractibility Persistence and attention span	3–7 years 72 items 7-point scale for parents
Revised Dimensions of Temperament Survey (DOTS-R) Windle and Lerner, 1986	Activity level – general Activity level – sleep Approach–withdrawal Flexibility–rigidity Mood Rhythmicity – sleep Rhythmicity – eating Rhythmicity – daily habits Task orientation	Preschool and elementary school 54 items 4-point scale Preschool form for parents School form: self-rating
Revised Infant Temperament Questionnaire (RITQ) Carey and McDevitt, 1978	All BSQ scales	4–8 months 95 items 6-point scale for parents
School-Age Temperament Inventory (SATI) McClowry, 1995	Negative reactivity Task persistence Approach–withdrawal Activity	8–11 years 38 items 5-point scale for parents
Revised Infant Temperament Questionnaire – short form (SITQ) Sanson et al., 1987	Approach Rhythmicity Cooperation-manageability Activity–reactivity Irritability	4–8 months 30 items 6-point scale for parents
Teacher Temperament Questionnaire (TTQ) Thomas and Chess, 1977	All PTQ scales except rhythmicity	3–7 years 64 items 7-point scale for teachers
Teacher Temperament Questionnaire – short form (TTQ-S) Keogh et al., 1982	Task orientation Adaptability	3–7 years 23 items

(*continued*)

Table 1. Continued

Inventory and References*	Scale	Format
	Reactivity	6-point scale for teachers
Temperament Assessment Battery (TAB) Martin, 1988	Activity Adaptability Approach–withdrawal Emotional intensity Distractibility Persistence	3–7 years 48 items: parents and teachers 24 items: clinicians
Toddler Behaviour Assessment Questionnaire (TBAQ)	Activity level Social fearfulness Anger proneness Pleasure Interest/persistence	16–36 months 106 items 7-point scale for parents
Toddler Temperament Scale (TTS) Fullard et al., 1984	All BSQ scales	1–3 years 97 items 6-point scale for parents
Adolescents and Adults Early Adult Temperament Questionnaire (EATQ) Thomas et al., 1982	All PTQ scales	140 items 7-point scale
EAS Temperament Survey (EAS-TS) for adults Buss and Plomin, 1984	Distress Fearfulness Anger Activity Sociability	20 items 5-point scale
Eysenck Personality Questionnaire – Revised (EPQ-R) Eysenck and Eysenck, 1985	Psychoticism Extraversion Neuroticism Lie scale	100 items Short scale – 48 items Yes/No format
Formal Characteristics of Behaviour – Temperament Inventory (FCB-TI) Strelau and Zawadzki, 1993, 1995	Briskness Perseveration Sensory sensitivity Emotional reactivity Endurance Activity	120 items Yes/No format
Pavlovian Temperament Survey (PTS) Strelau et al., 1999	Strength of excitation Strength of inhibition Mobility of nervous processes	66 items 4-point scale
Revised Dimensions of Temperament Survey (DOTS-R) Windle and Lerner, 1986	All scales as in DOTS-R for children but Task orientation replaced by 2 following scales: Distractibility Persistence	54 items 4-point scale

(*continued*)

Table 1. Continued

Inventory and References*	Scale	Format
Sensation Seeking Scale (SSS) – form IV and V Zuckerman, 1979	Thrill and adventure seeking Experience seeking Disinhibition Boredom susceptibility Sensation seeking general (IV) or total (V)	SSS-IV: 72 items SSS-V: 40 items Forced-choice items (A & B)
Structure of Temperament Questionnaire (STQ) Rusalov, 1989	Ergonicity, object-related Ergonicity, social Plasticity, object-related Plasticity, social Tempo, object-related Tempo, social Emotionality, object-related Emotionality, social	105 items Yes/No format
Tridimentional Personality Questionnaire (TPQ) Cloninger et al., 1991	Novelty seeking Harm avoidance Reward dependence Persistence	100 items True/False format

Note: From *Temperament: A Psychological Perspective* (pp. 288–290 and 299–300), by J. Strelau, New York: Plenum Press. Copyright 1998 by Plenum Press. Adapted with permission.
*For all references (but Strelau et al., 1999 which is in the references of this entry) presented in the table see: Strelau, 1998.

Temperament Questionnaires for Adolescents and Adults

There exist several dozens of questionnaires in use in current studies for assessing temperament in adults (see Strelau, 1998). Table 1 presents selected questionnaires which are currently among the most popular.

Temperament questionnaires for adults are mainly based on self-rating, which is one of the features discriminating them from temperament inventories for children. One of the methods for validating temperament inventories in adult populations is the comparison of self-rating with peer-rating. This procedure is based on the assumption that the peer (a friend, partner, or family member) is well-acquainted with the subject, and has had opportunities to observe the subject's behaviour in different situations over time.

The richest evidence of self- and peer-rating comparisons in temperament characteristics has been collected by Angleitner, Strelau, and their coworkers in the Bielefeld–Warsaw Twin Project (BWTP). Data collected from over 3000 twins (one twin from each pair) and over 6000 peers (two peers for each twin) including German (G) and Polish (P) samples allow some general conclusions to be made. The PTS, FCB-TI, EAS-TS, DOTS-R, and EPQ-R inventories, including altogether 27 scales, show satisfactory averaged reliability scores for both self- and peer-report [self-report: 0.78 (G) and 0.74 (P); peer-report: 0.79 (G) and 0.77 (P)]. Agreement between self-report and peer-report was on the average: 0.48 (G) and 0.47 (P), and between raters: 0.55 (G) and 0.54 (P) (for a detailed description, see Strelau, 1998). Data from the BWTP suggest that self-report/peer-report agreement (not corrected for attenuation) is comparable with agreement between peers.

Strategies for Constructing Temperament Inventories

Taking a methodological perspective on temperament inventories for assessment of children and

adults reference can be made to three basic strategies used in constructing personality inventories: deductive strategy, inductive strategy, and external strategy (Burisch, 1986).

The majority of temperament inventories were constructed by using the deductive strategy. Temperament researchers, however, differing in their understanding of what temperament is, and the structure of which it is composed, took their conceptualizations with respect to these issues as a starting point for constructing questionnaires. Differences in construction strategies refer mainly to the psychometric and itemmetric advances. From this point of view, several categories of temperament inventories can be distinguished.

- Inventories developed on the basis of interview items which bring rather to mind a well-structured interview with scales corresponding with the theoretical concepts. Grouping items into scales was done arbitrarily, without any psychometric procedure to back it up (e.g. the PTQ and TTQ).
- Questionnaires in which theoretical constructs have been operationalized into scales composed of items having content validity, and internal consistency with the scale to which they have been ascribed. Most representative inventories are those developed within the Thomas–Chess tradition (BSQ, EITQ, MCTQ, RITQ, TTS). Other inventories based on different temperament theories may also be classified in this category; for example, IBQ, CBQ, STQ, PAD.
- Questionnaires that have been constructed by thorough psychometric analysis, including content validity, internal consistency, convergent and divergent validity and detailed itemmetric characteristics. The PTS, FCB-TI, TCQ and TBAQ are typical examples of this kind of construction strategy.
- Questionnaires based on theoretical constructs to which, by means of factor analytic procedures, scales have been developed mainly in the attempt to obtain as much orthogonality between scales as possible. This strategy focuses on scale construction with less attention to itemmetric analysis. Several temperament questionnaires have been constructed by use of this strategy, such as the EAS-TS, EPQ-R and SSS.

There exists a whole group of questionnaires (e.g. ICQ, DOTS-R, SITQ, SATI, TTQ-S, TAB, CCTI) which resulted from a mixture of the deductive and inductive strategies of scale construction. These are instruments for which the construction of items and/or scales of existing inventories were taken as a starting point, and which are composed of scales that are a result of different factor analytic procedures. Questionnaire constructors representing this approach arrived at different scale solutions, mostly (with the exception of DOTS-R) with a reduced number of scales as compared with the nine categories and nine scales proposed by Thomas–Chess.

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Jan Strelau

RELATED ENTRY

Personality Assessment (General)

TEST ACCOMMODATIONS FOR DISABILITIES

INTRODUCTION

Access to educational opportunity or to the workplace often requires taking a standardized objective or performance test. For most people, taking on-demand exams present little difficulty, at least in terms of the form, structure, or procedures used by the test to assess the skill or learning construct. For individuals with disabilities, however, the structural characteristics of a test may present barriers that interfere with the assessment, yielding results that are inaccurate representations of what an individual knows or can do. For this reason, individuals with disabilities may take a test with an accommodation (i.e. adjustment) to the material used for the test, the procedure or procedures for administering the test, or to the way they respond. Accommodations are intended to remove or diminish the impact of the disability on test performance without invalidating the test construct or the score. Specifically, it is discriminatory to use selection criteria based on tests that screen out or tend to screen out individuals with disabilities unless the criteria are shown to be job-related, consistent with a business necessity, or related to a prescribed admissions standard. A test accommodation is called for when the test process or procedure requires an individual with a disability to use the impaired skill(s). Test accommodations are not testing modifications although the terms are often used interchangeably. Generally, an accommodation is considered a change in the way a test is administered but does not alter the construct and a modification is considered a change in the content of the test and may alter the intended construct.

With the onset of high stakes testing for school accountability purposes and access to post secondary institutions and eventually to employment opportunities accommodations have become commonplace when people with disabilities take on demand tests. Tests are not to act as barriers to the employment or admission to school of persons with disabilities unless the person is unable to do the job or be successful in school, even with reasonable accommodation.

CHARACTERISTICS OF TEST ACCOMMODATIONS

There is no approved set of assessment accommodations but most people agree that accommodations can be classified as adjustments to test setting, item presentation, time limits, response formats and test schedule. The most commonly used accommodations involve (1) changes in timing or scheduling, (2) special arrangements about where the test is taken, (3) allowing non-standard modes for responding, (4) Braille or large print, (5) reading questions or content aloud to a test taker, and (6) permitting individuals to engage test items using non-standard presentation formats (Thurlow, Scott & Ysseldyke, 1995). Much variability exists in how accommodations are employed as singular adjustments, or in combination, and research revealing their impact is just emerging. Indeed, accommodation research is difficult to design and perhaps even more difficult to interpret. Accommodations are designed to address individual needs so group data may be confounded by the complexities of interactions between subjects who may or may not need the particular accommodation(s) being tested.

PSYCHOMETRIC ISSUES AND ACCOMMODATIONS

Studies have analysed the effects of accommodations on test scores. For the most part, these studies have analysed large data sets collected from tests that use item formats that require examinees to 'select a response' in the form of multiple-choice or other objective items. Much less research has been completed using 'performance-based items', or items where examinees are asked to 'construct a response'. Clearly, accommodations allowed for one item format for one construct might not be appropriate when assessing the same construct using a different item format. These complexities add to the difficulty of conducting these studies.

Given that the foundation of all standardized forms of psychological and educational assessment is the consistency in test form and administration, accommodations research is growing. The psychometric questions are simple: Do accommodated versions of tests maintain their psychometric properties? At what point do departures from standardization begin to yield invalid or unreliable test scores? Do items function differently for groups with and without accommodations, and can meaningful inferences be made with confidence when the results of tests given with accommodations are used for placement, diagnostic, and policy purposes? While the questions appear simple, legitimate studies are difficult to implement primarily due to small sample sizes when subjects are sorted according to categories of disabilities (e.g. deaf, blind, learning disabled, etc.). The small sample problem is further complicated when sophisticated measurement techniques such as item response theory are used. Subsequently, to aggregate subjects across disability types is problematic due to the significant variations within a single disability and the potential for one person to have several different types of disability. In theory, there are potentially an infinite variety of accommodations if applied to the unique individual learning and cognitive characteristics among and between types of disabilities. From a measurement perspective, this is a mind-boggling premise but illuminates the complexity inherent in developing comparable tests when standardized procedures are altered for the disabled.

Demonstrating test comparability by using classical equating techniques is also plagued with methodological challenges. The 'classical' methods for equating call for random selection of two groups and then assigning each group to either a linear or percentile technique. Using a technique that utilizes a common set of 'anchor items' so that scores can be adjusted for ability between two groups relies on the groups being random and comparable. It is impossible to meet the requirement for randomly selected groups and it appears there is no standard technical solution available for precisely equating accommodated versions of standardized tests (Tenopyr, Angoff, Butcher, Geisinger & Reilly, 1993).

New approaches for equating are emerging and show promise but need further development since the classical procedures are not likely to be useful. For small samples (perhaps as low as 25), Livingston (1993) promotes the use of a chained equipercentile technique with log linear smoothing to produce bias free items even when the samples differ in ability. In this case, equating

occurs when the relationship between a set of anchor items and the remainder of the test is the same for the accommodated and non-accommodated groups. Mislevy, Sheenan and Wingersky (1993) take a different approach in that they argue for using expert judges to analyse item characteristics and factors that effect difficulty. This approach would ostensibly remove the theoretical, political, or practical factors that make it difficult to apply traditional equating standards. This approach would also require little or no data to make comparisons about comparability. Other psychometric issues that need to be considered when tests are presented with accommodations are reliability, content, construct, and criterion validity, fairness, differential item functioning (DIF), and robustness, to name the most important technical properties of a test. See Geisinger (1993) for a detailed discussion of these issues.

COMPARABILITY STUDIES

Willingham and his colleagues at the Educational Testing Service (ETS) (Willingham, Ragosta, Bennett, Braun, Rock & Powers, 1988) completed one of the first and most comprehensive reviews of test accommodations for people with disabilities taking the *Scholastic Achievement Test* (SAT) and the *Graduate Record Examination* (GRE). In terms of criterion-related validity, accommodated versions of the tests produced different outcomes for different disabilities than standard administrations. Overall comparability was found between standard and non-standard administrations of the tests with respect to internal reliability, factor structure and differential item functioning (DIF). However, test accommodations underpredicted first year college performance for students with hearing impairments, overpredicted first year performance for students with learning disabilities and physical disabilities, but produced comparable predictions for students with visual impairments.

More recent studies conducted with data generated from large-scale school accountability assessments have produced additional information. In the state of Maryland, Tippets and Michaels (1997) found the factor structures of several portions of the state test given with accommodations to be similar to the standard administration of the test. In Kentucky, Koretz and Hamilton (1999) detail the comparison of the large-scale tests given to students with disabilities using a variety of accommodations to standard administrations. In addition to the overall underperformance of the students with disabilities, differences were more noticeable among elementary students on multiple-choice items and more noticeable among students in higher grades on open-response items. Also, it was reported that DIF was apparent for students who used accommodations for both item formats and that the correlations among parts of the assessment when accommodations were used may indicate that the dimensionality of the assessment was changed.

It can be argued that comparing group data between individuals who receive test accommodations with those who do not misses the essence of why accommodations are given in the first place. That is, they should be tailored to the individual needs of the test taker and therefore analyses should be at the individual level. From this perspective Fuchs, Fuchs, Eaton, Hamlett and Karns (2000) provided students with and without learning disabilities with a variety of accommodations during maths calculation and problem-solving items. On traditional maths items students with learning disabilities did not benefit differentially but did receive a greater boost on problem-solving items that apparently presented greater reading/writing demands. Their results indicate that accommodations are often misjudged or overused by teachers and can have the effect of inflating a student's score.

FUTURE PERSPECTIVES AND CONCLUSIONS

Questions about the comparability of scores between accommodated and non-accommodated test administrations ultimately focus on the inferences made about the test results and the faith consumers have when using the results to make decisions. Professional judgement plays a pivotal role when accommodations are selected, implemented, and when test results are aggregated with scores from standard test administrations. Messick (1995) has pointed out that validity is an empirical evaluation of the meaning and consequences of measurement and that the

appropriateness, meaningfulness, and usefulness of score-based inferences are inseparable. From his framework, accommodations strive to remove construct-irrelevant variance without inducing or interfering with construct under-representation. Empirical checks between accommodated and non-accommodated versions of tests can only explain the relationships to a point. While it has been demonstrated that testing and school professionals believe few if any accommodations violate construct validity to a significant degree, more research is needed if results from accommodated versions of tests are considered equal to others.

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RELATED ENTRIES

Applied Fields: Education, Ethics, Standard for Educational and Psychological Testing, Learning Disabilities, Children with Disabilities

TEST ADAPTATION/ TRANSLATION METHODS

INTRODUCTION

During the decades the interest in cross-cultural studies has increased. These studies involve groups without a common language. The traditional approach of making close ('literal') translations of (usually Western) source instruments for all target languages, though still widely used, has been challenged. It is appreciated that an exclusive focus on the linguistic aspects of a translation does not address the question, to what extent the item contents are adequate in all target languages. Similarly, it is increasingly appreciated that in order to translate psychological instruments linguistic competence is necessary though insufficient (Geisinger, 1994; Hambleton, Merenda & Spielberger, 2001). Also needed are knowledge of the target cultures

and expertise in designing psychological instruments. Modern translation projects pay much attention to the question of how cultural, psychometric, and linguistic knowledge can be combined so as to optimize their adequacy in each of these domains (e.g. Schroots, Fernández-Ballesteros & Rudinger, 1999).

ADOPT OR ADAPT?

Linguistic, psychometric, and cultural criteria may lead to different translations. Linguistic criteria involve equality of, among other things, semantic meaning, comprehensibility, readability, and style. Psychometric criteria involve the need to follow good practice of item writing and to assess the adequacy of test translations using statistical means (analysis of bias and equivalence: (see entry on 'Item Bias'). Cultural criteria involve the appropriateness of item contents and compliance with local norms and habits. Depending on the degree of convergence of the three criteria, two different options in test translation may be appropriate (Van de Vijver, Fons & Leung, 1997; Van de Vijver & Poortinga, 2001).

The first option is called *adoption*. It amounts to a close translation of an instrument in a target language. This option is the most frequently chosen in empirical research because it is simple to implement, cheap, has a high face validity, and retains the opportunity to compare scores obtained with the instrument across all translations. The aim of these translations often is the comparison of averages obtained in different cultures (Does culture A score higher on construct X than does culture B?). Close translations have an important limitation: they can only be used when the items in the source and target language versions have an adequate coverage of the construct measured on items showing bias. Standard statistical techniques for assessing equivalence (e.g. factor analysis, see Behling & Law, 2000, and Van de Vijver, Fons & Leung, 1997) should be applied to assess the similarity of constructs measured by the various language versions. However, even when the structures are identical, there is no guarantee that the translations are all culturally viable and that a locally developed instrument would cover the same aspects.

The second (and more modern) option is labelled *adaptation*. It usually amounts to the close translation of some stimuli that are assumed to be adequate in the target culture, and to a change of other stimuli when a close translation would lead to linguistically, culturally, or psychometrically inappropriate measurement (e.g. a coping questionnaire has the item 'watches more television than usual' to express the idea of seeking distraction. In areas without electricity or a low density of televisions this item should be adapted. A behaviour could then be identified that comes close to the original in terms of psychological meaning.). The validity of the new measure can be examined by scrutinizing the nomological network of the instrument (e.g. by correlating scores obtained with the instrument with scores on locally developed measures). Comparisons of scores obtained with adapted instruments, using a *t* test or analysis of variance, are impossible. However, recent advances in psychometrics such as Item Response Theory (see entry on 'Item Response Theory') and Structural Equation Modelling (e.g. Byrne, Shavelson & Muthén, 1989) allow for numerical score comparisons across language versions even in the cases of test adaptations.

The choice for either adopting or adapting an instrument can be based on various factors. If the aim is to compare scores obtained with an instrument in different cultures, a close translation is the easiest procedure. However, the cultural adequacy of the instrument in the target culture has to be demonstrated. The 'quick and dirty' practice of preparing a close translation, administering it in a target culture, and comparing the scores in a *t* test without any concern for the cultural and psychometric adequacy of the measure is hard to defend. If the aim is to maximize the ecological validity of the instrument (i.e. to measure the construct in a target culture as an adequate way), the choice for an adaptation is more obvious.

In the last decades, various techniques to produce translations and examine their accuracy have been proposed. Table 1 provides an overview. A good example of a modern, integrated approach to test translation that features linguistic, cultural, and psychometric aspects can be found in the *Guidelines for Adapting Educational and Psychological Tests* (Hambleton, 1994; Van de Vijver & Hambleton, 1996). A description of the various stages of a prototypical translation project is given in Table 2.

Table 1. Common translation designs and their advantages and disadvantages

Procedure/design	Description	Advantage	Disadvantage
Procedures to produce translation			
Translation/back translation (Brislin, 1986)	Independent forward and backward translation; translation is considered to be accurate if original and back translated text are identical.	Can be applied even when researcher does not know target language and culture.	Can produce stilted language; does not identify areas of test where an adaptation would be needed.
Decentring (Werner & Campbell, 1970)	Words and concepts that are specific to a particular language or culture are eliminated and the remaining, presumably unbiased instrument is translated.	Powerful tool to identify bias, removes cultural idiosyncrasies.	If cultures are far apart, the core of common items may be small and may poorly reflect underlying construct.
Convergence approach	Each researcher designs an instrument for his/her culture; all instruments are translated and administered everywhere.	Can provide valuable insight in bias.	Laborious.
Committee approach	Persons with different expertise or cultural background prepare translation.	Synergy by combining different types of cultural, linguistic, and/or psychometric expertise.	Laborious; psychological factors such as dominance of group members may be important.
Study designs for checking accuracy translation			
Working with bilinguals	Administration of original and translated instrument to bilinguals.	Control of group differences as groups taking both language versions are optimally matched.	Impractical when working in multilingual projects; bilinguals are not a random sample of population (potentially poor external validity).
Working with monolinguals	Administration of original and translated instrument to monolinguals in source and target cultures.	Can be easily implemented.	Samples may differ on outcome-relevant characteristics, such as age or education.
Random probes	Non-standard administration of translated version by asking participants to explain responses.	Check on similarity of item-as-intended and item-as-interpreted; useful in pilot stage of project.	Usually no comparative data available; informal check.
Parallel blind technique	Independent translations are prepared and compared.	Easy to implement.	Does not identify inappropriateness of item or test contents.
Judgemental procedures	Identify sources of cultural or linguistic bias (e.g.) by asking linguistic and/or cultural experts.	High face validity; optimal usage of cultural expertise; does not require data collection.	Need to establish inter-rater reliability; judgements may be inaccurate.
Post hoc procedures for determining translation accuracy			
Statistical procedures	Use of extensive set of tools to assess equivalence.	Strict test of accuracy; can and should be combined with other approaches.	Some procedures require huge samples; statistical procedures are often combined with specific designs (e.g. studies with bilinguals) and, hence, 'inherit' their problems.

Table 2. Steps in a test translation project (from Hambleton & Patsula, 1999)

1	Ensure that construct equivalence exists in the language and cultural groups of interest.
2	Decide whether to adapt an existing test or develop a new test.
3	Select well-qualified translators.
4	Translate and adapt the test.
5	Review the adapted version of the test and make necessary revisions.
6	Conduct a small tryout of the adapted version of the test.
7	Carry out a more ambitious field-test.
8	Choose a statistical design for connecting scores on the source and target language versions of the test.
9	If cross-cultural comparisons are of interest, ensure equivalence of the language versions of the test.
10	Perform validation research, as appropriate.
11	Document the process and prepare a manual for the users of the adapted tests.
12	Train users.
13	Monitor experiences with the adapted test, and make appropriate revisions.

FUTURE PERSPECTIVES

From a theoretical perspective, translation studies do not constitute an area where major theoretical advancements can be expected, possibly with the exception of the area of machine translations. The recent, remarkable progress may continue. It may affect the practice of close translations. However, this progress is unlikely to change the practice of test translations in the foreseeable future, especially in the area of test adaptations. Analogously, new theoretical frameworks and statistical tools may refine procedures to assess equivalence.

More changes can be expected at a practical level. Procedures to enhance and examine the validity of translations are available but not yet widely applied. With the advent of multilingual studies, it is likely that researchers will begin to agree on steps that need to be taken in multilingual studies and on how to report these steps.

CONCLUSIONS

The momentum in test translations has moved from theory to practice. Frameworks for preparing test translations and testing their adequacy have been developed, with contributions from various branches of science, such as linguistics, cross-cultural psychology, cultural anthropology, and psychometrics. The emphasis is now moving to the application of these frameworks. The future will tell whether the procedures developed in the laboratory are practical, adequate, and sufficient in the field.

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RELATED ENTRIES

Cross-Cultural Assessment, Automated Test Assembly Systems, Standard for Educational and Psychological Testing, Testing through the Internet

TEST ANXIETY

INTRODUCTION

'Test anxiety' refers to the set of phenomenological, physiological, and behavioural responses that accompany concern about possible negative consequences or failure on an examination or similar evaluative situation (Zeidner, 1998). 'Test anxious' students are characterized by a particularly low response threshold for anxiety in evaluative situations, tending to view test situations as personally threatening. They tend to react with extensive worry, mental disorganization, tension, and physiological arousal when exposed to evaluative situations (Spielberger & Vagg, 1995). Test anxiety is often accompanied by maladaptive cognitions such as threat perceptions, feelings of reduced self-efficacy, anticipatory failure attributions, and coping through self-criticism (e.g. Matthews et al., 1999). A widely accepted definition proposed by Spielberger (e.g. 1980) construes test anxiety as a *situation-specific personality trait*. 'Test anxiety' may also refer to stressful evaluative stimuli and contexts, and fluctuating anxiety states experienced in a test situation. In general, *trait test anxiety* and *evaluative situations* may be seen as interacting to provoke *states* of anxiety (Sarason et al., 1995).

Test anxiety research has prospered, in part, due to the increasing personal salience of test situations for people in modern society, making tests and their long-term consequences significant educational, social, and clinical problems for many. Indeed, test anxiety figures prominently as one of the key villains in the ongoing drama surrounding psychoeducational testing, as a source of both scholastic underachievement and psychological distress. Many students have the ability to do well on exams, but perform poorly because of their debilitating levels of anxiety. Test anxiety may also jeopardize assessment validity in the cognitive domain and constitute a major source of 'test bias', in that anxious examinees may perform less well than their ability and skills would otherwise allow. Much of the test anxiety research over the past half century has been conducted to help shed light on the negative effects of test anxiety on examinee performance and these concerns have stimulated the development of a variety of assessment methods, to which we now turn.

SELF-REPORT INSTRUMENTS

Self-report assessments of test anxiety responses are most often elicited via questionnaires. Self-reports have become the most popular format for assessing test anxiety because they are considered to provide the most direct access to a person's subjective experiential states in evaluative situations, they possess good psychometric properties, they are relatively inexpensive to produce, and they are simple to administer and score. Self-report paper-and-pencil questionnaire measures of *trait* measures ask subjects to report symptoms they *typically*

or *generally* experience in test situations, whereas *state* anxiety scales ask individuals to report which of the relevant symptoms of anxiety they are *currently* experiencing in a particular test situation. Next, we briefly walk the reader through a number of salient issues in the development and validation of self-report measures.

What to Measure: Conceptualization and Dimensionality

An initial conceptualization of test anxiety is essential in order to guide the development of the item pool, and facilitate the initial construct validity research. As a hypothetical construct, test anxiety may be inferred by measuring cognitive (e.g. self-focused thoughts and worries), affective (e.g. subjective tension), or behavioural (e.g. escape behaviour) indices. Lack of precision in defining and observing inner constructs such as test anxiety can lead to serious problems in assessment. Although some early questionnaires were unidimensional, most contemporary researchers accept the distinction made by Liebert and Morris (1967) between *Worry* and *Emotionality* as major components of test anxiety. Worry refers to cognitive concerns about the level of performance, failure, and comparison with others, whereas Emotionality refers to feelings of tension and self-perceived physiological arousal. Debate continues on the dimensionality of test anxiety, and so contemporary questionnaires differ somewhat with respect to their number of scales.

Item Selection and Scale Construction

It is important to begin assessment with well-written items, and awareness of how item format may influence their measurement properties. Over the years, a wide array of item formats have been employed; currently, Likert scales are the most popular. Test anxiety self-report scales are also plagued by a number of conventional threats to validity, including response biases such as acquiescence and social desirability, defensiveness and repression of test anxiety, and deliberate faking. Thus, attention to possible biases and careful statistical analysis of test anxiety scales is essential. Most scales have been constructed using exploratory factor analytic techniques. Confirmatory factor analysis was used early in the 1980s in test anxiety research to test the adequacy of the indicator–factor relationship in the measurement model of test anxiety scales and has also recently been employed for purposes of item analysis and selection. The new latent trait theory methods of scaling have rarely been used in scale development, but they have considerable promise for scaling of test anxiety items in the years to come.

In general, test constructors have succeeded in developing measures with fairly high internal consistencies, typically in the high 0.80s to low 0.90s, and test–retest stabilities typical of personality traits. The factor structure of subscales is somewhat more uncertain, with conflicting results from different studies. Also, regrettably, few of the existing self-report instruments allow standardized comparisons to be made across independent investigations, although most provide separate norms for males and females.

Validity

Empirical evidence to show that a test purporting to measure test anxiety is indeed valid for the designated purpose. A main problem for empirical validation lies in finding an acceptable criterion. Scores on ability tests, grade point average, observer ratings, behaviour in structured evaluative situations, and the like are good candidates for criterion behaviours. Evidence on the concurrent predictive validity of test anxiety scales is reviewed by Zeidner (1998). Test anxiety scores predict academic criteria such as those just listed. Meta-analyses (e.g. Seipp, 1991) suggest a modest negative association between anxiety and academic performance of around -0.2. Validity coefficients are higher for worry than for emotionality, as expected: -0.29 and -0.15 respectively, in Seipp's meta-analysis of 126 studies (156 effect sizes).

Test anxiety scales also require 'construct validity', i.e. the nature of test anxiety is understood by relating test scores to other psychological constructs within the framework of some overarching theory. The predominant theories are cognitive-psychological, focusing on the detrimental effects of worry on attention and retrieval from memory (Spielberger & Vagg, 1995). Sarason (e.g. 1984) has proposed that test anxiety is characterized by self-preoccupation and worry, such that intrusive self-denigrating thoughts ('cognitive interference') attract attentional resources that might

otherwise be allocated to task-related processing. The person's appraisal of their own performance impairment feeds back into additional worry, generating, in the worst case, a vicious circle of progressively escalating worry and interference. There is a rich empirical literature showing that test anxiety is associated with maladaptive self-referent appraisals and ineffective coping strategies consistent with the Spielberger and Sarason theories (e.g. Matthews et al., 1999).

Key Measures

The *Test Anxiety Questionnaire* (TAQ), by George Mandler and Seymour Sarason (1952), is regarded as the first acceptable measure of the trait construct. This 37-item scale inquires about symptoms of anxiety experienced by examinees under major academic evaluative situations. Split-half reliability coefficients in the high 0.90s is evidenced for the TAQ, and test–retest correlations of 0.82 over a 6-week interval have been reported. Correlations of 0.59 between scores on the TAQ and behavioural ratings of overt manifestations of anxiety (perspiration, restlessness, inappropriate questions, and laughter) provide evidence of concurrent validity. A 'downscaled' version of the TAQ for children, the *Test Anxiety Scale for Children* (TASC), by Seymour Sarason and his co-workers (Sarason, Davidson, Lighthall & Waite, 1958), consists of 30 items dealing with anxiety in evaluative situations at school which subjects respond to with yes/no (e.g. 'Do you worry more about school than other children?'). Test–retest reliability coefficients in the low 0.70s are reported for the elementary school grades and internal consistency reliability coefficients for the TASC are reported to range from 0.82 to 0.90. TASC scores evidence concurrent validity when correlated with gross intellectual indicators, such as group IQ and achievement test scores. Factor analytic studies of the TASC have, with some exceptions, obtained the following four factors: 'Test Anxiety', 'Poor Self-Evaluation', 'Remote School Concern', and 'Somatic Signs of Anxiety'.

A second generation of test anxiety scales was spawned by Irwin Sarason, Seymour Sarason's younger brother. The *Test Anxiety Scale* (TAS; Sarason, 1978) is a trait measure of test anxiety, and represents a shift in focus from the situation to the person. The TAS consists of 37 items (originally consisting of 21 items taken from the TAQ), written in a true–false format and summed to obtain a total score. Test–retest coefficients in the 0.80s have been obtained for intervals of several weeks in the current 37-item version. Total TAS scores corrrelate highly with other test anxiety measures and also have been found to relate to task-debilitating and reported difficulty working under pressure. A factor analysis of the 37-item TAS yielded the following two-factor solution: (a) cognitive concern and worry about oneself and one's performance on tests, and (b) apparent consequences of this intense worry (including interference with effective cognitive functioning and a variety of physical and emotional consequences). Though it lacks sufficient normative data and sufficiently replicated information regarding the psychometric properties of this scale, the scale has been widely used in research on the nature and treatment of test anxiety. An additional scale developed by Sarason in 1984, the *Reactions to Tests* scale (RTT; Sarason, 1984), is a multidimensional measure of test anxiety, developed to gauge the following four theoretical dimensions of test anxiety: Worry (e.g. 'Before taking a test I worry about failure'), Tension (e.g. 'I feel distressed and uneasy before tests'), Test-Irrelevant Thinking (e.g. 'During tests, I wonder how the other people are doing'), and Bodily Symptoms (e.g. 'My heart beats faster when the test begins'). Each scale of the RTT is composed of 10 items, yielding four factorially derived subscale scores and a total score. Subjects are asked to mark the intensity of their responses on a scale from 1 ('not at all typical of me') to 4 ('very much typical of me'). Sarason (1984) reported subscale internal consistency reliabilities ranging from 0.68 to 0.81 for the total scale and 0.78 for all 40 items.

The *Worry and Emotionality Questionnaire* (WEQ) was developed by Liebert and Morris (1967) to measure what they believed to be the two major components of test anxiety – Worry (W) and Emotionality (E). Worry refers to cognitive concerns about such things as level of performance, failure, and comparison to others (e.g. 'I do not feel very confident about my performance on this test'). Emotionality refers to self-perceived physiological arousal and upset ('I feel my heart beating fast'). Scoring is along a 5-point Likert scale. In constructing the WEQ, five W and five E items were chosen from the TAQ on the basis of their general factor loadings content validity regarding

the dimensions involved. Alpha reliabilities for the W and E scales are in the 0.79–0.88 range. Scale validity has been demonstrated in the inverse relationship of performance-related indices to both Worry and Emotionality.

The most prevalent contemporary measure is the *Test Anxiety Inventory* (TAI; Spielberger, 1980). The TAI is a 20-item self-report scale based on two conceptualizations of test anxiety. The 20-item inventory consists of 8-item subscales for Worry ('Thoughts of doing poorly interfere with my concentration on tests') and Emotionality ('During tests I feel very tense'). The instrument has been translated into over a dozen languages including Arabic, Chinese, Dutch, German, Hindi, Hebrew, Hungarian, Italian, Japanese, Korean, Norwegian, Persian, Portuguese, and Spanish. The test manual (Spielberger, 1980) reports that alpha coefficients for the TAI total scores are 0.94 or higher, for both males and females. Although the internal consistency for the subscale scores is found to be somewhat lower than for the TAI total scale, the subscale alphas were all reported to be 0.86 or higher, with a median alpha of 0.90. Furthermore, the manual reports test–retest reliability to be in the range of 0.80–0.81 for 2-week to 1-month periods in a variety of student groups. The author provides impressive correlational evidence for the construct validity of the TAI. The TAI demonstrates strong convergent validity with the TAS ($r = 0.82$ for men and 0.83 for women), and is negatively correlated with both study skills ($r = -0.48$ for men, -0.14 for women) and grade point average ($r = -0.31$ for men, -0.18 for women). Furthermore, the TAI is modestly ($r = -0.22$), though consistently, related to academic achievement indices. Although a number of exploratory factor analyses have substantiated the two-factor structure of the TAI, confirmatory factor analyses tend to yield inconsistent results.

Benson and her co-workers (Benson, Moulin-Julian, Schwarzer, Seipp & El-Zahhar, 1992) combined the TAI and RTT scales to form the *Revised Test Anxiety* (RTA) scale, an 18-item multidimensional scale. The instrument produces four factorially derived subscale scores: Tension, Worry, Bodily Symptoms, and Test-Irrelevant Thinking. This scale takes advantage of the strong psychometric foundation of the TAI as well as the promising evidence for the multiple dimensions of the RTT. A unique feature of the RTA is its construction and validation through the use of extensive multi-national factor analysis and cross-validation procedures. Specifically, the scale was developed by subjecting the non-redundant items from the original RTT and the TAI to extensive multi-national factor analysis and cross-validation procedures based on a sample of 346 US, German, and Egyptian students. The RTA was then cross-validated using a second multi-national sample of 353 students. Cronbach's alpha for the 18-item RTA was 0.88. The Tension and Worry subscales showed reliabilities of 0.82 and 0.79 respectively, whereas the Bodily Symptoms and Test-Irrelevant Thinking subscales were lower, 0.68 and 0.67, respectively. The chi-square test of model fit for the 18-item four-factor RTA showed acceptable fit as did the cross-validation of the RTA.

ALTERNATIVE ASSESSMENT PROCEDURES

Think-Aloud Procedures

Think-aloud procedures are designed to assess the contents of consciousness in examinees while they are engaged in test taking, without imposing the researchers' preconceptions on respondents, as questionnaires may do. Subjects are asked to verbalize anything that comes into their minds, while working on the cognitive tasks given. The thoughts are then coded on relevant dimensions, such as their positive valence ('Problems are simple') or negative valence ('Not enough time left').

Physiological Measures

Test anxiety researchers have occasionally employed physiological measures of arousal (e.g. electrodermal activity) as indices of anxiety. Biochemical 'trace measures' assayed from blood, urine or saliva, such as corticosteroids and catecholamines, may also be useful, especially in studies involving prolonged exposure to evaluative stress (e.g. writing a doctoral dissertation). These responses should be immune to the problems of response bias endemic to self-report measures of anxiety. However, physiological indices suffer from a number of formidable methodological problems, including questionable construct validity, poor reliability, and low practicality in naturalistic field settings.

Behavioural Observations

Observations of behaviours such as excessive body movement and hand wringing may permit greater accuracy and more objectivity than self-report. Trained observers may utilize some standard set of observation categories in documenting test anxious behaviour. However, the use of observational procedures for measurement of test anxiety is rare and the psychological processes considered to be relevant to test anxiety are not very amenable to direct observation. Among the problems that adhere to these measures are: the complexity of coding schemes, observer bias and reliability, the reactive nature of the observation process itself, and the new latent trait theory methods of scaling high costs of conducting observational procedures. Table 1 presents a summary of the key measures of test anxiety.

FUTURE PERSPECTIVES: IMPROVING ASSESSMENT

We briefly present some suggestions for improving test anxiety scale assessment in light of current drawbacks, focusing on standardized scale development.

More Complete and Systematic Domain Coverage

Most scales focus mainly on cognitive and affective parameters of anxiety responses. The restricted content scope can be improved by employing more systematic domain mapping procedures (e.g. through facet theory) and better representation of additional facets in the test anxiety inventory. More attention to assessment of the processes supporting dynamic person–situation interaction across the various phases of a stressful evaluative encounter is also required.

Making Scales more Relevant for Clinical Purposes

Future scales need to target not just overall test anxiety, but also pathology associated with various antecedent or latent conditions, and a wider range of symptoms and consequences. The coverage of items needs to be expanded to reflect the phenomenology of high test anxious examinees, including such manifestations as panic attacks, total blackout, and anxiety blockage. Conversely, current instruments also tell us rather little about unusually low anxiety, ranging from lack of concern about evaluation and minimal motivation, to supreme self-confidence or high self-efficacy.

Differentiating between Adaptive and Maladaptive Manifestations of Anxiety

Current scales do not adequately separate maladaptive anxiety effects from those which may be adaptive, such as increased motivation. Future measures might distinguish between facilitating and debilitating arousal, and cognitive processes that are realistic (e.g. worrying about a genuinely threatening exam) and those that are unrealistic (e.g. those prompted by an exam covering familiar material).

CONCLUSIONS

Self-report test anxiety questionnaires have well-attested predictive and construct validity, but they may be open to a variety of response sets, including deliberate distortion and defensiveness. Future

Table 1. Classification of test anxiety measures: self-report versus alternative assessment procedures

Prevalent self-report scales	Alternative assessment procedures
Test Anxiety Questionnaire (TAQ) Test Anxiety Scale for Children (TASC) Test Anxiety Scale (TAS) Reactions to Tests (RTT) Worry and Emotionality Questionnaire (WEQ) Test Anxiety Inventory (TAI) Revised Test Anxiety Scale (RTA)	*Think-aloud procedures* (e.g. report anything that comes while working on the test) *Physiological indices* (e.g. electrodermal activity, muscle tension, GSR, trace measures, biochemical analysis of blood and urine samples) *Behavioural observations* (e.g. fidgety behaviour, nail biting, sweating, excessive body movement and tension, hand wringing, speed and accuracy of performance)

work might develop the assessment of physiological and behavioural test anxiety measures, and 'triangulate' assessment by means of converging operations. The assessment of test anxiety would also benefit from the application of the dynamic process models of contemporary stress theory. Rather than see test anxiety solely as a fixed property of the individual, it is important to explore how stable dispositions bias self-appraisal and coping in the context of the person's active attempts to manage the evaluative situation, and process cues towards performance adequacy.

Test anxiety scale scores must be understood within the context of a person's life and social milieu. Assessment requires appreciation of the various influences on anxiety score, including the person's academic history and learning skills, psychosocial adjustment, and behaviour during examinations. A simple composite test anxiety score should never be used in describing, predicting, or explaining an examinee's behaviour. Sound interpretation requires integration of various sources of data and assimilating them into an exposition that describes the examinee's functioning, detailing specific strengths and weaknesses, and predicting specific behavioural manifestations.

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RELATED ENTRIES

Applied Fields: Clinical, Theoretical Perspective: Psychometrics, Anxiety Assessment, Anxiety Disorders Assessment

TEST DESIGNS: DEVELOPMENTS

INTRODUCTION

Test design refers to the process by which a test developer builds psychological tests – cognitive, affective, achievement, aptitude, certification, licensure, interest, motivation, personality, and others. The process addresses the issues of *why* a test is being used, *what* the test will cover, and

how it will test for those. A well-designed test does not happen by accident, but results from a systematic and informed series of choices on a number of issues. This entry reviews those issues, and emphasizes advances in the test development process. There are several more lengthy treatments of the topic, variously emphasizing item writing (Haladyna, 1999; Osterlind, 1998), analysis of test scores (e.g. Embretson, 1985; McDonald, 1999), cognitive psychology (Frederiksen, Mislevy & Bejar, 1993), or new developments (Hakel, 1998).

AN OVERVIEW OF THE TEST DESIGN PROCESS

Test design may be considered in stages. One first determines a *use* (*purpose*) for the test – that is, a reason for giving the test – and how test scores will be used. Tests are given to produce scores, from which some kind of decision about the test taker will be made. Less frequently, tests may secondarily be given to convey something about the ones giving the test. For example, a selection test for a company might serve as a job preview, or might convey a message, such as 'this is a high-tech operation', or 'we demand high levels of integrity'. The purpose may affect both the development of test specifications and the selection of item types and delivery means. A selection test to be administered worldwide might be delivered on the web; a self-assessment might be delivered in a magazine.

Next one develops specifications for the test, and decides how the test will be delivered. Following this are the *item writing*, *test assembly*, *review*, and *standard-setting* (cut-score) phases, with empirical item trials throughout, or whenever possible. Each of these stages are reviewed.

TEST USE

Tests are used in many ways. Some of the most important are: selection, classification, certification, licensure, promotion, diagnosis, student modelling, and self-assessment. *Selection* refers to using test scores to admit applicants into jobs, the military, or educational or training programmes. *Classification* refers to using scores to place applicants into jobs or programmes for which they may best be suited in light of the pool of selected individuals. For example, an employer might assign an applicant with strong social skills (e.g. based on a personality test) to a job involving working with people. Or a college may place an applicant into a remedial reading programme based on a reading score. Classification is similar to selection, but differs in several ways – e.g. in how the efficacy of the process can be evaluated (Scholarios, Zeidner & Johnson, 1997), and in the legal issues surrounding use. *Certification*, or *licensure*, refers to using test scores to formally ascertain one's level of proficiency in a technical or professional speciality. Examples are driver's licence examinations, architectural, auto mechanics, and real-estate licensure examinations, and nursing, business, teaching, law, and medical board examinations. *Promotion* testing is similar to certification and licensure testing, except that it pertains to movement through the ranks of a particular job, and does not typically imply any legal status associated with proficiency level, as a licensure test does.

Diagnosis refers to using test scores to identify applicant strengths or weaknesses. For example, a diagnostic achievement test might suggest that the individual needs remedial work in algebra, or has difficulties comprehending long passages. Diagnostic tests are often accompanied with remediation suggestions. *Student modelling* refers to using test scores to tailor instruction to students' knowledge. The 'model' refers to a representation of the student's current level of knowledge and skill in the domain being taught (e.g. algebra), typically at a molecular level (e.g. 'proficient in two-place addition', 'cannot perform carry operations in subtraction', etc.). *Self-assessment* may be seen as a factor crossing all these, but typically it refers to using a test score for self-awareness, such as knowing one's strengths, weaknesses, interests, and personality.

TEST SPECIFICATIONS

According to the AERA/APA/NCME standards (1999) test specifications refer to many different aspects of the test and how it is to be used and administered. These include its content, number of items, item formats, desired psychometric properties, arrangement of items and test sections, amount of time for testing, directions, administration procedures, and scoring procedures. In many applications, and increasingly in the future, additional properties such as the

psychological processes involved in test taking may be treated as part of the specifications.

Delivery

There are three primary delivery systems for tests: paper-and-pencil, computer, and world-wide-web. Most tests are paper-and-pencil. This includes the SAT, given every year to over 2 million students applying to college, mostly in the United States. The advantage of paper-and-pencil test administration is that test takers are familiar with the format, administration and scoring procedures have been well worked out, it is the least expensive format, and security procedures are known and reliable. Computer tests are rapidly gaining in popularity. There are a number of high-volume computerized tests, such as the Armed Service Vocational Aptitude Battery (ASVAB), given to about 1.2 million people per year applying for entry into the US Military Services, the Graduate Record Examination (GRE, 1.5 million, graduate school admissions), and the Test of English as a Foreign Language (TOEFL, 1.5 million, for admission to English-speaking institutions of higher education, given to those who speak English as a second language). The main advantages of the computer to deliver tests is that it enables adaptive testing, reducing testing time, and it permits item types that cannot be given in paper-and-pencil, such as ones requiring precise control or measurement of stimulus presentation and responses (e.g. reaction time tests, complex simulation tests). Another advantage is that response information is automatically recorded for easier analysis. Tests delivered on the web also enjoy these advantages, and additionally make 'anytime, anywhere' administration easy. However, ease of administration comes at a cost of decreased security, making web-administered tests more problematic in high-stakes uses. Additionally, web programming is newer than personal computer programming, and less software is available for web test development. Over time, security issues may be lessened, and web-programming tools will become easier to use. Consequently, web-delivered tests are likely to grow rapidly in popularity.

Item Types

A number of item-type taxonomies have been suggested (e.g. Haladyna, 1999; Kyllonen, 2000). Haladyna's proposes two dimensions – high versus low inference formats, and constructed-response versus multiple-choice – and discusses features, advantages, and disadvantages of the various item types. Constructed-response formats include essays, experiments, fill-in-the-blanks, short-answers, portfolios, and performances. Multiple-choice formats include conventional, matching, and true–false item types. High-inference formats are typically abstract, complex to construct, relying on judgement and subjectivity for their scoring, have low reliability, and invite bias. Low-inference formats are the opposite. Clearly, low inference, multiple-choice item types are most popular, but developments in the field seem to be largely focused on how high-inference constructed-response items might be made more reliable, inexpensive, and objective. For example, automated essay scoring is an area of avid research interest, with operational systems already in use, and rapid improvements in the works (Burstein & Chodorow, in press).

In the swiftly growing area of web testing, a taxonomy has been published in the form of a specification presented by the IMS Global Learning Consortium, Inc., a group developing and promoting open specifications related to online learning. Their 'IMS Question & Test Specification', which 'addresses the need to be able to share test items and other assessment tools across different systems' (from FAQ number 6), specifies various item types. They are organized into four categories: (a) logical identifier, (b) X-Y coordinate, (c) string, and (d) numeric. Logical identifier items are true–false, multiple-choice, multiple response (i.e. multiple choice with more than one correct answer), order (e.g. rank the following), and connect-the-points (e.g. draw a triangle). These item types may use text, images, and audio presentation, and may require either pointing (with a mouse) or 'sliding' (with the mouse). X-Y-coordinate items are image-hot-spot (point to a part of a picture, such as identifying the location of a city on a map), drag-and-drop (e.g. open a menu), and connect-the-points. String examples are fill-in-the-blank and short-answer, and numeric examples are fill-in-the-blank (with integers or reals) and numerical-entry-with-a-slider. The IMS specification may turn out to be a particularly important taxonomy as developers write software to this standard, to accommodate the various item types suggested.

Content (or Construct) Frameworks

A content (or construct) framework is a specification of the content of the test. For example, a test that measures problem solving might divide items by stage – understanding the problem, weighing alternative solutions, implementing those solutions, or evaluating the results. A reading comprehension examination might divide passages by science, social science, literature, or art. A science assessment might separate items by biology, chemistry, or physics. The basis for content distinctions can vary. The problem-solving distinction above is based on the 'stages of problem solving' literature. Content distinctions are often based on how curriculum is organized. An empirical basis is often useful – one derived from the results of a factor analysis, for example.

The main reason for including some kind of content framework in test specifications is to ensure that the domain structure is reflected in the test makeup. It would be inappropriate for a reading comprehension test, used for general college admissions, to include only history passages, for example. It is not only fair to have the test content reflect domain content, but is also likely to lead to higher test validity. How content sampling is conducted is an important consideration. Ideally, there would be a methodology to link domain content to test content, reflecting frequency and importance. In practice, this is often done by expert judgement.

Psychometric Factors

The main psychometric factors considered in test specifications are item difficulty, discrimination, reliability, and validity. Typically, tests comprise items of varying difficulty levels – easy, medium, and difficult. In initial test development, difficulty levels are unknown, but are estimated by those who write the items. Even with skilful and experienced item writers, it is tricky to obtain more precise estimates than easy, medium, and difficult, until considerable data have been collected. Personality items do not have difficulty per se, but can be characterized by the analogous factor of 'endorsement' rate (e.g. the percentage of people who endorse the item, or say it is characteristic of them, for example). Endorsement is interchangeable with difficulty in how it can be treated in test specifications (e.g. a personality inventory could consist of items with low, medium, and high endorsement rates).

Discrimination refers to the degree to which item performance correlates with overall test performance – this is often called a 'part–whole' correlation. It is usually desirable to have items with medium to high correlations with the rest of the test items. Low correlations can indicate problems with the item (either low reliability, or the item is measuring a construct different from what the other test items are measuring).

Reliability is a property of a test score (as typically computed from several items) for a sample or population of test takers. It is a measure of how someone's test score would remain constant, relative to the scores of others, if the test (or another version of the test) were administered again. As such, it is a relative measure: it is actually a ratio of score variance due to persons over the total amount of score variance (variance due to persons plus variance due to items). Thus, reliability is also a direct measure of the existence of true individual differences in test scores.

Validity is an index of the degree to which an item or test score reflects what it is supposed to measure. This can be computed by correlating test scores with criterion outcomes, such as school grade point average (criterion validity), or with similar test or factor scores (construct validity). It can be determined during the construction of the test itself, for example, by developing items by sampling from texts, or by interviewing experts (content validity). An interesting new addition to the list of validity types is 'consequential' validity, which refers to the effects the test has on those who take it and those institutions that use it for making decisions.

Exposure is an important property of items from high-volume, high-stakes tests, such as ones given for college admissions. It has to do with how many times a particular item has been seen by test takers. The idea is that the more times an item has been seen, the more likely that item will be 'compromised', and therefore ought to be 'retired' (not used in the future). Exposure is an important concept for adaptive tests, which consist of items that are exposed differentially, and therefore retired at varying times.

ITEM WRITING

Most of the time, test items are written by individuals familiar with the content being measured. This is particularly true with existing tests, where items are written to replenish the item pool. The psychometric quality of items will reflect the expertise of the item writer, with respect to both content and the process of item writing. Item writing is often regarded as an art, but there recently have appeared several excellent texts covering item writing rules and heuristics (e.g. Haladyna, 1999; Osterlind, 1998). Large testing organizations such as Educational Testing Service and American College Testing employ hundreds of professional item writers, possessing advanced degrees in literature, science, mathematics, and other disciplines, who specialize in particular tests or item types.

In some cases, particularly new tests with no extant items to serve as a guide, the task of item writing falls on a committee of domain experts. A committee of architects might write items for an architecture licensure examination; auto mechanics might write items for a mechanic's proficiency examination. Typically, professionals and specialists will not have the item writing knowledge necessary, and so such committees often include professional item writers who provide some training, or help the subject-matter experts with item writing.

TEST ASSEMBLY

Assembling items into a test is a necessary part of the test design process. During assembly, items are reviewed to ensure that the test meets specifications. In test design, typically many more items are written than can be used. That is because items are eliminated during assembly, or later, after data on item performance comes in, revealing some items' psychometric weaknesses.

Item review is a necessary part of test assembly. Reviewers evaluate items for several reasons. One is to determine whether items match test specifications. Another is to ensure clarity in what the test item is asking for, by eliminating ambiguous wording, excessive use of negatives, and other problematic language constructions. A third is to settle on the correct answer, which can be as simple as double-checking, and as complex as polling a group of experts and hoping for a consensus. A fourth kind of review concerns avoiding language that might be interpreted as unfair, biased, or insensitive to certain test takers or groups of test takers. In some cases, these reviews can be conducted by a single individual, but in high-stakes or high-volume tests it is often necessary to have different specialists conducting the various reviews.

After assembly, it may be necessary to set score standards. Standard setting is the process of deciding on a passing, cutoff, or qualifying score. There are several ways to do this; most involve a combination of judgement and test score data. Often a group of experts decides what constitutes a passing score. Implications of setting the passing score at a particular level can be explored by determining how many and which test takers achieve such a score. The passing score can be adjusted up or down based on that kind of information. A more involved procedure requires that experts estimate the number of 'qualified' individuals who would pass an item, considering items one at a time, then averaging those percentages to get a qualification score, a method known as the 'Angoff procedure'.

FUTURE PERSPECTIVES AND CONCLUSIONS

Research in test development is focused in several areas. One is in efforts to increase the efficiency of developing and scoring items – through item generation, and the use of natural language methods for presenting items – and interpreting responses, such as in essay scoring. A second is in efforts to consider a wider variety of item types to measure factors that have been traditionally confined to research studies, such as creativity and motivation. A third is in attempts to create items with a richer domain context, such as simulations. Advances in technology have aided attempts along these lines. Below are some additional new directions test design may be headed.

Personality and IRT Modelling

Item response theory (IRT) methods were developed originally with cognitive test items in mind – items with correct and incorrect answers.

Several researchers have proposed adapting IRT methods for personality and attitude items, which do not have correct answers, but which can be characterized by endorsement rates. The advantages and applications of an IRT approach apply to personality as well as ability items, for purposes such as item analysis (to identify and eliminate poor items), scale definition (to develop more reliable and valid scores), and adaptive testing (to reduce testing time) (Embretson & Reise, 2000; Smith, 2001).

Evidence-Centred Design

Evidence-centred design (Mislevy, Steinberg & Almond, 2001), or ECD, represents potentially a new approach to the development of tests, particularly those that are tied to a domain for specific purposes, such as licensing and proficiency examinations, or embedded tests that appear within a computerized instructional course. It also seems particularly important for 'high inference' applications when the test is a complex performance that must be interpreted as opposed to the more conventional 'low inference' measures. The basic concept of ECD is that test design ought to start with a consideration of the kinds of inferences the test administrator would like to make about the examinee. Given such inferences (e.g. 'this person is proficient in repairing automobiles', or 'this person is qualified to practise medicine'), the question is what evidence would lead to such inferences, and how confident would we be to make such inferences given the evidence. The final consideration is what tasks or situations could we present to the examinee to elicit relevant evidence. Although all test design concerns itself with these issues, ECD makes this inference chain more explicit, and relies naturally on Bayesian inferential statistics to link evidence and inferences.

Automatic Item Generation

Because item writing is a costly and time-consuming part of test development, there have been attempts recently to automate the process of generating items (Irvine & Kyllonen, 2001). Two general strategies seem most popular. In item cloning, one takes an existing item with desirable psychometric properties (e.g. good reliability and validity), and develops variants of it by changing item features, such as the names or numbers used in a mathematical word problem. In template generation, one generates items from an algorithm. This seems especially useful for items with a well-known structure, such as puzzle-like intelligence-test items. Both approaches appear promising, and developments are occurring rapidly. We are likely soon to see the application of natural language processing methods to automatic item generation, a major step forward.

CONCLUSIONS AND FUTURE PERSPECTIVES

A way to summarize many of the developments is that we are witnessing the transition from an art to a science of test design. This is an important advance and promises to lead to more economical, reliable, predictively valid, and construct valid tests. Among the developments that signal this change are the publication of standards (AERA/APA/NCME, 1999; IMS, 2001; ITC, 1999), the development of automated essay scoring systems, and the emergence of item generation models and theory as a framework for test construction. Among the most significant challenges in this transition is the capability for dealing with complex item types, often characterized by messy scoring requirements. Advances in the use of natural language processing methods, and Bayesian inferential statistics, as in the ECD approach, appear promising as ways to address some of these challenges.

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RELATED ENTRIES

Intelligence Assessment (General), Theoretical Perspective: Psychometrics, Theoretical Perspective: Cognitive

TEST DIRECTIONS AND SCORING

INTRODUCTION

Test directions depend closely on the selected scoring rule. Therefore, this entry will mostly centre on the term *scoring*, which has two different meanings: (1) the process of attributing scores to the examinees according to certain rules, and (2) the selection of the scoring rule in the process of test construction. Both have been taken into account by the *Standards for Educational and Psychological Testing* (AERA, APA & NCME, 1999), although the first one has been given preference. The second meaning may have implications for the validity of the scores, and it is the one which has generated the most scientific research.

NORMATIVE ASPECTS

Concerning test directions, it is relevant to note that one of the rights of test takers is to be provided with as much information, where appropriate, about test scoring criteria as is consistent with valid responses. General advice about test-taking strategy should also be provided (AERA, APA & NCME, 1999: standard 8.2).

Following the semantic distinction on scoring, we will signal the standards related to scoring as a process (entry 5 on test administration, scoring and reporting) and as a decision on scoring rules (entry 3 on test development and revision).

Test Administration Scoring and Reporting

Standardized directions to examinees have the goal of ensuring that the procedure of test taking is properly understood. When tests are administered by computer or require special equipment, some practice time must be provided. Test takers will generally be informed of time constraints,

answering procedure, and, if pertinent, about when to omit item responses. Implicit is the goal of not providing unfair advantage to anyone.

With respect to the scoring process, standards 5.1, 5.2, 5.8 and 5.9 are summarized below: interpretability of test scores requires that tests be administered and scored following the developer's instructions, and only special situations or an examinee's disability would justify an exception. Scoring processes must be monitored in order to assure accuracy, correcting any systematic source of errors. When test scoring requires human judgement, adherence to scoring criteria should be checked regularly.

Test Development and Revision

Scoring rules are associated with *test framework* and *item format*, and must be consistent with the purpose of the test and facilitate meaningful score interpretation. Standards 3.6 and 3.14 are explicitly relevant to scoring.

Only after the nature of the item and response format has been specified, can scoring rules be selected. Scoring rules for multiple-choice items are obviously different from rules for short-answer items, extended-response formats, or performance assessments. In any case, all formats need some indication about how to score the responses. For short-answer formats, a list of acceptable answers is usually enough. For extended-response formats, instructions concerning the answers that will be scored correct have to be more detailed; in this modality, the scorers are usually provided with *scoring rubrics* specifying the evaluation criteria. For performance assessments, as well as for extended-response format, analytic or holistic scoring can be used – analytic scoring procedures give not only a total score on explicit criteria that reflect the test framework, but also separated scores for critical dimensions; holistic scoring procedures simply provide an overall score. The rationale of the various rules for multiple-choice testing programmes as well as the empirical data generated in the context of this format will be the object of the next section.

RESEARCH ON SCORING RULES

Multiple-choice items have many desirable characteristics (albeit some shortcomings, too); in addition, they are suitable for most of the purposes of testing, and therefore research studies on scoring rules have been mainly centred on this format. A major threat to the reliability and validity of scores on multiple-choice testing is guessing.

Guessing

The probability of guessing the correct answer is a ratio of one to the number of options ($1/k$). It is usual in educational contexts to adjust the directions and scoring rules to correct the expected effects of guessing in the sum of right answers, the traditional scoring rule. This is done by means of formula-scoring rules in which test takers' expected score will be the same whether they omit the answer to an item or guess at it randomly.

Two formulae have been proposed: (1) imposing a penalty of $1/(k-1)$ for each error, and (2) giving a bonus of $1/k$ for each omission. Both are linearly related by $S_{\text{bonus}} = [N + (k-1)\,S_{\text{penalty}}]/k$, where S means score and N is the number of items of the test. Consequently, if the asumptions of the formula-scoring model were true (i.e. errors are the product of guessing, and all guessing is at random), the ranking of subjects under these two conditions should be the same.

The validity of the scores could be still put into question if random guessing varied systematically between examinees, such as were it associated to aptitudinal, experiential or personality factors. Traub and Hambleton (1972) designed a study to assess the empirical effect of these scoring rules. Results showed that differences in reliability were favourable to the bonus procedure. With respect to criterion validity, no statistical difference was found, but effect sizes favoured the bonus procedure for every criterion they studied. In addition, the correlations between scores and personality variables did not systematically vary as a function of the scoring rules, which is inconsistent with the claim that encouraging guessing is in the interest of fairness.

However, Budescu and Bar-Hillel (1993) have proposed that examinees be taught to always answer. They compared the scoring rules on three dimensions: *strategic*, on how to maximize scores; *psychological*, on how actual examinees respond to the directions; and *psychometric*, on

the reliability and validity of the scores. They argue that, although psychometricians favour formula-scores, examinees have difficulties in understanding the corresponding instructions; and given that, from a strategic point of view, answering at random is never too prejudicial, encouraging test takers to always answer would eliminate the unfair advantage that often goes to risk-taking examinees.

But it should not be forgotten that guessing is found abhorrent by some people, and that it is also unethical in many real-life contexts, such as court witnessing or medical diagnosing, where accuracy is always preferred over quantity. It is difficult to justify that to evaluate children's knowledge, first they must be taught to guess! Taking into account this *educational* dimension, and expecting to discourage all sorts of guessing behaviour, Prieto and Delgado (1999a) tested a fourth rule – applying a penalty for errors that equals the premium for right answers. Globally considered, their results were favourable to the bonus rule, given that the level of errors remained high even under the most punishing condition.

If errors are not only the product of random guessing, but also of examinees' *miscalibration*, then instructions on strategy do not suffice to eliminate all errors, and applying a penalty for error is not, as pretended, a punishment for guessing. It seems that considerations other than guessing behaviour must be introduced in order to assess the performance of examinees.

Miscalibration

People monitor their memory reporting by deciding which items to omit as a function of the incentives for accuracy (Koriat & Goldsmith, 1996). However, the effect of monitoring on accuracy is dependent on the *calibration* of test takers, whose confidence judgements are not always diagnostic of answer correctness. Miscalibration is not easily altered (Gigerenzer, Hoffrage & Kleinbolting, 1991), and therefore it should not be expected to change by means of test-answering directions. This is a strong argument against penalty-based formula-scores. And there is still another reason to reject them: the implicit suggestion that, when guessing at random, right and wrong answers will cancel each other out is reinforcing the mistaken *belief in the law of small numbers* (on perception of randomness, see Bar-Hillel & Wagenaar, 1993). Under these instructions, examinees guessing at random should not be induced to believe that their scores will be the same as it would be had they omitted – this could be true in the long run, but it is only one of the possible outcomes in the actual situation. On the contrary, under bonus instructions, examinees know in advance the amount they will be rewarded.

Ben-Simon, Budescu, and Nevo (1997) tested various scoring rules involving self-assessment of *partial knowledge*, such as *elimination*, in which examinees are instructed to eliminate all distractors identified as incorrect, or *probability testing*, in which the probability that each option is the correct answer is reported. Their results confirm the existence of miscalibration, taking the form of an *overconfidence bias* for all the rules compared. Even though some of the rules can be very useful in order to assess different degrees of partial knowledge, the possibility of finding systematic association between overconfidence and individual differences variables jeopardizes the validity of the resulting scores.

FUTURE PERSPECTIVES

There is some evidence concerning the differential effects of scoring rules on different population subgroups, such as those defined by gender (Ben-Shakhar & Sinai, 1991; Prieto & Delgado, 1999b). Other subgroups (e.g. defined by minority status) could also be affected. Even though the effects were small, unfair classifications or decisions could reach a large portion of examinees were tests used in large-scale examinations. Predictive bias needs to be investigated.

The cognitive implications of asking examinees to judge their own state of knowledge during test completion must be researched, given that it could have a disruptive effect on examinee performance as well as having serious implications for construct validity.

CONCLUSIONS

The number right scoring rule seems to be inappropriate from both the psychometric and educational perspectives, and penalty-based scoring rules are also clearly inappropriate

from a psychological point of view, which also affects, although to a minor degree, the bonus-based rule, and partial-knowledge testing. However, it should be considered that passing a standard or getting high scores may be the main objective of examinees from a strategic point of view, but it is not the one that educators should foster. Teaching students to omit an answer when they are uncertain by means of rewarding seems far more adequate than teaching them to guess.

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RELATED ENTRIES

Theoretical Perspective: Psychometrics, Achievement Testing, Standard for Educational and Psychological Testing, Performance

TEST USER COMPETENCE/ RESPONSIBLE TEST USE

INTRODUCTION

The purpose of this entry is to highlight some efforts to promote responsible use of tests throughout the world. Psychological and educational tests serve as key professional tools for psychologists and non-psychologists, and test publishers serve as gatekeepers to determine who has access to different types of tests. A persistent problem, acknowledged by professional associations and publishers, has been the misuse of test data and its subsequent potential harm to test takers.

THREE-LEVEL PUBLISHER CLASSIFICATION SYSTEM

The American Psychological Association (APA), five decades ago, addressed ethical use regarding the sale and distribution of tests (APA Committee on Ethical Standards for Psychology, 1950). Their

1954 technical recommendations (APA AERA & NCMUE, 1954) introduced a 3-level system for classifying tests, which emphasized the importance of professional credentials to justify access to tests at the highest level: level C (Moreland, Eyde, Robertson, Primoff & Most, 1995). Though the 3-level classification reappeared in the 1996 test standards, it no longer exists in APA standards or ethics codes (APA, 1992; American Educational Research Association et al., 1999; DeMers & Turner, 2000).

The current status of the 3-level classification and qualification requirements was examined using material from 8 USA test publisher catalogues. Seven of the publishers used a 3-level system, each with their own definitions and interpretation of the requirements, based on questions in their qualification forms. User questionnaires included level of training, professional association membership, licensure, course work, and workshops. Robertson, who in 1986 reported on a survey of test qualification forms of 13 major publishers, concluded that 'conditions of sale often were stated so generally that it was not possible to ascertain the exact criteria used to establish professional credibility' (p. 9). His conclusion still holds. Credentials and degrees serve as a crude screen to place test purchasers into broad categories that cover a wide range of criteria. The publishers require test purchasers to adhere to the APA test standards or to the standards of other professional associations.

EMPIRICAL TEST USER RESEARCH AND TRAINING

The Joint Committee of Testing Practices (JCTP), which now includes APA and six other professional associations, was established in 1985 to provide 'a means by which professional organizations and test publishers can work together to improve the use of tests in assessment and appraisal'. Two of JCTP's products dealt with empirical research on test user qualifications and training. JCTP formed the Test User Qualifications Working Group (TUQWoG) with the purpose of developing behavioural competencies for test users, based on two job analysis methods: the critical incident method and Primoff's job element method (Moreland, Eyde, Robertson, Primoff & Most, 1995).

The empirically based results included 12 minimum competencies for proper test use, such as 'avoiding errors in scoring and recording ... keeping scoring keys and test materials secure ... and establishing rapport with examinees to obtain accurate scores (Moreland et al., 1995: 16). A set of 86 specific test user competencies were derived from critical incidents gathered from 62 experts on 48 tests. Seven factors of test misuse were identified that dealt with: (a) comprehensive assessment, (b) proper test use, (c) psychometric knowledge, (d) maintaining integrity of test results, (e) accuracy of scoring, (f) appropriate use of norms, and (g) interpretive feedback. Furthermore, a system for empirically clustering tests for possible 3-factor or 8-factor solutions, based on likelihood of test misuse, was developed. A sample qualification form was developed and adopted by three test publishers and was adapted by others. Two of the eight test publishers currently ask test purchasers to accept and comply with Principles of Effective Test Use and another publisher lists Elements of Sound Testing.

At the suggestion of Anne Anastasi, who recognized that the prevention of test misuse needed to include test user education, a new JCTP group called the Test User Training Work Group (TUTWoG) was established. This group published *Responsible Test Use: Case Studies for Assessing Human Behavior* (Eyde et al., 1993). This book includes 78 case studies, based on critical incidents that were linked with the 86 specific competencies. Users are presented with focus questions for each case, and, on the back of the page for each case, are provided with an analysis of the case along with the relevant competencies and factors of misuse.

APA POLICY ON TEST USER QUALIFICATIONS

APA established the Task Force on Test User Qualifications (TFTUQ) to provide a policy on test user qualifications (DeMers & Turner, 2000). The task force was established in part because psychological test users may not have the knowledge and skill that is needed for optimal test use. The aspirational guidelines include generic qualifications for typical uses of tests and specific qualifications for the use of tests in

different settings or for specific purposes. The knowledge and skills guidelines include, for example, a detailed list of core psychometric and measurement knowledge topics. The section on qualifications for use in specific contexts includes employment, education, vocational/career counselling, healthcare, and forensic settings. Regardless of setting, the specific contexts deal with classification, description, prediction, intervention planning, and tracking. It is hoped that the guidelines will be used in training programmes to strengthen curricula coverage in measurement theory and psychometrics, and improve skill in administration, interpretation, and communication of test results.

INTERNATIONAL TEST COMMISSION

The International Test Commission (ITC) is 'an association of national psychological associations, test commissions, test publishers and other organizations committed to promoting effective testing ... and to the proper development, evaluation and uses of educational and psychological instruments' (Bartram, 2001). ITC has members in Western and Eastern European countries, North America, and some countries in the Middle and Far East, South America, and Africa. ITC's international effort to develop International Guidelines for Test Use was designed to pull together existing guidelines, codes of practice, and standards to create a coherent structure (Bartram, 2001). These materials were developed into a framework document, which formed the basis of the ITC Workshop on test use, held in Dublin in July 1997.

The competencies cover the following issues (Bartram, 2001a):

- professional and ethical standards in testing,
- rights of the test candidate and other parties involved in the testing process,
- choice and evaluation of alternative tests,
- test administration, scoring and interpretation,
- report writing and feedback.

The document (Bartram, 2001a) also includes appendices on:

- Guidelines for an outline policy on testing.
- Guidelines for developing contracts between parties involved in the testing process.
- Points to consider when making arrangements for testing people with disabilities or impairments.

The ITC guidelines were prepared to be generic guidelines for flexible use in different countries. They may be adapted to different cultural contexts, with different statutory requirements, and act as a resource for national professional psychological associations. Its purpose was to describe areas where there was consensus of 'good practice', without being prescriptive (Bartram, 2001b). The guidelines represent the work of psychological and educational testing specialists from numerous countries.

The document was designed to be user friendly by categorizing the statements under 16 main headings and using a user-friendly format, which provides for the completion of a common stem. The headings are (Bartram, 2001b):

1 Take responsibility for ethical test use
1.1 Act in a professional and ethical manner
1.2 Ensure they have the competence to use tests
1.3 Take responsibility for their use of tests
1.4 Ensure that test materials are kept securely
1.5 Ensure that test results are treated confidentially
2 Follow good practice in the use of tests
2.1 Evaluate the potential utility of testing in an assessment situation
2.2 Choose technically sound tests appropriate for the situation
2.3 Give due consideration to issues of fairness in testing
2.4 Make necessary preparations for the testing session
2.5 Administer the tests properly
2.6 Score and analyse test results accurately
2.7 Interpret results appropriately
2.8 Communicate the results clearly and accurately to relevant others
2.9 Review the appropriateness of the test and its use.

The guidelines were issued in Stockholm in July 2000, and published in *International Journal of Testing* (2001). As of August 2000, translations were being made into these

languages: Chinese, Croatian, Danish, Dutch, French, German, Norwegian, Slovenian, Spanish (two versions, one for Spain and one for Argentina), and Swedish.

BRITISH PSYCHOLOGICAL SOCIETY

During the last decade, the British Psychological Society (BPS) (Bartram, 2001b) has been actively dealing with the problems of low quality tests and poor testing practices. BPS publishes test reviews and maintains a voluntary Register of Test Users.

BPS has developed a certification process for occupational/employment test users. Both psychologists and non-psychologists use the process. The topics covered in the process are as follows (Bartram, 2001b): 'test administration, basic psychometric principles and the use of test of ability and aptitude, and the use of more complex instruments, particularly those used in personality assessment' (p. 178). A variety of work samples is used in the assessments and verifiers ensure that the assessment process meets the same standards. So far, over 15,000 certificates have been issued, which provides BPS with funding for extension of its test use work. The process for certifying will soon be extended to the users of educational tests. The BPS certification process contributes to higher standards of test use in the United Kingdom.

CONCLUSIONS

Professional associations, such as the American Psychological Association, the British Psychological Society, and the International Test Commission, have been actively involved in providing guidelines for improving test use, educating, and evaluating test user competence. Among these groups, the focus is on test user competency, rather than on licensure and doctoral degrees.

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RELATED ENTRIES

Ethics, Standard for Educational and Psychological Testing, Theoretical Perspective: Psychometrics

TESTING IN THE SECOND LANGUAGE IN MINORITIES

INTRODUCTION

Standardized tests have become an indispensable tool in the assessment process and the results they produce frequently form the basis of decisions regarding competence, promotion, selection, or detection of pathologies that may greatly affect the personal and/or employment situation of the subjects tested. Due to the widespread use of tests for making important decisions, the possible influence of testing in the second language in minorities has become a constant research topic in recent years. Many hypotheses have been formulated regarding the influence of language when individuals are tested in a language other than their dominant one. However, although this influence is widely assumed to be present the way in which it affects test results remains unclear (López, 2000).

The term 'minority' has generally been used in a linguistic sense to refer to those persons whose native language is different from that of the majority, regardless of their level of fluency in this second language (Figueroa, 1990; Geisinger & Carlson, 1992), although the cultural differences associated with this are increasingly being taken into consideration as well. The problem of testing in the second language in minorities is not only an issue which is attracting growing interest, but is one which is being reformulated and approached from new angles due to the rapid social change being brought about at present: a direct consequence of migration and the globalization of the economy is that researchers are being led toward a multicultural and multiethnic map.

HISTORICAL PERSPECTIVE

The current situation can be better understood by analysing how the use of psychological and educational tests with minorities has developed over the years (see the reviews on this issue by Figueroa, 1990; Olmedo, 1981). Up until the mid-twentieth century, research was focused on the standardization of various tests of intelligence for subjects (particularly children) from minorities, it generally being assumed that they showed a lower level than the majority group. Bilingualism was seen as a negative phenomenon, a delay in intellectual development and an obstacle to achieving competence in the dominant language. Many of these studies ignored not only the impact of a second language on psychometric test scores, but also the interaction between such scores and the socio-economic and educational level of subjects.

After 1950, there was a gradual change in attitude toward the effects of testing of minorities, and linguistic and cultural factors, as well as the social, political and economic reality of these groups, began to be considered. The surge in research interest on this issue occurred especially in the United States during the 1970s, and was linked to the strong human rights movement. Unfair/invalid testing of minorities was considered to be an obstacle to social justice and economic opportunity. As a consequence, new laws were introduced in an attempt to reduce the discrimination in the testing of minorities and new assessment materials, which were neither ethnically nor culturally discriminatory, were called for. Thus, for example, the 1985 version of *Standards for Educational and Psychological Testing* acknowledged this concern and included a chapter entitled 'Testing Linguistic Minorities' which suggested ways of approaching the issue.

This gradual change in attitude has continued to the present day and the influence of culture, language, social status, education and many other factors on testing is now commonly accepted. Research on the issue aims to analyse these factors and define precisely their influence, emphasis being placed on the advantages and disadvantages of bilingualism, its effect on test results and possible solutions or improvements to the problem of testing of minorities.

THE CURRENT SITUATION

Widespread social interest in the equal treatment of minorities has been the main stimulus behind

studies on the role of linguistic competence and the issue of inter-language contact with respect to test results. Bilingualism has ceased to be considered as having a detrimental effect on the development of intelligence and learning and is now seen as a sign of cultural richness. However, there are many different opinions and disputed points of detail about how bilingualism affects test results, whether of intelligence, or personality.

In the area of intelligence some authors (Cummins, 1984; Reynolds, 1991) argue that bilingualism increases intellectual flexibility and enables certain cognitive skills to be improved. However, this effect may be reversed in children with insufficient development in the first language (the well-known Cummins' threshold theory). In order to avoid problems and measurement errors, other authors have suggested using non-verbal tests, which are supposedly free of linguistic contamination, instead of tests that rely on the dominant language (Figueroa, 1990; Duran, 1989). A constant finding seems to be that bilingual subjects score higher on non-verbal tests than verbal ones, but this solution results in a reduced predictive power for variables of academic achievement.

With respect to personality tests, the impact of the second language on test scores has not traditionally received as much attention as in the field of intelligence, but there is currently great concern to address the issue and provide any solutions which are required (López, 2000). Most researchers (Malgady & Constantino, 1998; Price & Cuellar, 1981) argue that when bilingual patients are tested in their native language rather than their second one, more pathologies are seen. This is because the ethnic similarity between the patient and the clinician increases the latter's skill in identifying the cultural forms of expressing symptoms, and in understanding both the meanings associated with specific experiences and the linguistic variation in the patient's thought and expression. Along similar lines, Marcos (1994) identified four categories of patient behaviour that are susceptible to being distorted or misinterpreted by clinicians who are only competent in the dominant language: the patient's general attitude toward the tester and the interview setting; motor activity, speed and verbal fluency; affective and emotional tone; and sense of self. All this makes it difficult for the clinician to distinguish between what is induced by a lack of linguistic competence and the tension this produces, and what is genuinely due to a psychiatric symptom.

Whatever the case, with respect to both intelligence and personality, it must be remembered that bilingual individuals differ considerably in terms of their receptive and expressive command of language. Malgady, Rogler and Constantino (1987) and Olmedo (1981) suggest using the language that maximizes the likelihood of the subject understanding the requirements of the test situation and being able to respond to the best of his or her ability in one or both languages. In order to achieve this, further attention must be paid to the type and degree of bilingualism of each individual at the point of testing. López (2000) suggests three aspects which should be taken into account: (a) identifying a subject's dominant language requires a systematic evaluation, part of which must include the subject's own view of his or her linguistic ability; (b) psychological functioning may be related to the language that a bilingual person uses as well as to the ability level in each of the two languages; (c) the amount of vocabulary used may vary according to the social context which is being evaluated: for example, in the case of immigrant children, second language vocabulary will be more developed in the academic context while their first language will be more developed in the family context. Therefore, it is essential that the tester can detect in which language the subject should be tested in order to optimize the accuracy of the assessment.

FUTURE PERSPECTIVES

The great impact of testing of minorities is clear and the amount of research on this issue in recent decades is proof of its importance. However, further work is undoubtedly required on several important aspects in order to provide new information about the process of testing and the accuracy of the subsequent assessment.

The latest editions of *Standards of Educational and Psychological Testing* and *DSM-IV* both consider the assessment of minority groups, but as Malgady and Constantino (1998) point out, it would be helpful to develop a set of explicit guidelines about how language and culture should be taken into account when making multiaxial diagnoses.

Another line of action would be to carry out measurement equivalence studies between

cultures, using existing methodologies which remain underused at present. The aim would be to determine the generalizability and transcultural equivalence of these constructs before applying them to other cultures. Allen and Walsh (2000), Brislin (1993) and Okazaki and Sue (1995) distinguish the levels of linguistic, metric and conceptual equivalence; these would be used to check, respectively, if test items have the same meaning, if a common metric can be used to measure the same attribute, and whether the underlying psychological construct has the same meaning for the minority group as for the majority group for whom the instrument was, in theory, developed (on this issue, see the entry on cross-cultural assessment in this encyclopaedia). In summary, comparing cultural difference should now be regarded as comparing cultural non-equivalence.

All the above must also be related to test bias analysis from the point of view of construct validity. In order for a test's multicultural validity to be established, it must be shown to be invariant across cultural groups (Van de Vijver & Poortinga, 1991). It is here that techniques of test and/or item bias analysis can be used (see the entry on 'Item Bias' in this volume), especially confirmatory factor analysis with multi-sample studies (Gómez, 1996) which highlights whether certain idiosyncratic characteristics of the cultural group influence test scores, in addition to the trait measured. The construct might vary among groups and there may be specific constructs for a given culture, in which case the way in which assessment with that instrument is interpreted will vary according to the cultural group.

Finally, consequential validity (Messick, 1995), whereby use of the test is considered in the light of the probable consequences of testing, must be taken into account. This forms part of the concept of overall validity, an interpretation of test scores which takes into account the consequences of such an interpretation.

CONCLUSIONS

The problems associated with testing in the second language in minorities are attracting growing interest in our social and cultural reality, a reality in which immigration is an increasingly common worldwide phenomenon and where the use of testing and interviews is ever more common.

The central problem is how to identify, define and analyse all those variables which may affect test results in a second language, so as to avoid bias against a given culture or minority group. Research on this issue suggests that the following are all relevant: the ethnic background of testers, their gender, the style of testing, the degree of bilingualism of the subject and tester, the subject's level of identification with each of the languages and/or cultures which are in contact, whether or not an interpreter is used, whether the test is administered in the second language, the native language or in both, and, in this latter case, the order in which it is given. Undoubtedly, further and more systematic research is needed to clarify more precisely the degree of influence and possible control of each of these variables so that minority groups can be tested fairly.

In general, authors tend to agree that in terms of assessment aims, testing should be carried out in the subject's dominant language as this is the best way of reducing errors. López (2000), Malgady and Constantino (1998), and Malgady, Rogler and Constantino (1987) suggest a culturally-sensitive individual approach to testing which requires a preliminary assessment of subjects' linguistic competence and their degree of preference and identification with the majority or minority culture. This is related to the problem of acculturation, the process which takes place when two or more cultures are in contact; the degree of acculturation affects problems of testing of minorities as it includes not only language acquisition, but also the acquisition of the majority culture's values, customs and cognitive styles. All in all, the aim is to guarantee the highest levels of precision when testing, using the language that maximizes subjects' ability to show their knowledge, feelings and symptoms.

Finally, it is to be hoped that the guidelines described above will, over the next few years, be fully taken on board and thus provide a useful complement to current findings. What is especially needed is the development of measurement instruments that enable constructs which are conceptually equivalent across different cultures and linguistic groups to be inferred, thus guaranteeing measurement equivalence and the fairness of testing in minority groups.

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Juana Gómez-Benito

RELATED ENTRIES

ETHICS, CROSS-CULTURAL ASSESSMENT, COMMUNICATIVE LANGUAGE ABILITIES, LANGUAGE (GENERAL)

TESTING THROUGH THE INTERNET

INTRODUCTION

Many have hailed the Internet as opening up a whole new set of opportunities for advancing the science of psychometrics and the technology of testing. Others have expressed concerns that the growth in the use of the Internet for testing will lead to poor tests being developed, good tests being used badly and a growth of bad practice that will adversely affect not only individual test takers but also act to discredit testing in general. This entry will explore both the areas of concern associated with the Internet and the opportunities it affords. More extensive treatment of these issues can be found in Bartram (1997, 2000).

UNDERSTANDING THE INTERNET

In order to appreciate its potential and its dangers, it is important to understand what the Internet is and how it works. The Internet is, literally, an interconnected set of computer networks (hence, inter-net). These various networks are able to communicate with each other through the use of a common shared protocol (TCP/IP).

The Internet has been with us since the 1950s. In its early days, the Internet, as a means of communication, was difficult to use. Use of the Net was confined largely to academics and the military, and its main use was for email and file transfer. The advance that led to the Internet becoming part of our everyday life was the development of the world wide web in 1992. A 'web' is a collection of pages connected by 'hyperlinks'. By simply 'clicking' with a mouse on a hyperlink on one page, the user can move from that page to another. Web pages are accessed using a 'browser'. This is a piece of software that resides on the users' computers, which lets them interact with the Internet and display web pages. With the addition of search facilities, the main features of the current World Wide Web were defined.

Webs (that is, interlinked collections of pages) are held on a 'server'. This will deliver pages to users when they call up the web's domain name (or URL). A web can reside on one server or consist of sub-webs divided across a number of physical servers. The Internet, as the transport medium, takes care of the process of finding pages and delivering them to the user.

In its simplest form, the pages delivered over the Internet to a web user will consist of content defined by HTML (Hypertext Mark-up Language). HTML contains simple formatting and layout instructions that tell the user's computer how to display the contents of the page. HTML pages can include graphics, sound, and video as well as text. However, the more information HTML pages contain, the longer it takes to deliver them.

In addition to HTML pages, it is possible to download applications (known as applets) that can run on the user's computer independently of the Internet. Tests written in this way will continue to run even if the Internet connection to the user is broken. This approach provides the test designer with far more control. However, for security reasons, some users may operate in environments that forbid the downloading and running of applets.

In considering testing on the Internet we need to consider both the technical strengths and weaknesses of the Internet itself (as a transport medium) and the limitations that the www technology imposes on the design of tests and control over their delivery.

SECURITY

Security concerns tend to be very high on the list of those worried about the use of the Internet for testing. The concerns over security need to be considered in relation to various sets of data.

1. The test itself (item content, scoring rules, norms, report-generation algorithms, report content, etc.).
2. The test taker's identify – both authenticating the person's identity and preserving their confidentiality.
3. Test results – ensuring that only those eligible to access the test scores are able to do so.

While all the above are areas of concern, it is important to put these into perspective by considering how the Internet, as a testing medium, compares with the current alternatives: paper-and-pencil and stand-alone computer-based testing.

Test Security

The key feature of the Internet is that, apart from the browser software itself, all the application software and all the data resides on the server not on the user's computer. Herein lie some of the main advantages of Internet-based testing:

1. All the important intellectual property associated with a test (scoring rules, norms, report-generation algorithms, etc.) remains on the server under the control of the distributor.
2. This level of control provides the distributor with detailed knowledge about the use of their products: who is using what, and when. This has enormous potential commercial benefits.
3. The test software and reference data set only exists in one location. This ensures that all

users have access to the most up-to-date version. It also greatly simplifies the process of making changes, fixing 'bugs', updating norm tables and so on.

Authentication of Users

There is a range of levels of authentication that can be used. The distributor can either make a test open access, or exercise full control over who can access the test content, when they can access it and from where. Control can be exercised by requiring a username and password, or access can be limited to specific machines on the Internet (by only allowing those with particular IP addresses to use the test). By combining IP address checking with user passwords, a very high level of control can be exercised. Such a level of control was never possible for paper-and-pencil testing or for stand-alone computer-based testing.

While this level of authentication would be more than sufficient for managing access to personal banking information, it is not sufficient for ensuring that people are not cheating in a high-stakes testing situation. For such a situation, a person could pass their identification to another person who would actually take the test, or they could have a group of helpers with them while they complete the test. Further advances in identification technology (fingerprint recognition and retinal eye-pattern recognition) would not really solve the problem of security in this sort of high-stakes testing situation.

For this reason, it is likely that high-stakes tests will continue to require the presence of a test administrator to confirm the identity of the test taker and ensure the test is completed under the correct conditions. While this is often noted as a disadvantage of Internet testing, it is really no different to other forms of testing technology.

Protection of Test Results

All the data generated by test takers resides on the central server. By applying best practice to the management of the server, the security of all aspects of the data can be far better assured than would be the case if the data were distributed amongst the various test users. Not only does the centralization of data storage make it easier to manage but it also makes all test data potentially available for research and development purposes. This in turn can raise concerns in some people that they may be losing control over their data. Clearly, if the data are to be used for research and development purposes then this should be agreed with the data providers in advance. The service providers should have clear policies on how individual data are to be kept, for how long and who is allowed access to them. These details must be made clear to the test taker and be agreed to by the test taker before the data are collected.

Those developing Internet-based testing systems also need to consider the applicability of various countries' data protection legislation on the privacy of the data they will hold on their server. At present, the situation is not clear with regard to psychological test data as to what rights the individual test taker has over access to their data. As a matter of good practice, they should be provided with meaningful feedback about their test performance. However, the issue of whether they also have a legal right to access information such as item responses, or scale raw scores, is still not clear and may differ from one country to another.

PERFORMANCE

It is in the area of performance that the major limitations of the Internet are to be found. Testing makes two main requirements of the delivery medium. First, it should provide the means of controlling the timing of delivery. Second, it should be robust and not fail mid-way through a test.

In an ideal environment, every time a page is requested, the page should appear within a fraction of a second of making the mouse click. In practice, it can take seconds or even minutes for the next page to arrive. To reduce the delay between one page and the next, you need to increase the rate of flow of information to the browser, reduce the amount of information in the page, or start sending information before the page is requested.

The last of these is only possible if the pages are in a pre-defined fixed sequence. For most applications this is not the case. Making the container smaller relies on minimizing the use of graphics and other media items that require a lot of space. The most effective solution is to increase the flow rate. This is limited, at present, by three potential bottlenecks.

1 First, the server may not be able to produce pages at a rate fast enough to keep up with the demand. Increasing the server capacity and increasing the bandwidth of the server's connection to the Internet can overcome this problem.
2 Second, the user may be accessing the server through a slow connection (e.g. a 56k telephone modem connection). For high stakes supervised testing, this sort of limitation can be easily overcome by using higher bandwidth connections at the user end. For open access tests, there is no way of controlling this directly, though it would be possible to write software that only lets someone take the test if they are capable of receiving pages at a certain minimum rate.
3 The third problem is the biggest one, and relates to bottlenecks that can occur in the process of getting the page from the server to the browser. The routing of traffic round the Internet is not directly under the control of the service provider.

The last of these problems is one of telecommunications infrastructure and is a significant problem in those areas of the world where the Internet is in relatively early stages of development.

The most rapid delivery is only of value if it can be relied upon. Hang-ups and lost Internet connections can potentially terminate a test session mid-stream. For some tests, it is not practical simply to resume from the point at which a break occurred.

The easiest way to overcome these performance issues is to download any time critical material as an applet. This, at least, will ensure that the test administration is not dependent on the Internet for its timing and integrity. However, from the user's point of view, this may create another problem, if the connection is a slow one; the applet may take a considerable time to download.

Consistency of Appearance

The Internet poses some of the same problems as stand-alone computer-based testing. For example, the test distributor has no direct control over the user's screen size or resolution. For stand-alone systems software controls can be used to mitigate and control some of the extremes of variation in screen settings. For browser-based testing, however, the level of control is rather less. Browsers are designed to leave the user in control of navigation around the Web and to be able to examine and modify the page display parameters in ways that we would wish to prevent in a normal test-taking situation.

Furthermore, there is no one 'standard' browser. Currently, two browsers dominate the market: Internet Explorer and Netscape Navigator. Unfortunately, these do not display information in exactly the same way. As a result, a test will look different and may behave differently depending upon the browser you are using.

Again, the solution to these problems, where they are likely to compromise the integrity of a test, is to create the test within an applet that can be downloaded and run on the user's computer.

GOOD PRACTICE

Much of the concern over Internet testing relates to issues of good practice. These concerns relate to three main areas:

1 Ensuring that there is adequate control over the management of the assessment process.
2 Ensuring that feedback and reporting is of high quality and contained within procedures that reflect good practice in assessment.
3 Controlling the quality of tests delivered over the Internet.
4 Ensuring equality of access.

Management of the Assessment Process

Testing is a process involving a number of participants, each with differing roles. The exact nature and number of participants will vary depending on the nature of the test and the reason for testing. Typically the roles include:

- The initiator or 'sponsor' of the testing process
- The person responsible for managing the process
- The test administrator
- The test taker

- The person who will provide feedback to the test taker
- Third parties who will be provided with information consequent upon the testing.

In addition to involving various people playing various roles, testing follows a sequence of events:

1 The tests are chosen
2 The arrangements are made for who is to be tested, when and where
3 The tests are administered
4 The scores are derived and reports generated
5 The reports are delivered to the designated recipients
6 Feedback is provided to the test taker and/or relevant others.

The Internet provides the ideal medium for managing both the participants and the process. Some current systems manage the process as a project that requires certain resources, in terms of people and materials, and has a time-line with a sequence of tasks and milestones. The work-flow is managed using project templates that users can configure by entering the names of the various participants, selecting the instruments to be used and setting milestone dates for key points in the sequence of events that make up the testing process. The process is automatically managed by assigning tasks to people and communicating with participants by automated emails and hyperlinks.

The level of control that can be exercised over each participant is potentially configurable by the user. In this way, for example, it is possible to ensure that only qualified test users will have access to reports that require an understanding of a particular instrument or that only qualified test administrators are allowed to log test candidates onto the system.

Feedback and Reporting

Just as it is necessary in some conditions to ensure that there is a human test administrator or supervisor present to ensure that high-stakes assessments are carried out properly, so there will also be conditions where it is important to ensure that feedback is provided to a test taker by a qualified person rather than over the Internet.

Most computer-generated test reports are designed for the test user rather than the test taker (Bartram, 1995). Considerable care and attention needs to be given to reports that are intended to provide the sole source of feedback for the test taker.

In practice, the situations where feedback needs to be provided on a face-to-face basis will tend to be the same ones where the assessment itself needs to be supervised. As such, providing for this is no more of a problem than it would be for traditional paper-and-pencil testing. With well-designed Internet testing process-management software, the logistics of arranging for test sessions and feedback appointments are much simpler than for traditional assessment.

Test Quality

The effect on a test's psychometric properties of delivering it over the Internet must be considered. Examples of bad practice abound. For example, some people have taken timed, supervised, paper-and-pencil tests and put them onto the Internet as un-timed and unsupervised. Clearly, one cannot regard the Internet version as the 'same' test as the original.

In general, when a test is presented, where there is some medium other than the one in which it was developed, it is necessary to check the equivalence of the new form (Bartram, 1994). In practice, this is most likely to be an issue for timed ability and aptitude tests. Most research suggests that the data obtained from un-timed self-report inventories are not affected by whether the test is administered on paper or on computer (see Bartram, 1994).

Equality of Access

There has been much concern expressed about the Internet creating a 'digital divide' between those with access to computer technology and those without (Keller, 1996). This is currently true on a geographical basis, with nearly all of the infrastructure and development of business taking place in North America, Europe and Asia-Pacific. This will change over the coming decade, but for some time we will not be able to use the Internet as the sole source of recruitment and selection in countries outside these three main areas.

Within the developed world, there has also been concern about inequalities of access relating to age, race and gender. Most surveys show that age and gender differences in usage are disappearing as use of the net becomes more widespread. Hoffman and Novak (1999) found that although income explained race differences in computer ownership and Web use, education did not (though education and income are related). Furthermore, they found no difference between white and African-American students when students had a home computer. The key concern within the US is that 'the Internet may provide for equal economic opportunity and democratic communication, but only for those with access' (Hoffman & Novak, 1999).

CONCLUSIONS

The Internet has rapidly grown from a medium that was used by relatively few people, to a situation where it is now used by a substantial proportion of the population in the 'developed' world, with new users increasingly reflecting demographic distributions of age, gender and ethnicity (Bartram, 2000). As such, the infrastructure is now sufficiently widespread and accepted to make it increasingly likely that the Internet rather than paper will become the medium of choice for testing over the next 5 to 10 years.

Before long, a high proportion of homes in North America, Europe and Asia-Pacific will have direct interactive access to the Web through the use of fibre-optic cable TV links. This is likely to dramatically increase levels of home-based traffic and will open up new possibilities for educational and occupational assessment in the home.

Technologies are converging to the point where it will be increasingly difficult to differentiate between PCs, TVs and telephones. As this happens, so interactive voice-response (IVR) technology will develop and merge with current Internet-based and video-phone technologies to provide a future seamless interactive communication medium. Digital domestic phones have similar features to digital mobile phones. In 1997, the President and CEO of Nokia estimated that there would be 300 million mobile phone users by the end of 1998, rising to one billion by 2005, and that 'a substantial portion of the phones sold that year will have multimedia capabilities'. UMTS (universal mobile telephony services) will carry an average 144,000 bits/sec compared to the current 9,600 bits/sec of current mobile phones. It will be capable of performing multimedia functions, including Internet access and email.

We are likely to see rapid improvements in both bandwidth and reliability, enabling a far greater range of assessments to be delivered and managed. Along with that will come wide public acceptance of the Internet as a 'natural' medium with which to interact. It will become as familiar as the telephone, radio and television. As this develops, so we will see increasing realization of the potential of computer-based testing: *item-banking* and *adaptive testing*, the use of increasingly sophisticated *item-generation* procedures and the developing of exciting new *simulations* and *scenario-based assessments*.

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Dave Bartram

RELATED ENTRIES

COMPUTER-BASED TESTING, ITEM RESPONSE THEORY: MODELS AND FEATURES

THEORETICAL PERSPECTIVE: BEHAVIOURAL

INTRODUCTION

'Behavioural assessment is a misunderstood term that has been defined in various ways' (Cone, 1998: 26). In the early days of the discipline, it was common for definitions to rely on contrasts of behavioural assessment with more psychodynamically oriented clinical assessment. Thus, whereas behavioural assessment views specific responses of the client as a sample of other, similar behaviour, traditional clinical assessment views them as signs of underlying dispositions or traits. Behavioural and traditional clinical assessment both seek the causes of behaviour. These are likely to be found in contemporary environmental influences for the former, however, and in the early developmental history of the individual for the latter. Behavioural assessors look outside the person in the environmental context for controlling variables. Traditional clinical assessors look inside the individual, trying to understand the complex interplay of dynamic factors (traits) as they control external behaviour.

There continues to be a great difficulty distinguishing behavioural from other types of assessment. It is the thesis of the present entry that a clear understanding of the discipline results from dividing the subject matter of assessment into two major categories: (a) behaviour itself (e.g. 'hits others'), and (b) inferences about behaviour (e.g. 'is aggressive', and, therefore, has the trait of aggression). All assessment relies on observations of behaviour for its basic datum. Different uses of those observations permit the identification of two dominant theoretical perspectives. When *behaviour* per se is the subject matter of interest, we can view the assessment enterprise as 'behaviour assessment'. If some characteristic of a person other than behaviour is our primary interest (e.g. traits or dispositions), we can view the enterprise as 'behaviour*al* assessment'. When traits are the focus of assessment, they are reached indirectly via inferences from behaviour. When behaviour itself is the focus, it is reached directly by observing it. Minimal inference is involved (Fernández-Ballesteros, 2002).

In what follows, assessment methods common to both behaviour and behavioural assessment are initially described, followed by separate discussions of the two approaches. Within each, the subject matter of prime interest is treated first. The quality of the information the approach provides is discussed next. Accuracy, reliability, and validity are the primary concepts, though their relevance to the two perspectives varies. Conclusions and future perspectives comprise the final sections of the entry.

METHODS OF ASSESSMENT

Five frequently used methods to assess behaviour include: (a) interviews, (b) self-reports, (c) informant reports, (d) self-observation, and (e) direct observation. As illustrated in Figure 1, these can be arrayed along a continuum representing the extent to which they involve observations of the behaviour of interest at the time and place of its natural occurrence. The directness continuum (Cone, 1977) incorporates three important characteristics of behaviour: (a) its topography or form, (b) its occurrence in terms of time, and (c) its location in physical space. Methods at the direct end of the continuum (e.g. self-observation, direct observation) involve

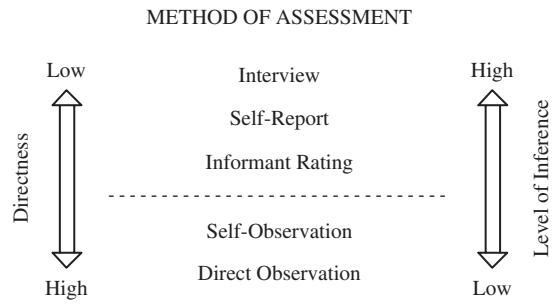

Figure 1. A three-dimensional scheme for organizing assessment methods in behavioural assessment.

observations of responses that are indistinguishable from the actual response of interest in terms of these topographic, temporal, and spatial features. Those at the indirect end (e.g. interviews, self-reports, and informant-reports) involve observations of responses that differ from the actual response of interest in one or more of these features. Indirect methods rely on representatives or surrogates of responses of primary interest. These surrogates are usually in the form of verbal reports by someone of their own behaviour (interviews, self-reports) or someone else's (informant report). Other things being equal, it is assumed that the highest quality data come from methods at the direct end of the continuum. That is, direct methods provide narrow-band, or focused, high quality information, whereas indirect methods provide correspondingly broader band, less focused, lower fidelity information.

BEHAVIOUR ASSESSMENT

Consider the terms 'behaviour assessment', 'quality assessment', 'health assessment', and 'maths assessment'. Distinguishing among these terms requires focusing on nouns representing the objects of assessment. That is, we assess behaviour, quality, health, and maths. Doing so does not imply *how* the assessment is to occur, however. As shown in Figure 1, there are a number of ways of assessing any one of these content types. In selecting an assessment method, it is important to be clear about the content or subject matter of interest. This is because some methods lend themselves more easily to assessing behaviour per se.

In behaviour assessment, the content of interest is behaviour itself. Behaviour can be viewed within a natural science perspective. From this point of view, it is seen as 'that portion of an organism's interaction with its environment characterized by a detectable displacement in space through time of some part of the organism and that results in some change in the environment' (Johnston & Pennypacker, 1993: 363). Seen in this way, the principles of measurement that apply to other natural phenomena are applicable to behaviour as well. For example, measurement in the natural sciences includes units that are absolute and standard. Behaviour occurs or it does not, and its frequency is determinable with reference to a true absence of behaviour or a zero point. These qualities mean units of measurement occur on ratio scales and yield scores that are fully manipulable using all four arithmetic operations (Frankfort-Nachmias & Nachmias, 1992).

Detectable displacements of some aspect of the organism can be observed and counted. These may be exceedingly small, as in the case of single neurons firing. Or, they may be relatively large, as in the case of swinging a golf club or throwing a ball. Assessment methods are selected to optimize observing behaviour, whether large or small. Moreover, direct observation of responses at the time and place of their occurrence is preferable to indirect observation that relies on surrogates from which behaviour is inferred. For example, observing actual movement of patrons between exhibits in a museum is preferable to inferring this movement from switch closures of electronic devices hidden under the floor (e.g. Bechtel, 1967). Observing the proportion of talk time occupied by husbands in conversations with their wives is preferable to relying on estimates of this proportion in the reports of the involved parties. Thus, an important characteristic of instruments used for behaviour assessment is their directness.

The size of the unit of behaviour assessed is also an important consideration. In the observation of hyperactive children, for example, we can record specific occurrences of 'out of seat', 'talks out of turn', and 'throws things', or we can consider these as interchangeable members of a larger class referred to as inappropriate behaviour. To be sure, even 'out of seat' is a collection of smaller responses and might be considered a behaviour class in its own right. Advantages of aggregating precisely determined responses into larger classes are increased reliability and validity of measures (Haynes & O'Brien, 2000). The logic of such aggregations must be carefully considered, however, in order to remain faithful to the original purposes of assessment. If our purpose is to learn something about behaviour per se, we are likely to prefer aggregates of responses that are functionally equivalent. If we are assessing to determine a person's position on a particular trait, our aggregate is likely to consist of interchangeable indicators equally determined by an underlying latent variable.

Behaviour assessment is at least 'the objective description of specific human responses that are considered to be controlled by contemporaneous environmental events and whose consistency and/or variability are directly related to the consistency and/or variability of their environment' (Cone, 1987: 2). Preceding the definition by 'at least' suggests it can be something more than the mere description of human responses. It can, for example, include a determination of just what those controlling environmental events are. Silva (1993) suggests this definition is at odds with the views of many others because it permits, but does not *require*, the performance of a functional analysis. Fernández-Ballesteros (2002) appears in agreement when she says functional analysis is an 'essence of behavioural assessment' (p. 1090).

It is well to separate the terms 'behaviour assessment' and 'functional analysis', and to appreciate that the latter requires the former, but not vice versa. Doing so recognizes behaviour assessment as the more comprehensive term, including in its reach any careful documentation of specific human responses, whether we search concurrently for their controlling variables or not. We cannot do a functional analysis without behaviour assessment, but we can do behaviour assessment without a functional analysis.

BEHAVIOURAL ASSESSMENT

Consider the terms 'behavioural assessment', 'psychological assessment', and 'educational assessment'. Distinguishing among them requires focusing on the adjectives representing an *approach* to assessment. That is, the terms tell us something about *how* assessment occurs. While they might also carry information as to *what* is assessed, there is no logical or syntactical requirement for them to do so. Whereas behaviour assessment communicates an interest in behaviour per se, behavioural assessment connotes an approach to assessment that may or may not have behaviour as its subject matter. Presumably, phenomena other than behaviour can be assessed with a behavioural approach.

Indeed, if we examine the types of phenomena appearing in the 'behavioural assessment' literature over the past 25 years, we find behaviour per se to represent only a small proportion. Often, the interest is in assessing a latent variable presumed to underlie behaviour and for which behaviour is of minimal interest in its own right. Rather, behaviour is taken as a sign of the underlying variable. When we view scores on an instrument as *determined* by an unseeable latent variable, it is that variable that is primary. Examples of such variables include 'assertion', 'anxiety', 'hyperactivity', 'autism', 'shyness', and 'heterosocial competence'.

Latent variable assessment (sometimes referred to as 'trait assessment') relies on behaviour as a sign or indicator of the underlying disposition. In doing so, it makes use of indirect measures such as interviews, self-reports, and informant reports. Responses to questions or items (indicators) comprising these measures are aggregated to provide overall scores that are used to infer how much of a particular trait a person has. Behavioural approaches to assessing anxiety from a triple response mode perspective are an example. Such latent variable forms of behavioural assessment often rely on indirect, high inference methods. Conversely, assessment focusing on behaviour per se tends to use direct, low inference measures.

Addressing both directness and inference continua simultaneously leads to the two-dimensional framework for classifying assessment methods represented in Figure 2. Direct observation assessment of family interaction via the FICS [Family Interaction Coding System] or having a client observe and record the number of cigarettes smoked (Quadrant A) are examples of direct observation methods that accept the behaviour at face value, making very low inferences about its meaning. Self-reported occurrence of depressive behaviour via the BDI [Beck Depression Inventory] or of social anxiety via the FNE [Fear of Negative Evaluation] (Quadrant D) are examples of indirect assessment methods that interpret scale item responses as indicative of the presence of an underlying disposition. Thus, behaviour is seen as a sign of the disposition and a person's score on the measure is used to infer the amount of the trait or characteristic possessed. Assessment approaches focusing on behaviour per se tend to fall in Quadrants A and C. Those using behaviour as a sign tend to fall in Quadrants B and D. Figure 2 helps clarify that the single most important characteristic distinguishing various approaches to behavioural

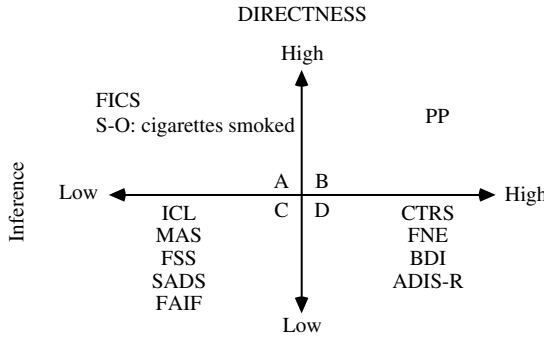

Figure 2. Classifying assessment devices in terms of directness and the level of inference associated with interpreting their data. FICS: Family Interaction Coding System; S-O: Self-observation; PP: Penile Plethysmography; ICL: Issues Checklist; MAS: Motivation Assessment Scale; FSS: Fear Survey Schedule; SADS: Schedule for Affective Disorders and Schizophrenia; FAIF: Functional Analysis Interview Form; CTRS: Conners Teachers' Rating Scale; FNE: Fear of Negative Evaluation; BDI: Beck Depression Inventory; ADIS-R: Anxiety Disorders Interview Schedule – Revised.

assessment is the level of inference used in interpreting scores.

DETERMINING THE QUALITY OF BEHAVIOUR(AL) ASSESSMENT

The usefulness of scores from assessment procedures relates directly to the scientific adequacy of the procedure. Quality of assessment information is discussed under the headings of reliability and validity elsewhere in this volume, and will be mentioned only briefly here. The very important concepts of accuracy, and representational and elaborative validity are discussed as they are particularly relevant to behaviour(al) assessment and may not appear in other entries.

Accuracy

Defining one's subject matter as behaviour and viewing it as a natural phenomenon places it among a class of events for which the properties are determinable more or less definitively. Consequently, instruments used to assess behaviour can be evaluated in terms of how faithfully they represent or portray these properties. Those doing a perfect job are said to be accurate in the same way that a microscope representing the structure of a cell with a high degree of fidelity is said to be accurate. Important aspects of behaviour include its topography, frequency, latency, duration, and magnitude. These will be represented with fidelity by assessment instruments of the highest quality.

Accuracy is determined by comparing data from an assessment instrument against an incontrovertible index or state of nature about which relevant information is available. If the values returned by the instrument are consistent with the properties of the incontrovertible index as independently determined, we say it is accurate. For example, a scripted interchange can be written to portray a verbal interaction between a parent and child. The script includes positive comments by the parent at a rate of two per minute. If direct observations of actors portraying the script reveal such a rate, the observations are said to be accurate. The limits of that accuracy can be derived and used to qualify data resulting from using the instrument. Accuracy is not relevant in this sense for measures of latent traits which, by their very nature, are hypothetical and for which there are no incontrovertible indices.

Reliability

A reliable instrument is one that yields the 'same measurement values when brought into repeated contact with the same state of nature' (Johnston & Pennypacker, 1993: 138). Reliability and accuracy are related though not equivalent concepts. Independent observations such as those provided by two persons viewing the same behaviour might agree with one another and thus be reliable. Their agreement (reliability) implies nothing about their accuracy, however, as something other than the reportedly observed state of nature might be controlling their observations.

Validity

Accurate instruments may or may not be useful for other than descriptive purposes. That is, they will provide a faithful representation of behaviour, by definition, but this representation may or may not relate to anything. A parallel concept

applies in other forms of assessment when instruments are described as being reliable but not valid. In this context, it can be helpful to describe accurate instruments as showing representational validity but not elaborative validity (Cone, 1995; Foster & Cone, 1995). Campbell (1960) distinguished trait from nomological validity in a similar fashion, though he appears to equate the latter with construct validity.

REPRESENTATIONAL VALIDITY

Representational validity deals with the extent to which a measure faithfully portrays or reflects the thing being assessed. It is the limited form of validity said to exist when an instrument measures what it is supposed to measure. Accurate instruments represent behaviour with high fidelity by definition, thereby showing representational validity. Thus, when behaviour per se is the focus, accuracy and representational validity are synonymous. When latent variables are the focus, other qualities (e.g. structural characteristics of the instrument, content validity, internal consistency, sensitivity to change over time) are relevant to showing representational validity. The issue here is the extent to which the indicators (items) of a measure do a credible job of representing the underlying variable. Internal consistency analysis is relevant because higher inter-item correlations rule out multiple determinants, allowing the interpretation of scores to focus on fewer latent variables, preferably only one.

When a measure is thought to reflect an underlying disposition, relevant theory dictates the measure's content. If careful analysis of that content shows it to represent the variable with a high degree of theoretical fidelity, the measure is said to show representational validity evidence. Likewise, confidence in the measure's faithful representation of the underlying construct grows as it is shown to be unrelated to measures of other constructs from which it is supposed, theoretically, to be independent. Historically, this form of independence has been referred to as discriminant validity (Campbell & Fiske, 1959). We assume that a measure represents its underlying construct more precisely to the extent it shows minimal overlap with measures of unrelated constructs.

In the same vein, confidence in the representational validity of a measure increases when it correlates with other measures known to tap the same thing. That is, when data from alternative ways of assessing a theoretical construct converge, our confidence in the representational validity of each increases. Historically, the correlation of multiple methods of assessing the same thing has been referred to as convergent validity (Campbell & Fiske, 1959).

ELABORATIVE VALIDITY

If scores on an instrument enter into relationships with scores representing other phenomena, they can be said to be useful, thus showing a degree of elaborative validity. Their usefulness expands (is elaborated) as more and more such relationships are demonstrated.

When behaviour is the focus, an important form of validity evidence comes from functional analysis. Thus, covariation between antecedent and consequent environmental events and behaviour is examined to establish causal relationships. The presumption underlying this approach is that understanding is advanced by showing systematic variation in behaviour to coincide with variation in environmental events. For example, discussions of husbands' alcohol drinking might be consistently associated with greater visual attention from their wives than discussions of other topics (Hersen, Miller & Eisler, 1973). This relationship can lead to the hypothesis that alcohol-related discussions are maintained by wives' attention to their husbands. Accurate observations of the discussion topic are shown to have elaborative validity in this way. That is, they show a degree of usefulness in helping understand why the content of the conversations might contain references to the husbands' drinking.

The type of elaborative validity evidence of greatest relevance for latent trait measures comes from showing that their scores enter into nomological networks involving other latent variables with which they are presumed to relate. In other words, a measure of self-confidence gains in usefulness when its scores relate in anticipated ways to scores on theoretically relevant variables, e.g. heterosocial competence. This type of relationship is the essence of construct validity in trait-oriented assessment.

Other forms of elaborative validity evidence involve correlations between scores on assessment measures and practical criteria (so-called criterion-related validity). These apply to measures directed at behaviour or at latent variables. Messick (1995) expanded construct validity to encompass the entire test construction and validation process. In so doing, he effectively eliminated the usefulness of construct validity, because a concept that is at once everything is at the same time nothing (i.e. no thing).

FUTURE PERSPECTIVES

Future theorizing should address such issues as whether internal consistency is conceptualized better as a form of reliability (as currently viewed), or as a type of representational validity as implied above. In addition, practical ways of establishing accuracy should be developed. Finally, the development of higher order assessment systems in which observations at all levels of behavioural molecularity are carefully and systematically interrelated is needed.

CONCLUSIONS

Contemporary behavioural assessment is approached from multiple perspectives. The dominant ones involve focusing either on behaviour per se or on underlying latent variables. They do so using common assessment methods, but preferring direct and indirect methods, respectively. Inferences about the meaning of scores differ substantially across perspectives, with low and high levels of inference characteristic of behaviour and latent variable assessment, respectively. Ways of assessing data quality vary, depending on perspective. Accuracy, reliability, and validity (both representational and elaborative forms) are emphasized when behaviour per se is the focus, but accuracy is not applicable when assessing latent variables.

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RELATED ENTRIES

Applied Fields: Clinical, Applied Behavioural Analysis, Behavioural Assessment Techniques, Observational Methods (General), Theoretical Perspective: Cognitive-Behavioural, Theoretical Perspective: Psychological Behaviourism

THEORETICAL PERSPECTIVE: COGNITIVE

INTRODUCTION

Generally, the terms 'cognition' and 'cognitive assessment' refer to different cognitive abilities and to different perspectives of treatment. If we accept a broad definition, numerous authors and theoretical approaches can be defined as belonging to a cognitive perspective, such as James (1890), Bartlett (1932), and Piaget (e.g. Piaget & Inhelder, 1969). More specifically, the cognitive approach focuses on the analysis of basic cognitive processes, such as perception, attention, memory, language and reasoning. In particular, the Human Information Processing approach, which inspired contemporary cognitive theories, first drew attention to the analysis of such basic processes. One of the main differences between a cognitive and behavioural approach is that the first focuses on the cognitive operations used by the human mind when a subject is engaged in a task, rather than examining general performance. In the study of mental processes, the contemporary view has been influenced not only by approaches that can be strictly defined as psychological, but also by other disciplines such as neuropsychology which studies the relationship between brain structure and cognitive operations, including the effects of brain lesions on cognitive functioning. Much neuropsychology research is in fact conducted on brain-damaged patients. What is defined as *cognitive science* reflects, instead, the particular interest in the study of cognitive abilities from an interdisciplinary point of view, which includes cognitive psychology, neuropsychology, linguistics, artificial intelligence and ergonomics. A cognitive assessment, which is based on cognitive science foundations, is typically aimed at evaluating not only the degree of cognitive abilities but also the presence of basic cognitive processes and how they intervene in the execution of a task. For example, when assessing reasoning abilities, researchers are interested not only in the efficiency of the output, but also in the types of processes involved and those that may be damaged. This approach can also be extended to the assessment of other psychological aspects such as personality and intelligence. For example, in assessment of personality, a cognitive perspective focuses on the cognitive operations which may yield specific psychic states, such as irrational ideas in depression, or impulsive processes in attention deficit or hyperactivity disorders, for example. On the other hand, in assessing intelligence, importance may be placed on identifying tasks which are considered critical for tapping the basic processes of intelligence. For example, when intelligence is assessed by the Raven test (1947), working memory seems to play a crucial role, while the use of other tests may highlight the importance of other components, such as speed of information processing and ability to inhibit irrelevant information.

COGNITIVE ASSESSMENT

A general cognitive approach, as described above, may influence any type of assessment. However, when the object of assessment is a single cognitive ability, such as perception, memory, reasoning or problem-solving etc., the approach acquires more specificity. Detailed procedures of assessment have therefore been designed to investigate the cognitive abilities considered relevant to several tasks. These assessment procedures were either born in the context of experimental and basic research, or, in some cases, represented a genuine effort to design specific psychological tests. Classical psychological tests were also adopted and analysed from the point of view of basic processes. The theoretical and empirical effort of the cognitive approach was greatly supported by studying exceptional individuals presenting specific deficits or strengths. In particular, by studying dissociation cases (which occur when a patient performs normally in one task but is impaired in a second),

cognitive neuropsychology shows which aspect of cognitive activity deserves to be studied, analysed and assessed. For example, theoretical research has highlighted many aspects of memory such as episodic versus semantic, short-term versus long-term, procedural versus declarative, implicit versus explicit, and verbal versus non-verbal memory. A cognitive analysis applied to clinical and educational settings shows which cognitive ability deserves more attention in order to design suitable testing materials. For example, given that implicit memory is a cognitive ability which remains intact in different groups of subjects with memory problems, it is assumed that there is no need to design many standardized tests to study this aspect. Differently, explicit memory which has been shown to be damaged in particular groups, such as old people and pathological subjects, requires the development of many standardized tests. Depending on the cognitive ability of interest, there are different procedures of assessment.

Perception

Many tests have been designed regarding perception aimed at studying whether the subject is able to recognize visual stimuli. They also highlight potential difficulties which, in subjects with good sensory skills, occur in the first stage of information processing (various disorders of visual perception are discussed in Köhler & Moscovitch, 1997). In the field of visual perception, particular success has been attributed to procedures which examine the visuomotor skills; that is, the ability to see a picture and reproduce it, as in many drawing tests used in developmental psychology or with seriously damaged adults. Among these, the Bender (1938) and the VMI (Beery, 1989) tests are very popular.

Attention

It is important to distinguish between different abilities that can be studied by experimental research and so generate different procedures of assessment. One aspect of attention which researchers are interested in concerns the ability to maintain attention focused on a stimulus for a long time (sustained attention). However, many studies (Posner, Rafal, Choate & Vaughan, 1985) have shown interest in the ability to shift attention from one target stimulus to another, or one task to another, which seems to be a crucial index of monitoring ability.

Language

Assessment of language has led to the development of a wide range of testing materials which take into account subjects' age and other aspects of language, such as the prosodic, phonological, lexical, syntactic aspects, sentence processing, discourse processing, and finally, pragmatic aspects of communication. These aspects are assumed to be independent of each other. In this field, the classical distinction between receptive abilities – that is, the ability to understand language – and expressive abilities – that is, the ability to produce language – still remain important.

Memory

As noted above, we can distinguish between different memory systems. It is therefore suggested that different procedures are employed to detect them. In addition to distinctions about the nature of the process, other distinctions which seem relevant from the point of view of analysis of individual differences concern the modality or nature of stimuli, so that memory for colour, faces, words, and meanings are assumed to be widely independent of each other. Recently, particular attention has been directed at assessing semantic and working memory. Semantic memory refers to the organization of human knowledge and can, in some cases, be damaged, while working memory refers to the ability to process information stored in a temporary memory system.

Visuospatial Information Processing and Imagery

In the context of visuospatial and imagery studies, it seems important to assess the visuospatial representations and imagery processes not simply because of the importance of the single components per se but also because they are involved in many aspects of human life. Assessment of these abilities aims to detect how the mind works for spatial representations, and

how images are created and transformed once they have been automatically generated (for a detailed account, see Richardson, 1999).

Reasoning and Problem-Solving

In this case too, there is a need to acknowledge the presence of different components or mental operations which define the reasoning processes. Attention has been directed to some basic operations of reasoning, such as the ability to make associations, to use analogies, make inferences, etc. In other cases, researchers have been interested in studying how subjects perform in a task requiring the combination of many basic operations of reasoning, as in problem-solving. Particular importance has been given to some processes, the so-called executive processes, which refer to the central operations that monitor cognitive abilities. These executive processes partially overlap with the 'metacognitive control processes' which involve planning, anticipating, monitoring and evaluation of results.

COGNITIVE ASSESSMENT IN CLINICAL AND EDUCATIONAL SETTINGS

Generally speaking, cognitive assessment can be applied to any aspect of human life which relies on cognitive processes, so that in pathologies which cannot be strictly defined as cognitive, a cognitive analysis may prove crucial. For example in depression, the cognitive approach focuses directly on negative thoughts to treat depressed patients (Beck, 1976). However, basic cognitive abilities also seem to play a key role in other disorders. For example, there is an increasing number of studies (Goldman & Patricia, 2001) which show that working memory may be damaged in schizophrenic patients, or that depression could be associated with a deficit in visuospatial information processing. In these areas, therefore, a cognitive assessment is adopted for its specific implications which are assumed to be associated to a more general problem. Finally, the use of a cognitive approach is linked to clinical cases in which the cognitive aspect seems to be prevalent, such as disorders of cognitive functioning in children or disorders due to traumatic events which in adulthood cause the loss of specific abilities, such as perception, memory and language. Cognitive assessment usually aims to detect with more specificity and accuracy the elements of dysfunction which occur in a patient. The main aim is also to design and improve treatment procedures to reduce the negative consequences linked to the deficit. In this case, either a deficit-centred logic of training, i.e. a logic focused on the deficit itself, or a 'compensatory' logic, which tries to take advantage of the cognitive resources still available in a subject, may be used. In the learning area, cognitive assessment usually starts with looking at performance indexes and continues on, when the case needs further investigation, to identify which processes the subject may use to perform a task. In this case, the logic of a general cognitive treatment may be more efficient because, differently from a brain-damaged patient, the child can reach significant results due to the greater plasticity of his brain.

FUTURE PERSPECTIVES AND CONCLUSIONS

In the last few years, cognitive assessment has become a very successful approach due to the contributions of different disciplines such as neuropsychology, artificial intelligence, linguistic and developmental psychology. By taking into account such a variety of perspectives, cognitive assessment is moving towards interesting developments. The use of computerized techniques and simulation procedures, the evaluation of the relationship between cognition and its context, the analysis of cognitive potential rather than performance, the refined resolution of cognition into its components are only few of the new areas on which cognitive assessment is recently focusing (for an updated review, see Blankstein & Segal, 2001; Snow & Lohman, 1993). Traditional cognitive assessment and rehabilitation approaches may be also strengthened by a metacognitive logic, in which the rehabilitative or educational work is not simply based on a deficit-centred analysis, but is addressed to identifying strategies which allow the subject to control the mind better and deal more easily with the task. The metacognitive approach refers to the *metacognition construct* which represents knowledge and beliefs about the way the

human mind works and monitors cognitive abilities (see Cornoldi, 1998). This approach, which can still be referred to as cognitive, highlights the importance of assuming a general cognitive view in the assessment and treatment of cognitive abilities compared to a deficit-centred analysis. In fact, the way people think and the procedures they use can also implicate emotional and motivational aspects that could be omitted if a deficit-centred point of view is adopted. It must be noted that if a deficit is a consequence of a severe brain dysfunction, its rehabilitation through a deficit-centred training may be incomplete, making integration with complementary rehabilitation strategies necessary, including the 'compensatory' and metacognitive. In the educational setting, cognitive assessment is the prevalent approach, as it is based on the idea that strengthening the cognitive abilities of a child may lead to the use of correct procedures and, consequently, to better performance. In the assessment of formal learning, the cognitive approach plays a crucial role, shifting the attention of developmental psychologists from the analysis of performance to the procedures a child may use. For example, in mathematical learning, recent developments are focusing on the mental operations a child may use in problem-solving (Lucangeli, Tressoldi & Cendron, 1998), because if the procedures are correct but the result is wrong, the case is less worrying compared with the situation in which the result and selected procedures are both wrong. Also in the analysis of reading processes, attention has been shifted from behavioural indexes (such as reading aloud, silent reading and reading comprehension) to underlying cognitive processes. This perspective has been applied to all formal learning and involves a change in the assessment and educational rehabilitation of learning disabilities.

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RELATED ENTRIES

Intelligence Assessment (General), Cognitive Processes: Current Status, Cognitive Processes: Historical Perspective, Attention, Memory (General), Language (General), Development: Intelligence/Cognitive, Cognitive Psychology and Assessment Practices, Equipment for Assessing Basic Processes, Theoretical Perspective: Cognitive-Behavioural

THEORETICAL PERSPECTIVE: COGNITIVE-BEHAVIOURAL

INTRODUCTION

The cognitive-behavioural approach to psychological assessment has roots in learning theory and cognitive psychology. It is characterized by empirically based, multimethod and multi-informant assessment of behaviours, cognitions, and contemporaneous causal variables in the natural environment. This entry provides an overview of the historical and theoretical foundations of cognitive-behavioural assessment, the strategies and methods used, cultural considerations in its use, and future perspectives.

HISTORICAL AND THEORETICAL FOUNDATIONS

Cognitive-behavioural assessment has been influenced by generations of scholars and by research in multiple disciplines. The concepts and methods of the paradigm are based in applied and experimental behaviour analysis, learning, and cognitive construct systems. Conceptual elements are derived from experimental psychology and the work of behavioural pioneers such as Watson, Pavlov, Hull, Mowrer, and Skinner. The most important contribution from these early researchers is the emphasis on empiricism, which encourages careful observation and precise and frequent measurement of explicitly defined variables. Empiricism remains the supraordinate characteristic of the cognitive-behavioural assessment paradigm.

The methods and foci of behavioural interventions have also played a significant role in the development of cognitive-behavioural assessment. Formal behavioural assessment strategies were initially developed during the proliferation of behaviour therapies in the 1960s, when traditional instruments, which target higher-order variables such as personality traits, were found to be less useful with behavioural methodology's focus on specific, observable behaviours.

Over the next few decades, a wider perspective within the field emerged and the focus of many behaviourists expanded beyond the strictly overt behaviours to include measurement of variables such as sensations, imagery, and psychophysiological functioning (Lazarus, 1973). Theorists such as Bandura, Mischel, Ellis, Mahoney, Meichenbaum, and Beck suggested that cognitions, a person's thoughts, play a significant role in behavioural problems. Although various subparadigms within cognitive-behavioural assessment differ in their emphasis on inferred variables and inner states, all variables targeted in cognitive-behavioural assessment are assumed to be amenable to empirically guided measurement.

BASIC ASSUMPTIONS

Cognitive-behavioural assessment incorporates the following assumptions about the characteristics and causes of behaviour problems (Haynes, 1998; Haynes & O'Brien, 2000): (a) clients often have multiple, related behaviour problems; (b) the importance of any specific behaviour problem differs across clients; (c) behaviour problems have multiple causes that can vary across clients, settings, situations, and time; (d) contemporaneous, social-environmental causes, those occurring closely together in time with behaviour problems, can be important; and (e) cognitions can serve as a causal, moderating, or mediating factor in behaviour problems.

Clients often have multiple, functionally related behaviour problems. For example, a client with marital discord may also be experiencing job difficulties and depressed mood as a result of the marital discord. The client may also increase alcohol consumption to relieve the depressed mood, and the increased alcohol consumption may exacerbate the marital and job difficulties and make it more difficult to handle these difficulties. In addition, the marital discord may have begun as a result of disagreements

with a spouse regarding how to discipline an oppositional child.

The relative importance of behaviour problems may vary across clients. One determines the importance of a behaviour problem in relation to quality of life, or the potential of harm, for the client. For example, two clients who report anxiety in social settings may also report similar problems, such as lack of interest in spending time with friends (social withdrawal), and repetitive negative thoughts (ruminative cognitions). For one client, however, the ruminative cognitions may be more important because thoughts of negative evaluation by co-workers are affecting her job productivity, causing her to lose time from work, and increasing her social withdrawal. For the other client, social withdrawal may be more important because his isolation has fostered depressed mood, ruminative cognitions about his inadequacies, and marital difficulties. For some clients, important variables (such as suicidal behaviours) may occur, but have no identifiable relationships with any social-environmental factors.

Causal relations for clients' problems can vary across clients, across settings and situations, and over time. For example, a lack of interest in social activities may result from a lack of contact with friends while at home, but result from negative social interactions with co-workers at work. Over time, lack of social interactions may become less important while other symptoms, such as lack of sexual activity, become more troublesome for clients.

Finally, contemporaneous social-environmental causal variables often present the primary focus for assessment as cognitive-behavioural therapy can modify these relationships, whereas the original causes of behaviour problems may prove unchangeable. For example, a person may temporarily stop engaging in previously enjoyed activities after the death of a spouse. However, if the person continues to avoid activities after an extended passage of time, the assessor searches for current factors that maintain the avoidance, such as lack of social/dating skills and negative thoughts about future dating possibilities.

ASSESSMENT STRATEGIES

The cognitive-behavioural approach uses assessment strategies that are congruent with its underlying assumptions. Such strategies: (a) are valid measures of important, controllable variables; (b) are sensitive to the dynamic nature of behaviour and causal variables; (c) are sensitive to the conditional nature of behaviour and associated cognitions; (d) capture functional relations; (e) include multiple sources of data; and (f) emphasize observable behaviours and associated cognitions in the natural environment. A central element of cognitive behavioural assessment is hypothesis testing, the formulation and testing of preliminary clinical judgements about a client's behaviour problems and possible causal variables.

Hypothesis-Testing

The cognitive-behavioural assessment paradigm assumes that clinical judgements made about a client's behavioural problem are more likely to be valid if a scholarly, hypothesis-testing approach is adopted. Hypothesis-testing involves the collection and evaluation of data to either support or rule out tentative assumptions about the nature and causes of a client's behaviour problems. Hypotheses are generated very early in the clinical assessment, as early as the referral or pre-interview with the client, and are continuously modified throughout the assessment as new data becomes available. When hypotheses are supported and no new hypotheses are suggested, a treatment strategy is selected. Ongoing assessment of treatment is also part of this strategy, to measure treatment outcome, track treatment effects, and aid in modifying failing treatments.

Validated Instruments

The cognitive-behavioural assessment paradigm also emphasizes the use of validated instruments. Invalid instruments can lead to invalid clinical judgements. However, the validity of an assessment instrument (i.e. the accuracy of the data derived from an instrument) is conditional. Instruments should be validated for samples similar to the client's characteristics (sex, ethnicity), in conditions similar to the target assessment occasion (work vs. home setting), and for purposes congruent with the intended use (screening vs. diagnosis). Clinicians must consider sources of error associated with an instrument (an aspect of the instrument that is

not measuring what it was designed to measure), such as biases in the way data is remembered or observed.

Multiple Sources of Information

Multisource assessment involves the use of multiple (a) informants (teachers, co-workers); (b) methods (self-report questionnaires, analogue observations); (c) instruments (use of more than one informant or questionnaire); (d) assessment occasions (time-series measurement); and (e) contexts and settings (times of the day, different social environments).

There are several important reasons why clinicians should consider multiple sources of information when formulating clinical judgements. First, different sources of information may capture unique aspects of a client's behaviour and its causal variables. For example, information from a co-worker about a client's job difficulties may provide different but equally important information than a self-report questionnaire that asks the client about his or her thoughts or feelings about the job difficulties.

Second, different assessment instruments that use the same method and target the same behavioural problem can also provide unique information about that behavioural problem. For example, several questionnaires may purport to assess 'time-management' skills, yet one may emphasize affective facets of 'time management' while another focuses on behavioural or cognitive facets.

Third, different methods and instruments can capture different modes (e.g. cognitive, affective, motoric, physiological) of a behavioural problem. For example, a semi-structured interview with a client who avoids social situations can provide useful information concerning the affective mode (e.g. depressed mood) of that avoidance. In contrast, a skin conductance test can provide important physiological information (e.g. increased perspiration) concerning the client's social avoidance.

Fourth, each source of information has unique sources of error. For example, information from a teacher about a student's aggressive behaviour can provide useful information but may also reflect the teacher's biases toward the student. Information derived from a self-report depression questionnaire can reflect the client's actual mood state or it may reflect the client's need to present in a socially desirable manner.

Finally, information from different sources can capture behaviours or thoughts of a client in different situations. For example, information from parents about their child's aggressive behaviour at home may differ from information provided by the child's teacher in school. The child may only be aggressive in school but not at home, and in school the child may only be aggressive in certain situations.

Time-Series Measurement

Cognitive-behavioural assessment encourages time-series measurement strategies, which involve frequent measures of important variables over time at regular intervals. This is a useful strategy, given that behaviour and associated cognitions can change rapidly over time. Time-series measurement can (a) capture the dynamic nature of behaviour and cognitions, (b) elucidate functional relations, and (c) evaluate the effects of an intervention. Some examples of time-series measurement include hourly monitoring by hospital staff of a patient's aggressive behaviour to identify environmental triggers and rewards, and the completion of a self-report measure of parent–child interactions prior to weekly treatment sessions to monitor intervention effects.

Time-series measurement can be used to identify patterns of change across time in a client's behaviour problem. For example, a couple with marital difficulties may be asked to self-monitor their daily verbal disagreements for a specified period of time, which is then plotted to visually illustrate change over time. Such data can also help facilitate discussion with the couple about possible triggers for their frequent disagreements. Changes across time in a hypothesized causal variable can also be identified using time-series measurement. For example, to evaluate the hypothesis that certain kinds of verbal interactions between the couple lead to arguments, the couple may be asked to record negative attributions (e.g. explaining the other's behaviour as having negative motives) made during their interactions. Such data can provide information about the changes in negative attributions made that lead to frequent arguments. The hypothesized causal variable can even be manipulated to test different hypotheses when

used with single-case experimental designs (e.g. ABAB reversal designs) as well as to evaluate the effects of treatment.

METHODS OF ASSESSMENT

The cognitive-behavioural assessment paradigm emphasizes the integration of idiographic and nomothetic (combined data of a population or group of individuals) methods of assessment that focus on observable behaviours, cognitions, and their functional relations. Assessment methods most congruent with the underlying assumptions of the paradigm include: (a) naturalistic observation; (b) analogue observation; (c) clinical interview; (d) self-monitoring; (e) questionnaires and other self-report methods; and (f) psychophysiological measurement.

Naturalistic Observation

Naturalistic observation is the systematic observation of behaviour as it occurs in the client's natural setting. It can provide both qualitative and quantitative data on problem behaviours and their causal variables. For example, an assessor may attempt to identify different types of aggressive behaviour (e.g. verbal vs. physical) exhibited by a client (qualitative) or track a prespecified aggressive behaviour over intervals of time to determine frequency, intensity, or duration of that behaviour (quantitative). Naturalistic observation can be carried out either while physically present in the client's environment, or by video recording that is later viewed and evaluated by trained reviewers. However, it can be a difficult and expensive method of assessment, especially for behaviours that are infrequent or socially sensitive. Also, the awareness of being observed may influence the client's behaviour (reactive effects of observation). To minimize these problems, participant observers (individuals already present in the environment, such as hospital staff or spouse) can be used to gather data.

Analogue Observation

Analogue observation involves an artificial setting with environmental manipulations to simulate the natural environment. For example, a parent and child may be asked to discuss a hypothetical problem in the clinic so that the clinician can directly observe their interaction. Analogue observation is a cost-effective strategy that allows the clinician to control and evaluate functional relations, and is particularly useful for low-frequency events, such as partner aggression. Because analogue observation involves contrived settings and is more susceptible to errors associated with assessment reactivity, the generalizability of the data, or the degree to which the data can be extrapolated to real world situations, is sometimes a concern.

Clinical Interview

The clinical interview, perhaps the most widely used method of assessment, can provide valuable information concerning behaviour problems and their functional relations. A distinguishing feature of the cognitive-behavioural interview is the focus on specifying behaviour problems, the identification of associated cognitions, and other important, controllable variables. For example, a child may be interviewed about his or her oppositional behaviour with a focus on specifying type of behaviours (e.g. swearing and throwing objects), antecedent or trigger variables (e.g. request to perform a difficult task by teacher), associated thoughts (e.g. 'Everyone thinks I'm stupid'), modifying variables (e.g. presence of other students), and consequences (e.g. teacher withdraws request). Some potential problems associated with interviews include client and interviewer biases, interviewer characteristics and skill level, degree of client cooperation, and interviewee's cognitive impairments.

Self-Monitoring

Self-monitoring methods involve the client recording specified behaviours, situations, emotions, and/or thoughts. Self-monitoring instruments can be tailored to clients' unique behavioural problems and goals. For example, a client may self-monitor level of anxiety during social activities using a Likert-type rating scale, while recording automatic thoughts associated with the event. Although clients' cognitive limitations, biases, and level of cooperation can bias self-monitoring data, errors can be reduced with clear and detailed instructions, less complex methods, in-vivo practice, and follow-up contacts.

Other Self-Report Methods

Questionnaires, checklists, rating scales, and computer-assisted assessment are other methods of self-report commonly used in cognitive-behavioural assessment. Many methods have been devised to assess the presence, characteristics, frequency, and duration of specific behaviours and cognitions. Such self-report measures are easy to administer and cost-effective; however, consideration must be given to the validity of the measure for its intended purpose.

Psychophysiological Measurement

Psychophysiological measures can provide valid physiological markers of behavioural responses and thoughts. Examples of psychophysiological measures include ambulatory monitoring of cardiovascular reactivity to daily stressors, monitoring of covariation between blood glucose and depressive symptoms, and the measurement of blood pressure and skin conductance to assess physiological arousal to a client's negative self-statements (e.g. 'I'm not as good as my friends'). Some of these methods can be costly to use and require training in the use of technical instruments (Cacioppo & Tassinary, 1990). However, there are many inexpensive and portable devices for the measurement of physiological variables, such as blood pressure and glucose monitors.

PSYCHOMETRIC FOUNDATIONS

Psychometrics, the science of psychological measurement, is the evaluation of data and inferences obtained from assessment instruments. Psychometry plays a central role in cognitive-behavioural assessment, because psychometric evaluation of data helps determine how much confidence can be placed in clinical judgements drawn from the data. More comprehensive discussions of psychometric principles can be found in Cone (1998) and Haynes and O'Brien (2000).

Psychometric Issues Specific to Cognitive-Behavioural Assessment

The application of psychometric principles to cognitive-behavioural assessment is guided by the paradigm's assumptions about the multidetermined, dynamic, and idiographic nature of behaviour. Although assessment can be evaluated on a number of dimensions, some psychometric evaluative dimensions may be less applicable to cognitive-behavioural assessment than others. For example, targeted constructs in cognitive-behavioural assessment, compared to personality assessment, are often lower level, less inferential constructs. Psychometric indices such as internal consistency or factor structure may prove less relevant when applied to lower level constructs.

The validity of any psychometric measurement is conditional – it depends upon the particular assessment goals and settings, the characteristics of the measured variable(s), and the inferences sought. Data from a particular observation instrument may provide a valid estimate of the rate of aggressive behaviours of a child in the classroom, but not provide a valid estimate of these behaviours at home, on the school bus, or at recess. Such data may be validly used to design a classroom intervention, but would not provide a meaningful basis for diagnosis.

Similarly, data obtained in cognitive-behavioural assessment can be accurate but invalid. For example, accurate data may be obtained from analogue observation of a client's social interaction, but the data may display low levels of covariance with the same behaviour measured in natural settings.

The idiographic assessment strategies that are emphasized in cognitive-behavioural assessment also affect the relevance of various dimensions of cognitive-behavioural assessment. Accuracy and content validity are particularly important in idiographic assessment.

Reliability

Reliability refers to the stability or consistency of data derived from repeated administrations of an instrument or procedure across similar situations (temporal consistency), or from the pattern of covariance of elements within an instrument or procedure (internal consistency). In cognitive-behavioural assessment, the assumption that behaviour can change across time and situations complicates the interpretation of reliability coefficients. Coefficients may reflect variability due to true change in the phenomenon of interest as well as measurement error.

Validity

The primary focus of psychometric evaluation is construct validity, the degree to which data and inferences derived from an instrument are representative of the targeted construct. Construct validity represents a meta-judgement that integrates multiple data sources, including indices of reliability, content and criterion validity, and clinical utility (Haynes & O'Brien, 2000).

Content validity reflects the degree to which elements of an assessment instrument are representative of the targeted construct for a particular assessment purpose. Content validity has increased importance in cognitive-behavioural assessment because obtained measures are thought to reflect behaviour or event samples rather than higher order constructs. Thus, one must estimate the degree to which a measure adequately samples the targeted construct (Haynes, Richard & Kubany, 1995).

Applicability and Utility

The utility of an assessment instrument refers to the degree to which it gathers clinically relevant information – i.e. information that increases treatment effectiveness – on particular populations, behaviours, or behaviour disorders. Evaluative dimensions of assessment instrument utility include treatment utility, sensitivity to change, cost effectiveness, usefulness for developing a functional analysis, and incremental validity.

The multimodal, multimethod procedures of cognitive-behavioural assessment have demonstrated considerable empirical utility. However, in settings that emphasize treatment delivery rather than research, some methods may have less than optimal clinical utility, due to the time-consuming nature of methods such as behavioural observation, inadequately trained personnel, and/or financial contingency systems that de-emphasize assessment.

FUTURE PERSPECTIVES

The empirically based cognitive-behavioural assessment paradigm undergoes continual refinement. Changes occurring during the past decade include new strategies for integrating assessment data and new causal models that influence assessment strategies. Although specific advances are too numerous to review here, several broad trends deserve mention. These include (a) an expanding focus of assessment, (b) technological advances in measurement, and (c) a focus on the clinical decision-making process.

An Expanding Focus

Recent changes in cognitive-behavioural assessment reflect an increasing recognition of the complex, dynamic, and multi-determined nature of behaviour. For example, the application of non-linear, dynamical modelling and chaos theory to data analysis allows sophisticated evaluation of complex sequences of behaviour, enhances detection of important functional relationships, and strengthens the inferences from time-series data (Heiby, 1995).

There is an increased focus on the incorporation of cognitive, physiological, social, and systemic variables into case conceptualizations (Koerner & Linehan, 1997). Greater attention is given to understanding the specific cultural context in which a client's behavioural problem occurs, and the validity of instruments and methods used for a client from a particular cultural group. For example, the Culturally Informed Functional Assessment Interview (Tanaka, Matsumi, Seiden & Lam, 1996) has been developed to identify and elaborate the role of specific cultural variables in causal models.

Technological Advances

Computer technology has: (a) facilitated the acquisition of self-report data; (b) permitted more efficient measurement in the natural environment via ambulatory techniques (e.g. hand-held computers); (c) enhanced the collection, reduction and analysis of time-series data; and (d) increased the efficiency and objectivity of clinical judgements by allowing computerized synthesis of data and hypotheses (Kazdin, 1998).

Increased Focus on Clinical Decision-Making

Accompanying the broadening scope of cognitive-behavioural assessment is an emphasis on the

development of more systematic and objective methods of case conceptualization. Clinical case conceptualization aims to identify important causal variables and integrate these into a model that allows the formulation of optimal intervention decisions. Visual systems for integrating assessment data, and guiding clinical decision-making, have undergone refinements in the past decade (Haynes, 1992; Haynes & O'Brien, 1990; Nezu & Nezu, 1993).

CONCLUSIONS

This entry presented a brief overview of the conceptual premises, characteristics, and methods of the cognitive-behavioural assessment paradigm. Cognitive-behavioural assessment is a dynamic and evolving paradigm that encompasses many subparadigms. The methodological diversity of the approach reflects the influences of experimental, learning, and cognitive conceptual systems. A supraordinate characteristic of cognitive-behavioural assessment is its empirical orientation.

Assumptions that affect the goals and methods of cognitive-behavioural assessment include emphases on individual differences, contemporaneous, social-environmental causal models, and the dynamic, multidetermined nature of behaviour. Cognitive processes are addressed as causal and mediating variables of behaviour problems. Important strategies in cognitive-behavioural assessment include the use of multisource, well-validated measures, time-series measurement, and an idiographic, functional approach to assessment. A scholarly, hypothesis-testing approach to clinical case formulation is a cornerstone of the paradigm.

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RELATED ENTRIES

THEORETICAL PERSPECTIVE: BEHAVIOURAL, THEORETICAL PERSPECTIVE: COGNITIVE, THEORETICAL PERSPECTIVE: PSYCHOLOGICAL BEHAVIOURISM, IRRATIONAL BELIEFS, SELF-CONTROL, SELF-EFFICACY

THEORETICAL PERSPECTIVE: CONSTRUCTIVISM

INTRODUCTION

An assessment strategy might be classified as constructivist to the extent that it (a) elucidates 'local', as opposed to 'universal', meanings and practices in individuals or social groups, (b) focuses upon 'provisional', rather than 'essential', and unchanging patterns of meaning construction, (c) considers knowledge to be the production of social and personal processes of meaning-making, and (d) is more concerned with the viability or pragmatic utility of its application, than with its validity, per se (Popkinghorne, 1992). This emphasis on local, provisional, and pragmatic assessment of (inter)personal meanings can be illustrated by a closer consideration of two core techniques associated with a constructivist approach, each of which encompasses many different variations. These include *repertory grid technique*, which focuses on the content and structure of people's construct systems, and the *analysis of personal narratives* in spoken or written 'text', which reveals the changing processes by which people create meaningful stories of their experience.

REPERTORY GRID TECHNIQUE

Developed within personal construct theory, repertory grid technique represents a widely used method for studying personal and interpersonal systems of meaning. Because of their flexibility, repertory grids (or *repgrids*) have been used in literally thousands of studies of a broad variety of topics, ranging from the shared perceptions that constitute an organization's unique 'culture' to the naïve understandings of school children about physical science concepts (Fransella and Bannister, 1977). However, the most common application of grids has been in the clinical area, where they have been used to study such issues as the body images of women struggling with eating disorders and attitudes toward alternative careers held by clients in vocational counselling.

The 'reptest' was initially designed by George Kelly (1955), the author of personal construct theory, as a means of assessing the content and structure of an individual's repertory of role constructs – the unique system of interconnected meanings that define his or her perceived relationships to others. In its most common form, the reptest requires the respondent to compare and contrast successive sets of three significant people (e.g. my spouse, my father, and myself), and formulate some important way in which two of the figures are alike, and different from the third. For example, if prompted with the above triad, a person might respond, 'Well, my father and husband tend to be very *conventional* people, whereas I'm more *rebellious*.' This basic dimension, *conventional vs. rebellious*, would then be considered one of the significant themes or constructs that the person uses to organize, interpret, and approach the social world, and to define his or her role in it. By presenting the respondent with a large number of clinically significant 'elements' (e.g. a previous romantic partner, best friend, a disliked person, one's ideal self), the reptest elicits a broad sampling of the personal constructs that constitute the person's outlook on life and perceived alternatives. These constructs can then be interpreted clinically, used as the basis for further interviewing of the respondent, or coded using any of a number of reliable systems of content analysis, conducted either manually or with available computer programs (Neimeyer, 1993).

Although the analysis of construct content often is revealing, most users prefer to extend the method beyond the simple elicitation of constructs by prompting the respondent subsequently to rate or rank each of the elements (e.g. people) on the resulting construct dimensions. For example, a respondent might generate a set of 15 constructs, on which 10 important elements (e.g. my mother, employer, self, partner) could be rated, yielding a matrix of 150 specific ratings

that would then be amenable to a wide range of analyses. Although the repgrid was originally devised as an interview-based or paper-and-pencil measure, contemporary users typically rely on any of a number of computer programs for their elicitation and analysis, such as the popular *WebGrid III* program available via the Internet. Although analysis of the grid can focus on simple element ratings (e.g. observing that the respondent views herself as *independent*, *rebellious*, *driven by fear*, etc. on a sample of her personal constructs), it is often more helpful to conduct a comprehensive analysis of the grid to discern larger patterns. This might involve correlating and factor analysing the matrix of ratings to see at a glance which constructs 'go together' for the respondent (e.g. *independence* is associated with being *secure*, whereas *dependence* implies *vulnerability to hurt*), or to learn the people with whom the client most and least identifies. These linkages among constructs often suggest why people remain 'stuck' in symptomatic patterns, as when a client resists becoming more *assertive* instead of *passive*, because the former is associated with being *rejected* as opposed to *loved*. Similarly, patterns of identification among elements in a grid can be clinically informative, with some of these (e.g. degree of correlation between actual self and ideal self) providing useful indices of progress in psychotherapy. At the most general structural level, grids can be useful in identifying how 'tightly' or 'loosely' a given person's meaning system is organized, as revealed, for example, by the average degree of correlation among the constructs that comprise it. Clinically, overly 'tight' systems, in which most constructs are closely linked, such that changes in one imply alterations in many others, have been associated with resistance to change in psychotherapy. Conversely, very loose systems might signal that the individual is having a great deal of difficulty in developing a coherent view of the social world, a factor that has been associated with the heightened despair and perturbation preceding high-risk suicide attempts.

Although repgrids are most commonly used to assess the idiosyncratic content and structure of an individual's construct systems, they have also been used to evaluate how members of families and groups view one another, as well as how they converge or diverge in their outlooks. For example, convergence in the content, application, and structure of personal constructs has been found to predict successful intimate relationships, whereas inability to construct a common reality has been implicated in relationship breakdown and failure. In keeping with a constructivist philosophy, however, such meaning systems are viewed as 'moving targets', which require ongoing assessment, particularly in the shifting context of psychotherapy. Assessment methods having some affinity to grid technique include *laddering technique*, which elicits the higher-order value implications of the respondent's constructs of behaviours and social roles (Neimeyer, Anderson & Stockton, 2001), and the *self-confrontation method*, which evaluates an individual's sense of agency and communion with others through an analysis of important life events. A common feature of these methods is their focus on *personal structure*, viewing meaning in systemic terms that can be depicted visually to enhance its comprehension and discussion by clients and therapists.

NARRATIVE ASSESSMENT

Narrative psychologists believe that the structures and elements of which stories are composed act to direct our thought processes. Instead of viewing logic as the guiding force behind information processing, they view people as organizing life events into unique plot structures and creating themes that give them significance. This quest for meaning is especially evident in people's attempts to develop self-narratives that give them a sense of identity and coherence, and that allow them to share their experiences with others (Neimeyer & Levitt, 2001). This 'storying' of complex life experiences draws on the distinctive language, scripts, and symbols derived from different cultures and traditions, as well as the unique life histories of their individual authors. The rapid development of this narrative perspective over the last 20 years owes partly to its broad relevance across cognitive, developmental, and clinical areas of research. However, psychotherapy researchers have been particularly active in developing methods to assess the style and substance of clients' stories, whether told within the therapeutic hour or in subsequent research interviews about their therapy or their lives.

The *Narrative Process Coding System* illustrates the use of constructivist methods to assess the topical and thematic shifts that characterize client accounts of their experience (Angus, Levitt & Hardtke, 1999). First, an investigator using the system segments the dialogue of a transcribed therapy session into topic units that are identified through shifts in protagonists and themes. For instance, a client may begin a session by discussing a recent trip to Florida and then shift to an examination of disappointing family vacations in childhood. The identification of such topic segments can allow researchers to consider how themes are maintained or changed through discussion and how the interpersonal psychotherapeutic process can act to facilitate narrative development. Second, the researcher codes these topic segments into one of three narrative processes. *External* narrative sequences are dominated by event description. An account of a vacation itinerary would be an example of this narrative type. *Internal* narrative sequences focus upon emotional and experiential states. A description of the storyteller's awe or uneasiness at first glimpsing the ocean would exemplify this narrative process. Finally, *reflexive* narrative sequences entail analysis and interpretation of events and internal reactions in order to understand their significance. An exploration of the meaning of relaxation in one's life would be classified as reflexive.

Through the assessment of narrative processes, researchers can study how changes in the client's storytelling about life events are evidenced in therapy. For example, investigators have found that experiential therapists tend to shift discourse from external event descriptions toward internal and reflexive processes to promote self-exploration and meaning-making, while clients tend to shift into a more external process, to integrate their therapeutic insights into their daily life experiences. Likewise, narrative process assessment of various types of treatment could suggest what forms of client processing are associated with more favourable outcomes in different forms of therapy. For example, prompting clients toward an external storytelling, communicating childhood events and experiences, seems to facilitate progress in psychodynamic therapy, whereas encouraging a more reflexive, interpretive style appears to promote more rapid gains in a cognitive treatment (Angus et al., 1999).

Assessment of the narrative forms and structures of different clients has also begun to shed light on distinctive features in the themes and style of their self-narratives. A schizotypic client, for instance, might display a fragmentary, poorly elaborated narrative style in relating events of his life, in a way that gives few clues about his internal responses to the stories he tells. Such research holds promise for clarifying difficulties in narrative production in different diagnostic groups, and for tracking their change over therapy toward richer and more communicable accounts of their experience.

Other constructivist methods for assessing different dimensions of clients' self-narratives include various *content scales* for coding the extent to which people feel like 'origins' of life choices or 'pawns' of fate, as well as their level of 'cognitive anxiety' associated with the diagnosis of serious illness (Gottshalk, Lolas & Viney, 1986). Another method, the *Narrative Assessment Interview* involves asking open-ended questions inviting the client's self-description from internal and external perspectives at the outset and termination of therapy. Systematic coding of the responses can yield a clear depiction of client change over treatment, while permitting clients to convey this change in their own words, rather than having to 'translate' their meanings into the sometimes alien language of the assessor.

FUTURE PERSPECTIVES AND CONCLUSIONS

Although constructivist assessment methods have a history that dates at least back to the 1950s, they are currently enjoying a period of rapid development (Neimeyer & Raskin, 2000). In part, this reflects the growing popularity of constructivist and narrative approaches to psychological theory, with their attendant focus on the unique meaning-making processes of individuals and social groups. In part, their proliferation also reflects the continued elaboration of human science methodology, which has developed along both quantitative lines (as reflected in the range of computer programs for administering and analysing repertory grids) and qualitative lines (as evidenced in thematic approaches to narrative analysis). Nonetheless, users of constructivist assessment methods confront problems

as well as prospects, as they consider how to evaluate the validity and reliability of measures that respect the individuality, complexity, and mutability of the meaning-making processes of their subjects. Preliminary studies of the psychometric adequacy of these methods are encouraging, however, suggesting that the further refinement and application of constructivist assessment will contribute to a more adequate psychological science and practice in the future.

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RELATED ENTRIES

Qualitative Methods, Subjective Methods, Idiographic Methods, Theoretical Perspective: Systemic

THEORETICAL PERSPECTIVE: PSYCHOANALYTIC

INTRODUCTION

Psychoanalytic theories of behaviour embrace a diversity of views that can be grouped into four main lines of thought: drive theory, which focuses primarily on basic needs of the individual and how these needs are channelled and expressed; ego theory, which stresses the nature and adequacy of the coping resources that people bring to bear in dealing with life situations; object relations theory, which emphasizes the representations people form in their minds of the characteristics of other people; and self-psychology, which attends to how people differentiate themselves from others and develop a sense of agency, authenticity, and self-esteem (see Pine, 1990). Despite many differences among them, these threads of psychoanalytic thought share three common premises, each of which has been confirmed by empirical research findings (see Masling, 1983, 1984; Westen & Gabbard, 1999): (a) unconscious mental processes, including thoughts, feelings, and motivations that exist outside of conscious awareness and influence an individual's personality characteristics and action tendencies; (b) a dynamic interplay between conflicting attitudes that generate anxiety leads in all people to defensive manoeuvres intended to reduce this anxiety; and (c) developmental experiences play an important role in shaping abiding personality characteristics and patterns of interpersonal relatedness.

Accordingly, psychological assessment from a psychoanalytic perspective serves the purpose of

elucidating aspects of personality structure and personality dynamics in ways that clarify the role of drives, conflict and defence, and object representations in shaping how people are likely to think, feel, and act. Assessment information framed in this way assists dynamically oriented clinicians in formulating the problems, diagnostic status, and treatment needs of patients they see and guides them in planning and conducting whatever psychotherapy they provide (see Blatt & Ford, 1994; Shectman & Smith, 1984). Familiarity with this psychoanalytic perspective on assessment also gives psychologists direction in their selection of assessment procedures and the manner in which they interpret the data they obtain. This impact of psychoanalytic theory on the selection of assessment procedures and their utilization in differential diagnosis and treatment planning can be traced to the seminal work of Rapaport, Gill, and Schafer (1968) and has subsequently been reflected in numerous other publications (see Weiner, 1983).

ASSESSING PERSONALITY STRUCTURE

Personality structure comprises a broad range of fairly stable characteristics and orientations of individuals that lead them to conduct themselves in certain ways. Most important among these persistent tendencies and abiding dispositions from a psychoanalytic perspective is a person's coping style, particularly with respect to his or her preferred defence mechanisms. Strictly defined, defence mechanisms constitute mental operations or overt behaviours undertaken without conscious awareness to minimize or avoid the experience of anxiety, as in attributing one's own unacceptable attitudes to someone else (projection) or having to repeat a useless ritual in order to feel comfortable (undoing). As elaborated in the work of Schafer (1954) and Cramer (2000), defence preference information emerging from psychological assessment can facilitate differential diagnosis, as in recognizing excessive reliance on projection as a likely indicator of paranoid tendencies and pervasive undoing as a clue to obsessive-compulsive disorder.

Appropriately selected and interpreted psychological assessment methods also help to identify the adequacy as well as the nature of an individual's defensive style and preferred ways of coping with stress. Particularly important in this respect is the utility of psychodiagnostic testing in measuring the maturity of an individual's personality organization. Test-based distinctions among neurotic, borderline, and psychotic levels of organization provide valuable information for differential diagnosis and many key aspects of treatment planning (see Lerner, 1998; McWilliams, 1994; Silverstein, 1999).

The capacity of people to cope with stressful situations without becoming unduly upset by them, as revealed by assessment data, provides a general index of ego strength that can contribute to drawing conclusions and making recommendations in a wide range of contexts. Finally of note, psychodiagnostic indices of ego strength capture the adequacy both of defences erected against conflict-induced anxiety and of resources existing in the conflict-free sphere of ego operations. Hence, a psychoanalytic focus on assessing coping capacities helps direct attention not only to an individual's psychological limitations and maladaptive tendencies, but also to his or her personality assets and admirable qualities as well.

ASSESSING PERSONALITY DYNAMICS

Personality dynamics refer to the nature of people as defined by the underlying needs, attitudes, conflicts, and concerns that influence them to think, feel, and act in certain ways in certain circumstances. These underlying dynamic influences on behaviour interact with structural aspects of personality functioning to determine what people actually say and do in their daily lives. In this interaction, however, the nature and adequacy of people's coping style is usually more directly apparent from their behaviour than from their inner life, which is often expressed indirectly in derivative manifestations of underlying psychic phenomena. For this reason, psychoanalytic perspectives have been singularly significant in psychodiagnostic assessment for fostering the utilization of psychological tests to illuminate underlying personality dynamics that by their nature are less obvious and less easily detectable than aspects of personality structure.

For example, numerous widely used personality assessment instruments designed to draw

inferences indirectly on the basis of how people perform on various tasks, rather than directly on the basis of how they describe themselves, include scales and guidelines for measuring needs for dependency, achievement, dominance, intimacy, and various other drive states of the individual. These measures can be used to identify underlying hostile, resentful, loving, collaborative, and other attitudes toward significant other figures in a person's life, or underlying derogatory, aggrandizing, and other attitudes toward oneself, all of which reveal the kinds of object representations a person has formed. Likewise, indirect personality assessment can identify concerns about sexual identity, interpersonal humiliation, loss of self-control, and other underlying sources of anxiety that may not be directly apparent or within a person's conscious awareness but can be accurately and usefully formulated within a psychoanalytic perspective.

DEVELOPMENT OF INSTRUMENTS

As already implied, psychoanalytic perspectives have influenced psychological assessment methods not by fostering the development of new instruments, but by enriching the ways in which existing measures can be used and interpreted. Perhaps the most notable exception in this regard is Blum's (1950) Blacky Pictures, on which respondents tell stories to cartoon pictures depicting the doggy Blacky and drawn with the specific intent of capturing such psychoanalytic developmental phenomena as oral eroticism, oedipal concerns, and castration anxiety. However, neither this measure nor any like it has ever found widespread use in actual practice. On the other hand, four types of relatively unstructured performance-based measures have shown considerable potential for tapping underlying personality dynamics and have lent themselves well to psychodynamic formulations of the test process and of specific test indices focused on psychoanalytic concepts. These four types of measures include (a) inkblot methods, as exemplified mainly by the Rorschach; (b) story telling methods, as first formalized with the Thematic Apperception Test and subsequently expanded to include such other commonly used methods as the Children's Apperception Test, the Roberts Apperception Test, and the Tell Me a Story Test; (c) figure drawing methods, of which the best known are the Draw-a-Person, the House–Tree–Person, and the Kinetic Family Drawings; and (d) sentence completion methods, as illustrated by the Loevinger Sentence Completion Test and the Rotter Incomplete Sentences Blank.

FUTURE PERSPECTIVES AND CONCLUSIONS

As is the case in describing personality functions or the process of psychotherapy, psychoanalytic perspectives bring to psychological assessment a breadth of formulation and a depth of understanding that could not otherwise be achieved. It is by looking beneath the surface of human behaviour, by seeking to know not only what is apparent but also what appearances may reflect or signify, that psychodynamic approaches to assessment can grasp why people act as they do and how they are likely to act in the future. There is sometimes a tendency in science to become enthralled with new ideas and regard older ideas as antiquated and obsolete. Psychoanalytic thinking, despite its voluminous literature and constant fresh outpouring of reconceptualizations and new directions (see Pine, 1998), is subject to being demeaned for its longevity and denigrated as a 19th century relic, as if Freud's Vienna marked the end of its development. Solid in substance and invigorated with fresh ideas, however, psychoanalytic perspectives seem destined to continue enriching psychological assessment for many years to come.

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RELATED ENTRIES

Applied Fields: Clinical, Projective Techniques, Qualitative Methods

THEORETICAL PERSPECTIVE: PSYCHOLOGICAL BEHAVIOURISM

INTRODUCTION

Behaviourism, with its goal of establishing the general theory of conditioning, has never had much of a connection to the traditional field of psychological measurement. Psychological measurement has a contrasting goal, that of dealing with individual differences. Furthermore, as Spence (1944) pointed out, behaviourism deals with stimulus-response laws, where the independent variables are the stimulus manipulations that affect the dependent variable, behaviour. Predictive tests, in contrast, deal with response–response laws where the first response (a test result) is related to the second response (the individual's predicted performance). These R-R laws are not causal as S-R laws are. Skinner's radical behaviourism has added to the reasons for ignoring the field of psychological measurement by taking the position that the individual's performance on tests can give no information about the individual's behaviour (1969: 77–78).

Psychological behaviourism has differed from the start, making behavioural analyses of existing psychological tests and projecting assessment in the context of a behavioural therapy (Staats, 1963).

> [A] rationale for [behavior therapy] will also have to include some method for the *assessment of behavior*. In order to discover the behavioral deficiencies, the required changes in the reinforcing system, the circumstances in which stimulus control is absent, and so on, evaluational techniques in these respects may have to be devised. [It is necessary] ... to determine such facts for the individual prior to beginning the learning program of treatment. Such assessment might take a form similar to some of the psychological tests already in use ... [However,] a general learning rationale for the behavior disorders and treatment will itself suggest techniques of assessment. (Staats, 1963: 508–509, italics added)

Silva (1993) has described the psychological behaviourism contribution as 'pioneering' with respect to founding the field of behavioural assessment. For in 1963 there were no other radical behaviourism or social learning theory that suggested the new behavioural assessment developments. However, later researchers (for example, Mischel, 1968; Kanfer & Saslow, 1965) used the psychological behaviourism projection of behavioural assessment within a *radical behaviourism* approach, thereby confining the development of the field to the principles of reinforcement, direct measurement of behaviours, and the rejection of psychological tests.

Psychological behaviourism, however, has continued to develop its position that there

should be a unification of traditional psychological assessment with behavioural analysis (see Burns, 1980; Fernández-Ballesteros & Staats, 1992; Evans, 1985, 1986; Staats, 1975, 1996).

PSYCHOLOGICAL BEHAVIOURISM, PERSONALITY, AND PSYCHOLOGICAL ASSESSMENT

Traditional (including radical) behaviourism could not connect to the field of psychological measurement because it lacked a theory of individual differences (personality) with an empirical-methodological arm. Psychological behaviourism has established a new approach that, while entirely consisting of behavioural principles and methods, nevertheless creates such a personality theory (see especially Staats, 1963, 1968, 1971, 1975, 1996). The basic conception is that at birth the child begins to learn complex repertoires of behaviour. And that changes the child. For example, when a two-year-old child has learned a rudimentary language repertoire the child is changed very basically, as in the child's characteristics of learning. To illustrate, a child with language can learn to count via instruction (see Staats, 1968). This type of training is not possible with a pre-verbal child.

There are thus individual differences among children in learning ability on the basis of repertoires that they have already learned. Thus, on the one hand, the repertoires are an effect since learning trials produced them. On the other hand the repertoires are a cause. The child who has them is capable of learning that a child without the repertoires is not. The learned repertoire in such a case is both a cause and an effect.

The psychological behaviourism position generally is that individual differences in behaviour in the same situation are due to previously learned basic behavioural repertoires (BBRs) in three general areas: language-cognitive, emotional-motivational, and sensory-motor. The psychological behaviourism theory is that those BBRs constitute personality. The phenomena of personality are explained by the basic behavioural repertoires. As additional examples, people have behavioural characteristics that are general across situations, and show continuity over time as well, because of their learned BBRs.

PSYCHOLOGICAL ASSESSMENT

Psychological behaviourism states that psychological assessment instruments measure the individual's BBRs. As one example, PB has analysed many items on intelligence tests that measure aspects of the child's language repertoires. To illustrate, the child must be able to respond to verbal instructions to succeed on most items. Other items assess the extent of the child's verbal labelling repertoire (i.e. vocabulary), with increasing refinement as age increases (as with words dealing with length and number). There are wide individual differences in the language repertoires children have learned and hence in how well they will do on intelligence tests.

Following the theory, if intelligence consists of learned repertoires then it should be possible to increase intelligence through training. We (Staats & Burns, 1981) tested this in one study in which four-year-old children were given training in writing the letters of the alphabet (which yields skills in the sensory-motor repertoire). When these children were later given the WPPSI (Wechsler, 1967) they did significantly better on the Geometric Design and the Mazes tests (ordinarily thought to measure different mental abilities) than children without the letter-writing experience. The training had given the children basic repertoire elements relevant to various other intellective performances.

With respect to the emotional-motivational repertoire PB has shown that values, interest, and attitude tests are composed of items that measure emotional response to different types of stimuli (see Staats, 1996). In one study (Staats & Burns, 1981), it was shown that people measuring high in religious values learned an approach response to religious words more quickly than subjects low in religious values. But when an avoidance response had to be learned to such words, people with high religious values learned more slowly than people with low religious values. This showed that religious values consist of emotional responses that individuals have learned to religious stimuli and differences in this personality characteristic affect the way the individuals behave and learn. In another study it was shown that being high or low in a vocational interest, a personality difference, determined two groups' choice behaviours. Attitudes toward racial groups also have been shown to involve emotional responses that have

been conditioned to racial features and names (see Staats, 1996). The commonality in principle in values, interest, and attitude tests shows how the personality theory unifies personality concepts and the tests used to measure personality. (For additional PB works in psychological assessment see Burns, 1980; Carrillo, Rojo & Staats, 1996; Evans, 1985, 1986; Fernández-Ballesteros & Staats, 1992; Heiby, 1989.)

Prediction and Test Construction Methodology

One of the things a theory of psychological assessment should provide is an understanding of what the field does and what kind of knowledge is produced by the field's products. For example, PB explains why psychological testing knowledge can provide prediction of behaviour but cannot provide knowledge by which to change the individual's behaviour (personality) characteristics.

Let us start with prediction. In constructing intelligence tests, for example, items are selected that some children can answer correctly and other children cannot. Then the items are evaluated for the extent to which they predict children's success in school, and those that predict are selected for use. The general belief, however, is that IQ tests measure some biological process, quality, or structure within the child – intelligence – that determines the ability of the child to learn in school. That is why the tests are thought to predict school success.

The PB explanation, in contrast, is that *the intelligence test measures BBRs the child needs to be able to learn in school*. The criterion that an item, to be included on an intelligence test, must predict school success ensures that the item is measuring a part of a BBR that is necessary for the child to learn in school. Similarly, when a group of interest test items are shown to be characteristic of a particular occupational group this reveals an important aspect of the emotional-motivational repertoire (likes and dislikes) of those individuals. That is the reason why any individual with the same emotional repertoire will be happy on the job; that is, will have positive emotions elicited by the stimuli in that occupation, will find rewards on the job, and will be drawn to activities that enhance job skills and success. Interest tests predict successful occupational behaviour because they measure emotional response to occupationally relevant stimuli, as we have shown (Staats, Gross, Guay & Carlson, 1973), not because of some mental trait called an interest.

Because of their construction psychological tests provide prediction of later behaviour. But to be able to control – that is, effect – that later behaviour requires (1) that the basic behavioural repertoires that yield that behaviour are known as well as (2) the learning conditions that determine those BBRs. Let us take the intelligence test as an example. The knowledge of a child's IQ score provides improved prediction, but not control on the child's performance (behaviour) in school. However, by identifying the BBRs that the intelligence test measures, it is possible to use the test to detect what BBRs a child has as well as what BBRs the child lacks. Using the knowledge of how to train the child in the deficit BBRs it is then possible to improve the child's school performance. More generally, the PB psychological assessment theory, its analysis of testing instruments, and its training procedures can provide knowledge by which to effect behavioural outcomes. As another example, take the Geometric Design and Mazes tests of the WPPSI. If the child's score is low on these tests that says the child lacks the necessary BBRs. The psychological behaviourism analysis states that training the child to write the letters of the alphabet provide the necessary BBRs and thereby raise the child's intelligence scores on these two tests. The research results verify this.

If we had that type of knowledge for the various psychological tests in existence then it would be possible to do something about the individual differences they measure. That would apply to the personality repertoires (BBRs) that compose sociability, extraversion, neuroticism, depression, and paranoid personality. With respect to intelligence tests a partial analysis has been made with respect to what intelligence is and how it is learned. What is needed is the complete analysis of and research on the BBRs that compose children's intelligence, so problems of intelligence could be prevented and treated.

Organic Determinants of Individual Differences

Does this mean that PB takes the position that behaviour and personality is entirely determined by learning? I can answer this simply: no. The

organic state of the individual is important during the learning of the BBRs. If there is some organic reason that reduces the individual's ability to learn, then even with normal learning conditions there will be a decrement in the formation of the BBRs. Moreover, once the BBRs have been learned organic trauma may delete them or distort them. In either case, when the individual encounters later life situations they will have a deficient or distorted set of BBRs from which elements of the individual's behaviour can be selected. So organic conditions can be causes of behaviour, in several ways.

Environmental Determinants of Individual Differences

The psychological behaviourism theory of personality states that the environment plays two roles. It is the learning experiences of the environment that lead to the formation of the BBRs. But the environment also plays a role at the time of behaving. A person may have learned a repertoire of aggressive behaviours, for example. But elements of the repertoire will only be called out in some situations. Individual differences in behaviour can result because individuals with similar BBRs are confronted with different life situations (environments).

FUTURE PERSPECTIVES AND CONCLUSIONS

As future perspectives the psychological behaviourism theory provides a wide-ranging programme of study for further development of the field of psychological assessment.

Analysis of Psychological Assessment's Test Instruments

Psychological behaviourism has analysed various psychological tests – for example, intelligence – in a prototypical way. The value of such analyses have been shown, as in training children to be more intelligent. But the purview that this work opens is vast. For there are many tests to be analysed in terms of the basic personality repertoires they measure. A major future perspective, thus, consists of the call for studies to analyse in specific detail the basic behavioural repertoires that compose the major tests in the field.

Test Construction

Psychological behaviourism in its present form provides a foundation for the construction of new types of tests. One of the basic behavioural repertoires that is involved in intelligence and other tests is that of language. Psychological behaviourism has analysed and researched the learning of the sub-repertoires of which language is composed. Those analyses could form the basis for constructing an intelligence test for children. Other similar developments are suggested.

Behavioural Research: Connecting to Psychology and Establishing Control

Fernández-Ballesteros (1994) has called for relating psychological assessment to other fields of psychology. At present the focus is on measurement, not on study of the causes of what is measured. But construction of tests that provide knowledge by which to change personality or behaviour requires work beyond that of measurement. It requires specification of what is measured, what causes what is measured, and how what is measured affects behaviour. Psychological behaviourism says that intelligence consists of learned personality repertoires that make connections to fields concerned with learning and behaviour. Establishing those connections can give psychological assessment the power not only to predict but also to affect that which is predicted. A perspective of psychological behaviourism is to further that major development.

Assessment Instruments and Basic Personality Research

Another avenue for unifying psychological assessment and basic psychology has been projected. To illustrate, psychological behaviourism's general theory of emotion includes the principle that emotions elicited from different sources algebraically add to each other in producing an emotional state. If the emotions are both positive or negative, there is a more intense emotional state. But when a positive emotion is added to a negative the emotional state is less intense. Jesus Carrillo has suggested testing this using a test that measures positive and negative emotion from experience and from thoughts, with a depression inventory

measuring the emotional state. He, Nieves Rojo, and the author have data that shows the productivity of this approach. Peter Staats, myself, and Hamid Hekmat (2001) have researched the principle using an integration of psychological assessment and experimental psychology. The two sources of emotion were (1) a positive or negative placebo and (2) high or low anxiety as measured on a pain anxiety scale. The dependent variable was extent of pain in the cold pressor task. Our results showed subjects with two sources of negative emotion had greater pain than subjects with two positive sources, with subjects with mixed positive and negative sources falling in between.

These are examples of how psychological behaviourism suggests a programme for using test instruments in the study of psychological processes.

The Disunity of Psychological Assessment: A Programme for Unification

The fields of personality and psychological assessment constitute a chaos of highly diverse studies. There are many different personality theories, set forth in different theory languages, and ordinarily considered separately, with no systematic attempt at integration. The same is true in psychological assessment, where there are innumerable tests whose relationships are unknown, even when they overlap in items.

These tests can be analysed in terms of the BBRs their items measure. Such analysis can define those tests in terms that relate and organize them and thereby unify the field (see Staats & Burns, 1981). Such analyses would also yield knowledge for constructing tests that would measure the BBRs without redundancy. The psychological behaviourism goal of unification calls for many works of various kinds.

Clinical Treatment, Assessment, and Evaluation

Fernández-Ballesteros and Staats (1992) have constructed a model that relates assessment, treatment, and evaluation within psychological behaviourism. There are many suggestions for works to be conducted within this model (see also Eifert, Evans & McKendrick, 1990).

Conclusion

Psychological behaviourism is a broad overarching theory that includes a unification of psychological assessment methods and instruments with principles and methodology of a behavioural theory of personality. This theory suggests various new avenues of development and research that will define psychological assessment and relate it to the other fields of psychology.

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RELATED ENTRIES

Theoretical Perspective: Behavioural, Theoretical Perspective: Cognitive-Behavioural, Applied Behavioural Analysis

THEORETICAL PERSPECTIVE: PSYCHOMETRICS

INTRODUCTION

Human behaviour is enormously variable, depending on the inner state of a person, the demands and opportunities of a situation, and in dependence on a person's individual style of living, and on her/his interests, abilities, values, and motives. 'Psychological assessment' denotes the universe of systematic, scientifically based methods for describing, recording or interpreting a person's behaviour – provided that a method meets defined psychometric criteria, especially of reliability and validity. In this contribution basic concepts and psychometric methods employed in developing, evaluating and applying assessment methods are introduced.

MENTAL MEASUREMENT

The variations in behaviour and experience, which are captured in an assessment method, differ in the kind and source of psychological data accessed. These may include biographical information (like school records or employment history information), behaviour traces (products of a person's behaviour, like drawings), direct behaviour observation, behaviour ratings, segments of expressive behaviour (like handwriting or style of emotional expression in a person's face), so-called projective techniques (highly unstructured visual or other stimulus material, which a person is invited to interpret), interview data, questionnaire responses, so-called objective tests, or psychophysiological data. In this sense, psychological assessment encompasses a wide spectrum of methods, with 'tests' being but one type of method. As a technical term, '(objective) test' refers to a sample of items, questions, problems or the like chosen to sample representatively a presumed universe of items, questions or problems indicative of the trait or state to be assessed (Pawlik, 2000: 382). The literature referenced in the section 'Psychometric Assessment Theories', introduces these assessment sources in all the necessary detail.

While the choice of an assessment methodology will depend on the nature of the assessment problem under study, the heuristic goals of assessment can be described independent of the method chosen. This goal can either be descriptive, prognostic, explanatory, or decision-oriented. Purely descriptive assessment is a relatively infrequent exception, where the assessment is conducted with the sole purpose of describing the current behavioural state of a person. Much more

frequent are assessments subserving a prognostic or explanatory goal. In the first case the assessment is conducted to predict the person's behaviour, state of feeling etc., at a future occasion or in another setting. Examples are psychological tests administered to predict a person's success in a training programme or under psychotherapy. Extending assessment results in the opposite direction of time is called explanatory: to infer from a person's assessment results her/his psychological state at an earlier stage of development or under past situational conditions. For most practical purposes, psychological assessment is – primarily or additionally – decision-oriented. That is to say that the assessment results are employed to facilitate or improve decisions among alternative courses of action or treatment. These may refer to different types of educational or professional training, to different methods of psychological therapy, to alternative vocational choices, or the like.

Irrespective of the heuristic goal, assessment methods have to meet stringent criteria of accuracy (reliability) and validity. To this end, formal (i.e. mathematical–statistical) theories of measurement have been developed for the construction and the quality control of assessment methods. 'Psychometrics' is the branch of psychological methodology that comprises these theories and resulting methods for developing and evaluating assessment methods. In this context 'measurement' simply refers to a method of mapping variations in behaviour or experience onto a chosen number system. Different levels of measurement are distinguished depending on the rules and prerequisites chosen for this mapping.

In nominal measurement different numbers only reflect different units of classification (for example: 0 = single, 1 = married, 2 = widowed, 3 = divorced). Obviously no bigger–smaller interpretation or numerical operation (like addition or subtraction) is permissible in nominal measurement. In ordinal measurement the assessment correctly maps bigger–smaller relationships in behavioural variations (as in ranking data: person A was faster than B, B was faster than C) but not magnitudes of differences between behaviour states. In this case equal intervals in the assessment result cannot be taken to reflect equal-sized differences in state of behaviour. Therefore, ordinal assessment results too must not be subjected to numerical operations like addition or subtraction. In interval measurement assessment results will map correctly bigger–smaller relationships and size of differences in the targeted dimension of behaviour. Many personality and intelligence tests are constructed at the level of interval measurement. In this case numerical operations of addition and subtraction are permissible, while operations involving multiplication or division are not. These operations are only permissible for so-called ratio-scaled measurement, in which the zero point of measurement has been proven identical to the absolute zero point of the underlying dimension of behaviour.

Historically, present day psychometric models and methods are rooted in so-called mental measurement, that is psychological assessment designed to measure inter-individual differences in mental performance (on tests of intelligence, visual memory, spatial orientation, logical reasoning, etc.). The underlying assessment principle is that of behavioural sampling, i.e. of selecting a limited number of items of observation (test items, intelligence problems, perceptual tasks, etc.) in a way that will allow for representative generalization with respect to an hypothesized underlying trait (of general intelligence or memory aptitude). Later this assessment approach has been employed also in the assessment of non-aptitude traits, like personality dimensions or interests, and has been extended further to accommodate not only inter-individual assessment, but also intra-individual tests of state variations, of situation-specific patterns of behaviour or behavioural change as a function of development or as a result of implemented intervention (as in psychotherapy). See Pawlik (2000) for a more detailed coverage of these different modes of psychological assessment.

PSYCHOMETRIC QUALITY STANDARDS

Different psychometric theories of assessment differ in the assumptions (axioms) on which a psychological measurement theory is based. In so-called classical test theory (CTT) one assumes that a person's observed test score is equal to the sum of her/his true score in the underlying trait and an unsystematic error term (error of measurement), which will be linearly uncorrelated

with variations in true test score and with variations in true or error score on any other test (ideal random variable). Then it can be shown that the squared standard deviation (variance) of observed test scores must be a sum of the variance of the true scores (true variance) and the variance of the error terms (error variance). In this theory two tests (1, 2) are called strictly parallel, if the true scores on test 1 and 2 are the same for any one person and if both tests 1 and 2 have same-sized error variance. Then it can be shown, mathematically, that the product-moment correlation of two strictly parallel tests equals the ratio (quotient) of the true score variance to the observed score variance on any one of them. This ratio is called test reliability. It gives the size of the true variance as a percentage of observed test score variance.

Different methods have been developed (parallel test correlation; retest method; split-half reliability; internal consistency measures) for estimating the reliability of an assessment method. According to common standards a reliability of 0.75 to 0.80 is considered minimum requirement for application of that method in practical psychological assessment work. (Reliability of at least 0.75 would indicate that at least 50% of the raw score standard deviation [square root of $0.25 = 0.50$] is unaffected by errors of measurement.)

A second and equally important quality standard of psychological measurement is called validity. It refers to the degree to which a psychological assessment (test or other) measures that and only that psychological variable or attribute it is designed to measure. Criterion validity is a frequently employed variant of test validity. It is given by the correlation between observed test scores and a targeted external criterion (like: final exam scores in an educational curriculum which the test is designed to predict; or for a clinical questionnaire of generalized anxiety: patients' anxiety assessments given by ward staff). Reliability is a necessary but not sufficient prerequisite of validity. It can be shown that the validity of an assessment method cannot exceed the square root of its reliability. Once the criterion validity of a test is known, one can compute the standard error of predicting a person's criterion score on the basis of her/his test scores. While an assessment method has one and only one reliability, it may have different validity for different traits, attributes and criteria.

In research and psychological theory development, often a second kind of validity is given even more preference: the so-called construct validity. In construct validation, the validity of an assessment method is estimated by the degree to which this method will yield empirical results in accord with hypotheses derived from the theory in which the construct is embedded (convergent validity) and, at the same time, not in accord with hypotheses linked to an unrelated construct (discriminant validity). For example, one would expect that scores on a test of general anxiety will be lower after psychotherapeutic treatment known to reduce general anxiety, yet remain unaffected by placebo treatment. In this case construct validity refers to the degree to which these theory-based predictions can be shown to hold for the test in question.

Next to reliability and validity, several additional psychometric quality standards of assessment have been introduced. These include:

- objectivity of administration of an assessment method: the degree to which situational context variables of an assessment, the behaviour of the tester and other circumstantial factors are standardized and proven, not to give rise to differences in assessment results;
- scoring objectivity: the degree to which different scorers of the same assessment protocol will yield identical scoring results;
- the nature of statistical norms (population reference statistics for test interpretation): size and representativeness of the standardization population, proper choice of standardized score;
- discriminative power of an assessment method: the degree to which true differences in state of behaviour will be assessed by the method, be it in inter-individual comparisons (trait measurement) or intra-individual comparisons (state measurement);
- internal consistency: the degree to which the components (sub-tests, items, scales) of an assessment method measure equivalent psychological entities and can thus be interpreted in a summative way (for example, in a total score or intelligence quotient);
- response objectivity: the degree to which assessment results can be influenced by the

testee, be it voluntarily (faking good or faking bad) or involuntarily;
- level of test fairness: the degree to which the test content, the sampling of test items, the scoring procedure and the rules for test interpretation are equally representative and valid for testees from different sub-groups of a population (male vs. female, young vs. older adults, different ethnic origin, etc.).

In most countries these psychometric standards of assessment are complemented by additional ethical/legal standards of psychological testing, especially with reference to the protection of privacy, the principle of informed consent, and, particularly important, the principle of confidentiality.

DEVELOPMENT OF PSYCHOMETRIC ASSESSMENT METHODS

Next to assessment quality control, psychometric theories provide a basis also for standards in development of assessment methods. In order to optimize test construction with respect to the fore-mentioned pychometric quality criteria of psychodiagnostic assessment, the literature on psychometric test construction comprises ready-to-implement methods for:

- adequate definition of target traits or states or criterion measures;
- choice and sampling of units of observation (items) in test construction;
- methods of item analysis for assuring sufficient internal consistency, for developing parallel tests and alternate forms of an assessment instrument;
- procedures to be followed in test standardization;
- alternative procedures to be followed in assessing the above mentioned quality standards.

When choosing among alternative assessment methods for a given assessment problem, the psychologist is trained and professionally committed to carefully examine available information on the standards followed in test development and on psychometric quality control (especially with respect to reliability and validity) of assessment results obtained with the method in question. In many countries the national code of ethics for psychologists make it compulsory for a psychologist to carefully examine the psychometric appropriateness of an assessment method (with respect to standards of test development and test quality control) before applying it in practical service.

PSYCHOMETRIC ASSESSMENT THEORIES

CCT is still the most widely employed psychometric theory for psychological assessment, despite certain inherent methodological shortcomings. To combat these, more advanced mathematical–statistical models have been developed which employ detailed (and empirically testable!) assumptions about the statistical relationship between observed test scores and underlying true scores. In such a model one specifies a probability function relating observed item scores to underlying true trait scores. (This item-characteristic function can be chosen, for example, to follow the integral [ogive function] of a normal density function or a logistic function.) The reader is referred to the classical text by Lord and Novick (1968) for an introduction into probabilistic psychometric theories. Probabilistic psychometric measurement yields estimates of persons' true scores, of test item difficulties, and of test reliabilities that are statistically independent of specifics of the sample of persons and items under study. Furthermore, these more advanced psychometric theories are suitable for so-called adaptive testing (tailored testing). In such an assessment, those and only those items (questions, test problems, questionnaire statements, etc.) are administered whose item difficulties range close to a person's estimated attribute score. In this way psychological assessment can be designed more economically (in testees' and testers' time and effort) and, at the same time, optimally reliable within pre-set standards of reliability. Adaptive assessment designs lend themselves most readily to computer-assisted testing, which has come to replace older paper–pencil tests in a growing number of assessment situations.

The reader may consult these texts, handbooks and handbook chapters for a more detailed introduction into the psychometric theory of

psychological assessment: Anastasi (1988), American Psychological Association (1985), Lord and Novick (1968), Pawlik (2000), Wainer (1990).

FUTURE PERSPECTIVES AND CONCLUSIONS

The development of psychometric theory has established a firm and professionally obligatory basis for the development of psychodiagnostic assessment instruments and their quality evaluation with respect to objective standards of reliability and (prognostic or diagnostic) validity. More recent developments in probabilistic item-response theory have extended this basis to provide an advanced basis for the measurement of psychological change and for testing procedures designed to assess a person's trait values with the smallest-possible number of items thereby fulfilling a pre-selected level of psychometric accuracy (reliability). In all likelihood, future developments of psychometric assessment will develop further today's technologies of computer-assisted testing and of ambulatory assessment of behaviour traits under everyday life conditions, outside the (physical and methodological) refinements of a laboratory or stationary testing situation. If implemented successfully, these ambulatory techniques of psychological assessment will expand presently available methods for studying behaviour changes in multiple-base line designs (as frequently needed in clinical testing), of studying intra-individual variation due to changes in mood state, activation level or co-variant environment conditions, and provide for more advanced methods of intervention-related assessment in educational and clinical psychology.

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RELATED ENTRIES

Classical and Modern Item Analysis, Classical Test Theory, Trait–State Models, Objectivity, Validity (General), Norm-Referenced Testing: Methods and Procedures

THEORETICAL PERSPECTIVE: SYSTEMIC

INTRODUCTION

Historical Roots

Depending on viewpoints, different developmental pathways of the systemic approach can be identified such as (i) family therapy schools, (ii) solution focused and resource oriented concepts of clinical practice, and (iii) the dynamic systems approach in complexity science. The first two grew up on the soil of psychotherapy practice whereas the third belongs to the field of formal and empirical sciences. Family therapy as well as solution-focused approaches intend to stimulate changes of individual or interpersonal patterns (patterns of feeling, thinking, behaving, and of social communication). In order to do this, they need an idea of how complex systems create and transform such patterns. In the last

two decades, the theories and methodologies of complex dynamic systems were used to get such ideas. Surrounding the concept of self-organization, theories and assessment tools provided the basis for empirical research on psychotherapy change processes.

Basic Assumptions

The systemic approach focuses on dynamics, interconnectedness, and complexity of psychological, physiological, and social phenomena. Its look at the world adopts the perspective of time, development, and pattern transitions. This look is qualified by its structure of knowledge and its methodological approaches, not by the 'objects' or the phenomena under consideration (e.g. families). This perspective refers to interpersonal constellations such as couples, families, or social groups in so far as features like dynamics and complexity are at the core of diagnostic interest. The mere classification of social units into categorical or dimensional systems does not fulfil any criteria of systemic assessment procedures. The feeling, thinking, and behaving of individuals is also at the core of interest, as well as (individual or coupled) brain dynamics.

Qualities of social systems like interactional styles, dyadic coping, expressed emotions, cohesiveness and many others are of interest, if they can be seen as a result of dynamic processes. In terms of self-organization theory these qualities are collective order parameters of a social system, reducing the degrees of freedom of behaviours and cognitions of the system members (subsystems or components). Components become part of coherent patterns which are determining their behaviour (top-down causality), but the other way round, interactions between components constitute emergent patterns and qualities not yet existing at the level of components (bottom-up causality). Global qualities can also act as constraints and/or boundary conditions of the realized system dynamics – more or less in touch with these dynamics and so themselves more or less prone to change.

If individual or socially shared cognitions can be seen as self-organized products of such circular causalities between micro- and macro-level dynamics, social as well as individual constructivism finds its theoretical foundation in the systemic processes of self-organization. Spontaneous order formation in brains, minds, and societies is the basis of meaningful constructions or 'Gestalts', and this is the reason why constructivist and systemic procedures of assessment share quite similar epistemological backgrounds.

ASSESSMENT PROCEDURES

Systemic assessment techniques can be classified along the axes of (i) static or dynamic portraying, (ii) qualitative or quantitative methods, and (iii) practical or research oriented purposes.

Visual Representations of Interpersonal Constellations

Well-known visualization tools like family genograms, sociomatrices based on preference choices between group members, structural models of relationship qualities or group and family sculptures (incorporated by real individuals or realized by symbols like coins or Szeno Test figurines, as in the method of family boards) are widely used in systemic therapy (*cf.* Cierpka, 1996; Schiepek, 1991, 1999). Following our taxonomy, these procedures usually are realized for practical purposes and will be found at the static and qualitative end of the axes. They are systemic only in as far as they try to portray the complexity of interpersonal constellations, but in a first step, any information of dynamic qualities is missing. In a second step, however, they help to initiate communicative and emotional dynamics within the portrayed social system, and – applied repeatedly and entering by this an iterative cycle between representation and action – they play an important role in supporting therapeutic change processes.

Circular Questions

A classic example for a change instigating assessment procedure is circular questioning. The interviewer is not interested in 'facts as they are', but in facts related to other facts, in shapes (Gestalts) on their backgrounds, in information related to the information producing systems, in observations related to their observer(s), in the present mirrored by the future, in distinctions producing distinctions. The exchange of

perspectives on interaction patterns and pattern descriptions within groups is a transformation-inducing process.

Subjective Reconstruction of a System's Evolutionary Pathways

In contrast to the iterative portraying realized by circular interviewing procedures there are other methods focusing on system dynamics in a more direct way. One of these is the graphic representation of the developmental patterns of certain important system qualities. These developmental patterns will be graphically represented using a system of coordinates (with the *x*-axis representing the time span of the development under observation [hours, days, months, or years] and the *y*-axis representing the intensity of the qualities). The resulting retrospective time series characterize the subjective view on developmental processes of an individual or a group (team, couple, or family). Notions of relevant life events, phase specific resources, realized decisions, and extrapolations into the future can enrich the dynamic patterns.

Idiographic Systems Modelling

Going beyond this finger exercise in dynamic thinking one can develop hypotheses about the interactions and feedback-loops between relevant systems variables, which can be graphically represented by a network diagram (idiographic systems model). Like a complex macromolecule composed of smaller molecules, one gets a macro-hypothesis built up of smaller partial hypotheses. All these assumptions represent different aspects or components interwoven into a complex bio-psycho-social process, which generates the characteristic dynamic patterns of the system. In clinical practice, these models represent some kind of functional analysis of problem behaviour or abnormal bio-psycho-social patterns. They integrate a broad basis of knowledge and combine some case-relevant parts of this knowledge into multi-perspective views on clinical problems. The specific gain of this procedure beyond a mere addition of hypotheses and information is the consideration of feedback-loops between the system components (variables). Following the paths interrelating the components, one gets some idea of the characteristic evolutionary patterns of the phenomena under consideration. Despite using theoretical (nomothetic) and empirical results from psychology and other fields, the aim is a specific idiographic understanding of single cases. Additionally, qualitative network models help for an understanding of system functioning and can, therefore, be used in order to prepare further steps into formalized models.

Computer Simulations

Consequently, systemic assessment strategies end in simulation procedures, i.e. in the transition from qualitative to formal modelling. Different formalization approaches are available in the field of system dynamics. Widely used are difference equation systems, differential equations, cellular automata, autonomous agents, neuronal networks, and hybrid (mixed) approaches (*cf.* Schiepek, 1999). Computer simulations open the door to a deeper understanding of dynamic complexity. Most of the phenomena psychiatry and clinical psychology are dealing with can be understood as 'dynamical diseases' characterized by specific dynamic structures and by different degrees of stability or instability. Their generating mechanisms are nonlinear mixed feedback systems that combine increasing, i.e. exciting, and decreasing, i.e. damping, processes.

Gaming Simulations

In the repertory of systemic assessment, not only computer simulations but also real life simulations or gaming simulations are widely used. This enlarged role-playing starts from carefully prepared social constellations and problems. The evolution of dynamic scenarios and problem solutions will take place in a self-organized manner. Real life simulations are realized in order to better understand complex social systems, to anticipate possible problems and developmental pathways before entering real changes in organizations, or to do research on social systems.

Real-Time Monitoring of Change Processes

If there exist some possibilities to measure the relevant system variables in a prospective manner (by daily ratings or repeated observations, for example), one gets the material for time series

analysis. Before entering more sophisticated analysis procedures, a mere visual inspection of time series data can result in surprising insights – but sometimes in misleading interpretations, too. Statistical tools are being developed for practical applications. In practice, clients' diaries, therapy session feedback sheets, or other documentation instruments can be of great importance.

Video Based Coding Systems

Especially within psychotherapy research, video based coding systems are used to get time series data of dynamic processes. An observation system of the therapist's behaviour is the *Rating Inventory of Solution Focused Interventions* (time sampling: one minute). Another method develops its own observation categories by an idiographic strategy. This method, called *Sequential Plan Analysis*, allows for a highly resolved, video based encoding of the self-presentation behaviours of interacting persons (time sampling: 10 seconds). The synchronicity of different behaviour aspects (so called 'interactional plans') of the interacting persons results in dynamic patterns, which can be visualized by an encoding system very similar to musical scores. Every instrument of the orchestra (every plan) only realizes one single note which can be played or not, but out of the synchronicity of these on–off-sequences melodies, rhythms, and harmonies are emerging. By means of intensity ratings of the concrete behaviours representing interactional plans at the concrete level, the time dependent evolution of the plans can be quantified. The resulting time series can be analysed by linear and non-linear methods (Kowalik et al., 1997; Schiepek et al., 1997).

Configuration Analysis

Horowitz (1987) identifies sequential patterns of 'states of mind'. These are global qualities of psychological functioning and of constituting social relationships. 'States of mind' integrate actualized beliefs, situation perceptions, emotions, coping reactions, and images of the 'self' and the 'other'. By this, states can be seen as order parameters or attractors of the 'stream of consciousness', and a sequence of states represents order-to-order transitions of psychosocial system dynamics.

Scientific as well as practical interests of systemic assessment and analysis methods focus on the identification of dynamic order (attractor types), order transitions, and the degree of stability or instability of dynamic processes. As living systems are engaged in learning, adaptation, and evolutionary processes, they realize dynamic changes. Their behaviour is not only characterized by non-linear dynamics, but also by nonstationary ones. Consequently, existing analysis methods for non-stationary time series get increasing importance (Vandenhouten, 1998).

EVALUATION CRITERIA

The quality criteria of dynamic assessment are partially different from static assessment. Instead of 'true values' the aim is to identify 'true dynamics', i.e. to distinguish these from measurement biases and dynamics caused by noise or error. The discussion of criteria in systemic assessment establishes different priorities, depending on purposes or contexts (more practical or more scientific), and reflects the epistemological conditions of the observing (assessing) system as well as the relationship between observing and observed (assessed) systems (*cf.* Schiepek, 1991, 1999).

Most assessment methods used in systemic practice realize assessment as well as change inducing functions at the same time. System representations produced by the system itself or mirrored from the outside are frequently instigating reactions or transformation processes. This reactivity is intended, so that assessment procedures involving clients in practice have to be judged not only by criteria of reliability and validity, but also of effectiveness and usefulness in terms of clients' goals.

FUTURE PERSPECTIVES AND CONCLUSIONS

The systemic approach in its formal and methodological aspects is not restricted to certain types of interpersonal constellations (like couples or families) or to clinical applications. One important field of applications will be the understanding and assessment of management processes as well as transformations of profit and non-profit organizations. An important role is played by the computer-assisted real-time monitoring of change processes (including

human as well as monetary and structural aspects) and the possibilities of real-time data analysis, whose results will be fed back to management and decision processes. Qualities like the stability or instability of the ongoing process are of important relevance for such decisions. In the economic field, gaming simulations will become part of assessment centres, depending on the accepted insight that competencies in complexity management and systemic thinking are qualities of successful leaders.

Another field of application is the real-time assessment of psychotherapy processes providing both therapists and clients with relevant information about ongoing dynamics. If it is true that the human brain is one of the most prominent, complex, non-linear, self-referential, and self-organizing systems, the analysis of signals from the brain will remain an important field of non-linear portraying and analysis methods. In psychological research, using systemic assessment tools stands for the transition from static to dynamic thinking.

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RELATED ENTRIES

Theoretical Perspective: Constructivism, Idiographic Methods, Qualitative Methods

THINKING DISORDERS ASSESSMENT

INTRODUCTION

Regardless of the instruments used, the clinical assessment of thought disorder must begin with clarification of the meaning of this illusive concept. 'Thought disorder' is a widely used and often misunderstood term with a history of confusion regarding the definition, underlying mechanisms, and diagnostic specificity. Following a presentation of a working definition of disordered thinking and a brief mention of various areas of conceptual confusion, I summarize categories of assessment instruments used to measure thinking disturbances.

DEFINING THOUGHT DISORDER

A comprehensive definition of thought disorder encompasses a broad perspective that includes not only traditional concepts such as impaired pace and flow of associations, but also such factors as

inefficient focusing and attentional processes; deviant word usage; errors in syntax and syllogistic reasoning; inappropriate levels of abstracting; failure to maintain conceptual boundaries; and a breakdown in the discrimination of internal perceptions from external ones. Such a definition captures the multidimensional nature of disturbances in thought organization (Kleiger, 1999).

CONTROVERSIES, PROBLEMS, AND CHALLENGES

Measuring disordered thinking is beset with a number of controversies, potential problems, and challenges. Making inferences about an intangible variable such as thinking from overt speech is controversial and has led some to question the validity of the construct of 'thought disorder'. Because the construct itself is called into question, instruments which purport to measure disordered thinking, instead of disordered speech, for example, are vulnerable to the criticism that they lack sufficient construct validity to justify claims of their effectiveness as diagnostic tools.

Another difficulty that plagues assessment effort is the lack of universal agreement over what constitutes disordered thought. There is general agreement that disordered thinking occurs in a variety of conditions, falls along a continuum of severity, and reflects a number of different anomalies in thinking. However, there is no absolute standard for classifying these anomalies of thought. Furthermore, different researchers often employ different techniques to assess different types of disturbed thinking. Although there may be overlap in many of the variables studied by different assessment methods, comparison between the various techniques is often difficult. Different assessment approaches may employ different names for similar variables or use the same name for essentially different types of disordered thinking.

Achieving sufficiently high inter-rater reliability or clinical sensitivity with the instruments is a challenge since many of the ratings or scoring systems themselves can be quiet intricate, difficult to learn, and subject to interpretation. Research on the most prominent scales and scoring systems demonstrates that significantly high inter-rater reliability is possible; however, learning some of these rating systems usually requires more than familiarizing oneself with the manuals. Often consultation with the researchers, who pioneered the ratings scales or scoring systems, is necessary in order to use the instruments competently.

The impact of phase of illness, medication, and context must be taken into consideration when assessing disordered thinking. The degree to which an individual's thinking is disorganized will depend on whether she/he is in an acute phase, or in a partial or complete remission. Valid measurement of disordered thinking also requires one to evaluate the subject's motivation, attitude, the context in which the idiosyncratic thinking is revealed. Is the subject aware of the bizarreness of his or her speech or ideas and, if so, what is their attitude toward it? Is idiosyncratic speech used to shock, control, or entertain? The presence of unusual ideas or odd speech does not constitute immediate grounds for inferring the incursion of a psychotic process.

ASSESSMENT INSTRUMENTS

Disordered thinking can be assessed by a variety of instruments ranging from formal psychological tests to structured interview techniques. Chapman and Chapman (1973) reviewed five methods for measuring thinking disturbances in schizophrenia. Included among these were (1) clinical descriptions of spontaneous verbalizations, (2) clinical interpretation of verbalizations made to standardized stimuli, (3) classification of verbalizations into predetermined categories, (4) standardized tests with formal scoring of deviant verbalizations, and (5) multiple-choice techniques. These methods differ in the degree to which examiners/interviewers (1) specify the stimulus situation, (2) restrict the number of possible responses an individual can give, and (3) limit the scoring categories for these responses. Simplifying matters, Koistinen (1995) divided assessment techniques into two broad categories, those using structured interview techniques and those based on psychological tests.

Interviews with Rating Scales

One of the most popular interview-based rating scales is Andreasen's Scale for the Assessment of Thought, Language, and Communication (TLC)

(Andreasen, 1978). This scale consists of definitions and directions for rating the severity of 20 forms of thought disorder manifestations along either a 4 or 5 scale. Subjects are given a standard interview of approximately 45 minutes. Beginning with an unstructured sample of the subject's speech, the interviewer then asks a series of specific questions regarding topics such as family life, politics, and religion. The interrater reliabilities of each of the subtypes defined by Andreasen have been shown to be sufficiently high to make the TLC Scale a useful instrument for research and clinical assessment of disordered thought, language, and communication. As a tool to aid in differential diagnosis, Andreasen demonstrated both quantitative and qualitative differences in TLC scores between different groups of psychotic patients.

Psychological Tests

Tests such as the MMPI/MMPI-2 and MCMI offer the advantages of time-efficiency and ease of administration; however, they provide, at best, crude measures of deviant thinking. More recently Butcher (Butcher et al., 1989) developed MMPI-2 Content Scales, which included a Bizarre Mentation scale. This special scale like Wiggin's older Psychoticism scale (Wiggins, 1966) was designed to measure patients' reports of strange thoughts and psychotic experiences.

A variety of other brief or self-administered paper and pencil tests, such as the Rust Inventory of Schizotypal Cognitions (Rust, 1987), the Schizotypal Personality Questionnaire (Raine, 1991), the Whitaker Index of Schizophrenic Thinking (Whitaker, 1973), were all developed to assess vulnerability to schizophrenia-spectrum thought disorders.

Self-report inventories are a good place to begin but they cannot provide a detailed assessment of the nature of disturbed thought processes. Even attempting to identify the presence of psychosis with these instruments is usually accompanied by unacceptably high false positives and negatives. True and false or multiple-choice questions, if read carefully, understood correctly, and answered truthfully, might be sensitive to some unusual ideas and experiences; however, without a sample of verbal behaviour and an opportunity to inquire into idiosyncratic responses, it is difficult to judge anything about the severity or quality of subtypes of disordered thinking.

Since the Rorschach was developed more than 70 years ago (Rorschach, 1921), researchers and clinicians have devoted enormous attention to identifying signs of schizophrenia and other forms of serious psychopathology. Although early Rorschach studies mirrored general psychiatric diagnostic trends, which assumed an isomorphic relationship between schizophrenia and disordered thinking, sophisticated ways of conceptualizing and measuring through pathology with the Rorschach have been developed. Virtually all Rorschach systems for assessing disordered thinking are based on the work of Rapaport (Rapaport et al., 1968), who made thought disorder scoring a key aspect of the test.

There are two contemporary Rorschach approaches for scoring thought disorder manifestations. The Special Scores of the Comprehensive Rorschach System (Exner, 1993) and the Thought Disorder Index or TDI (Johnston & Holzman, 1979) both assess a range of deviant thought and speech elements embedded in verbalizations and reasoning used to justify a Rorschach response. Both instruments were developed in the mid-1970s but had relatively separate developments over the last several decades. Exner's Comprehensive System is the most commonly used approach for administering, scoring, and interpreting the Rorschach, while the TDI was developed as a research instrument and, as such, has made few inroads into clinical assessment practice. The TDI is made up of 23 different forms of thought disorder, scored at 4 levels of severity (0.25, 0.50, 0.75, and 1.0). A more complex instrument to learn, the TDI is useful for identifying subtle differences among different groups of psychotic subjects, aiding in differential diagnosis of psychotic disorders. Interrater reliability is relatively good for ratings across different severity levels, with interclass correlations ranging from 0.72 to 0.77 (Coleman et al., 1993). Apart from it being a difficult instrument to learn, one drawback of the TDI is that it was developed using the Rapaport Method of Rorschach administration, which differs from the standards used by the more popular Comprehensive System. Nonetheless, the TDI is viewed not only as a robust measure of thought disorder, but also sensitive to identifying differential diagnostic patterns among different groups of psychotic subjects.

By contrast, the Special Scores of the Comprehensive System offer a much crisper and more economical approach to identifying major thought disorder categories. Four major categories comprising eight different scores can be scored according to level of severity (Level 1, mild slippage; Level 2, moderate and severe). By reducing the number of categories, the Comprehensive System ensures better inter-scorer reliability and ease of learning. Different scores are weighted according to their level of severity and entered into a summary index used to help make the diagnosis of Schizophrenia (SCZI). However, the SCZI is inadequate as a specific diagnostic indicator, yielding many false positives as many non-schizophrenic subjects, with other forms of psychoses, trauma, or personality disorders, often score positively on this index. The SCZI is probably better conceived of as an index of psychotic thought, as opposed to an index sensitive to one particular diagnostic syndrome.

FUTURE PERSPECTIVES

Traditionally studied as a psychological construct, researchers have increasingly sought to understand disordered thinking from a cognitive neuroscience perspective. Cognitive deficits in working memory, executive functions, and information processing have been found to be present in individuals suffering from schizophrenia-spectrum illnesses. Cutting edge research is being conducted to examine the correlation between thought disorder, neuropsychological measures, and neuroanatomical brain. Increasingly, we can expect neuropsychological studies of thought disturbances in affective, trauma-based, characterological, and anxiety-related disorders.

CONCLUSIONS

Thought disorder has been shown to be a construct that is reliably and validly assessed by a range of instruments. Researchers generally favour more rigorous methods that employ interview and rating scales such as the TLC or Rorschach approaches such as the TDI. Clinicians can use a variety of personality inventories and self-report forms to screen for the presence of thought disorder and the Comprehensive Rorschach System which offers a user-friendly and scientifically sound method of measuring different forms of disordered thought.

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RELATED ENTRIES

Applied Fields: Clinical, Theoretical Perspective: Cognitive, Classification, Diagnosis of Mental and Behavioural Disorders

TIME ORIENTATION

INTRODUCTION

Time perspective (TP) is the often non-conscious process whereby the continual flow of personal and social experiences are parcelled into temporal categories, or time frames, that help to give order, coherence, and meaning to those life events. These cognitive frames may reflect cyclical, repetitive temporal patterns or unique, non-recurring linear events in our lives. They are used in encoding, storing, and recalling experienced events, as well as in forming expectations, goals, contingencies, and imaginative scenarios. Between the abstract, psychological constructions of prior past and anticipated future events lies the concrete, empirically centred representation of the present action moment.

When a tendency develops to habitually overemphasize past, future, or present temporal frames when making decisions, it serves as a cognitive temporal 'bias' toward being past, future, or present-oriented. When chronically elicited, this bias becomes a dispositional style, or individual difference variable, that is characteristic and predictive of how the individual will respond across a host of daily life choice situations. Of course, there are variations in the degree to which a person utilizes these temporal orientations, and there may be situations in which each of these orientations will lead to an optimal decision. Temporal bias may include either habitual over or under use of one or more of these temporal frames. Such limiting biases are in contrast with a 'balanced time orientation', an idealized mental framework that allows individuals to flexibly switch temporal frames between past, future, and present depending on situational demands, resource assessments, or personal and social appraisals.

PREVIOUS RESEARCH ON TIME PERSPECTIVE

One possible reason why this intriguing, seemingly central aspect of the human experience – time – has not been incorporated into the current domain of psychological science may be due to the disjointed, non-cumulative nature of past research, the lack of adequate theory, and the absence of a standard, reliable, and valid measure for assessing TP. Given the complexity of this construct, it is no wonder that time perspective has been measured and operationally defined in a variety of different ways by independent investigators. Most research has tried to relate either future or present orientations to other psychological constructs and to their effects on selected outcome behaviours, with relatively little attention to past orientations. In general, future orientation has been shown to be related to many positive consequences for the individual in Western society, such as higher SES, superior academic achievement, less sensation seeking, and fewer health-risk behaviours. The opposite holds for those with a dominant present-orientation, who are seen as at risk for many negative life consequences, among them mental health problems, juvenile delinquency, crime, and addictions, when they function in a predominant future-oriented society (see, for example, DeVolder & Lens, 1982; Fraisse, 1963; Levine, 1997; Nuttin, 1985; Strathman, Gleicher, Boninger & Edwards, 1994; Zaleski, 1994).

Previous attempts to capture the complexity of TP in a single index have used: Thematic Apperception Test; Experiential Inventory (Cottle, 1968); Circles Test (Cottle, 1976); Motivational Induction Method (Nuttin, 1985); questionnaires (Bond & Feather, 1988); and Time Lines (Rappaport, 1990), among others. However, none of these methods has been widely accepted because of their low reliability or scoring difficulties. Because the meaning of TP must be closely linked to the standardized operations used to assess it effectively, such disparate definitions and methods have hindered the fuller development of this domain of psychological inquiry.

Attempts at conceptual simplification have tended to focus on only a single dimension, such as the present or future, without the

complicating influence of the other temporal dimensions, such as a future anxiety scale (Zaleski, 1996), or the Consideration of Future Consequences (CFC) scale (Strathman et al., 1994), and a well-known sensation-seeking scale whose features emphasize present-oriented functioning (Zuckerman, 1994). While these scales are improvements over previous graphical or story-based attempts to measure TP, they are literally one-dimensional. By focusing on but one dimension, they fail to provide assessments of the relative strengths of the other dimensions within individual temporal profiles. Moreover, they assume, incorrectly, that scoring low on a scale of future orientation is equivalent to being highly present-oriented, or scoring low on a measure of the present is equivalent to being future-oriented. Notably absent from these scales is any representation of the past.

A single pencil-and-paper scale – the Zimbardo Time Perspective Inventory (ZTPI) – can be productively used to illustrate the development of a valid assessment instrument and to introduce psychological constructs with which time perspective may be related (Zimbardo & Boyd, 1999). The ZTPI is easy to administer and score, with a clear, replicable factor structure, reasonable subscale reliabilities, and demonstrated validity. It provides a quantifiable measure of multiple time frames as individual temporal profiles, assesses broad dimensions of time perspective, and is built on a theoretical foundation that combines motivational, emotional, cognitive, and social processes that are assumed to contribute to, and are in turn influenced by, the operation of time perspective. At a conceptual level, TP may unite or integrate diverse constructs in previously unrecognized ways, and hopefully utilization of the ZTPI will serve as an impetus to bring order, coherence, and predictive power to the next generation of research on TP.

CONSTRUCTION OF A SAMPLE SCALE

Overview

A first empirical demonstration of the utility of a scale to measure such differences came from a convenience sample of more than 12,000 respondents to a *Psychology Today* magazine questionnaire that was prepared based on exploratory investigations (Zimbardo & Gonzalez, 1984; Gonzalez & Zimbardo, 1985). Refinement of the ZTPI was empirically driven, based on repeated factor analyses of the pool of statements thought to characterize different time perspectives. When factor analysed, these items, collected from many different sources, reliably produced five distinct factors. There was no a priori theoretical prediction of the number or characteristics of the factors that we would obtain; their nature was determined solely by the pool of characteristic statements and repeated factor analyses of this pool. After establishing the stability of the five-factor structure, individual items were analysed and revised in order to maximize factor loadings and increase the internal consistency of the subscales. The final factor analysis described below thus represents the end product of more than a decade long multipronged approach to the development of the ZTPI.

Exploratory Factor Analysis

The ZTPI asks respondents to indicate how characteristic a statement is of them on a 5-point Likert scale, where one endpoint is 'very characteristic' and the other is 'very uncharacteristic'. Exploratory principal-components factor analysis (using varimax rotation and replacement of missing values with the mean; $N = 606$) revealed five distinct Time Perspective factors, which explained 36% of total variance. The five latent constructs identified were theoretically viable and were similar to those obtained in our earlier analyses.

The Five ZTPI Factors

Past-Negative

The first factor of the ZTPI reflects a generally negative, aversive view of the past, labelled the 'Past-Negative'. Items that comprise this factor include, 'I think about the bad things that have happened to me in the past', 'I think about the good things that I have missed out on in my life', and 'I often think of what I should have done differently in my life'. Because of the reconstructive nature of the past, these negative attitudes may be due to actual experiences of unpleasant or traumatic events, to negative reconstruction of benign events, or a mix of both. However, it

seems reasonable to assume that the surprising prominence of this first strong factor is greater in our current United States cultural context in which the false memory syndrome/repressed memory controversy is publicized prominently and where PTSD is reported frequently in the media.

Present-Hedonistic

The second factor reflects a hedonistic, risk-taking, 'devil may care' attitude toward time and life. It includes such diverse items as, 'Taking risks keeps my life from becoming boring', 'I do things impulsively', 'I often follow my heart more than my head', and 'When listening to my favourite music, I often lose all track of time'. It suggests an orientation toward present pleasure with little concern for future consequences.

Future

The third factor reflects a general future orientation. Items typical of the Future factor include, 'I am able to resist temptations when I know that there is work to be done', 'It upsets me to be late for appointments', 'I complete projects on time by making steady progress', and negatively, 'I take each day as it is rather than try to plan it out'. The Future scale suggests that behaviour is dominated by a striving for future goals and rewards.

Past-Positive

The fourth factor reflects an attitude toward the past that is very different than that captured by the first factor. While the first factor suggests trauma, pain, and regret, the Past-Positive reflects a warm, sentimental attitude toward the past. Items that load on the Past-Positive factor include, 'It gives me pleasure to think about my past', 'I get nostalgic about my childhood', 'I enjoy stories about how things used to be in the "good old times", and 'I like family rituals and traditions that are regularly repeated'.

Present-Fatalistic

The fifth and final factor of the ZTPI reveals a fatalistic, helpless, and hopeless attitude toward the future and life. Items that comprise the Present-Fatalistic TP factor include, 'My life path is controlled by forces I cannot influence', 'You can't really plan for the future because things change so much', and 'Often luck pays off better than hard work'.

CONVERGENT AND DISCRIMINATE VALIDITY

Having established the factor structure, test–retest reliability, and internal consistency of the ZTPI, we turn to issues of validity. As with the basic scale construction process, validation was complicated by the nature of this ephemeral but pervasive phenomenon. Time permeates and defines our existence, so much so that it can be related to many diverse psychological constructs. Any attempt at validation, therefore, must include numerous psychological measures that conceptually might be related to any of our five TP factors. We next demonstrated the relationships of each of our scale factors with a network of traditional measures assumed to share some common variance with them. Our analyses revealed the unique contribution of our five temporal factors within the correlational structure existing between them and a dozen traditional measures. Space considerations do not allow us to detail all of the hypotheses we considered. Please see Tables 1 and 2 for a summary of the relationship between factors of the ZTPI and other well-established psychological constructs, and Zimbardo and Boyd (1999) for a fuller presentation of our validation studies.

FUTURE PERSPECTIVES AND CONCLUSIONS

As the pace of life in our post-modern world continues to accelerate, the role that time plays in the course of our lives is likely to become more salient and, perhaps, more divisive. Individuals may become blindly devoted to the pursuit of the future, others may become engrossed in the emotion of the present, and others may retreat to the comfort – or terror – of the past. The fortunate will balance the temporal demands of life with equanimity. Of how time will change in the future and of how individuals will choose to spend it, we cannot be certain. We can be certain,

Table 1. Convergent and discriminate validity; ZTPI correlations: CSM data ($n = 205$)

Scale	Past-negative	Present-hedonistic	Future	Past-positive	Present-fatalistic
Aggression	0.57***	0.34***	−0.37***	−0.19**	0.48***
Beck Depression	0.69***	0.24***	−0.24***	−0.20**	0.45***
Energy	−0.23***	0.35***	0.39***	0.19**	−0.28***
Friendliness	−0.14*	0.07	0.05	0.29***	−0.11*
Conscientiousness	−0.14*	−0.25***	0.73***	0.05	−0.29***
Emotional Stability	−0.54***	−0.23***	0.08	0.10	−0.24***
Openness	−0.12*	0.06	0.14*	−0.01	−0.25***
CFC	−0.24**	−0.39***	0.67***	0.02	−0.72**
Ego Control	0.32***	0.75***	−0.50***	−0.05	0.38***
Impulse Control	−0.44***	−0.33***	0.39***	−0.01	−0.32**
Novelty Seeking	0.36***	0.72***	−0.53***	−0.04	0.37***
PFC	−0.12*	−0.51***	0.59***	0.11*	−0.21*
Reward Dependence	0.01	−0.01	0.50***	0.24*	−0.18**
Self-Esteem	−0.56***	0.13*	0.16*	0.33***	−0.34***
Sensation Seeking	0.06	0.72***	−0.40***	−0.06	0.22*
Trait Anxiety	0.73***	0.08	−0.17*	−0.30***	0.47***

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$

Table 2. ZTPI and single self-report item correlations: College of San Mateo & San Francisco State Data ($n = 566$)

	Past-negative	Present-hedonistic	Future	Past-positive	Present-fatalistic
Age	−0.08	−0.10*	0.23***	0.01	−0.08*
GPA	−0.05	−0.07	0.21***	0.07	−0.08*
Hours study/week	0.06	−0.15**	0.28***	0.01	0.02
How creative	−0.06	0.28***	0.09*	0.13***	−0.11*
How happy	−0.41***	0.16***	0.01	0.36***	−0.23***
How often steal	0.12*	0.16**	−0.02	0.04	0.13*
How often lie	0.18***	0.16***	−0.20***	0.03	0.17***
How shy	0.20***	−0.16**	0.00	−0.13**	0.13**
Temper	0.18***	0.05	−0.08	−0.06	0.18***

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$

however, that time will play an increasing role in our lives, and it will be imperative that scientists have valid assessment instruments with which to measure it. We hope that other researchers will agree that time perspective is a psychological concept whose time has come.

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RELATED ENTRY

Personality Assessment (General)

TOTAL QUALITY MANAGEMENT

INTRODUCTION

This entry is intended to describe in general terms Total Quality Management, discuss some international movements to implement TQM, and focus on the European Foundation for Quality Management (EFQM) Model of Excellence as a practical tool for implementation through the assessment of performance of a psychological organization. All of these models sponsor different yearly Prizes and Awards on Excellence or Total Quality Management.

In order to introduce the reader gradually into the field, we shall cover, in sequence, the basis of Total Quality Management, the content of some of the international models focusing on the EFQM, a summary of the content of the model (criteria and attributes), aspects on self-assessment and performance improvement, and our views and perspectives for the future.

ESSENTIAL IDEAS BEHIND TOTAL QUALITY MANAGEMENT

Total Quality Management deals with managing with quality all functions of the organization. Managing with quality means meeting stakeholders' needs (with emphasis in the customer) through self-assessment, continuously improving efficiency and effectiveness.

Consequently, we could define TQM as a management strategy, based on self-assessment, focused in the customer, continuously improving all activities of all functions through the integration of the employees, and the personal assumption and evaluation of their responsibilities.

From the early artisan times, quality has evolved to Total Quality in the 1980s, but it followed a long journey (Teboul, J., 1991):

- 1930 Statistical control
- 1940 Acceptance plans
- 1950 Reliability and quality control
- 1960 Cost of quality, prevention
- 1960 to 1970 Involvement of everyone (Deming, E.W., 1982), problem analysis (Juran, J.M., 1989) and zero defects (Crosby, P.B., 1979)
- 1980 TQM starts

Let us examine a series of principles which provide the basic philosophy of Total Quality Management. Later in this entry, you will have

the opportunity to observe how these principles are structured in the EFQM Model.

Continuous Improvement Based on Self-Assessment for Learning and Innovating

The basic principle is that every activity is subject to improvement, and to be able to do that it is necessary to learn and apply this knowledge to innovate. This process has to be implemented through self-assessment.

The useful cycle used in science and industry applies: first you observe the results of any specific experience; second you reflect on these results; third you check or verify if your initial assumptions were met and, as a consequence, you learn; finally you take action either to correct towards the direction you want to take or you change your objective.

People Involvement and Implication

The improvement is not possible without the active participation of the people involved, who self-assess and assess the organization. Certainly, implication of management at all levels is needed, but the key to success is the involvement of the employees in the organization.

To do that, people training and development is a basic requirement; but empowerment by delegating authority and recognizing people when they contribute to improvement are ways to achieve employee implication.

Leadership

Leadership, which is 'an attempt at influencing the activities of followers to *willingly* cooperate through the communication process toward the attainment of some goal or goals' (Fleishman & Hunt, 1973: 3), is a complementary requirement to the above. It should be understood at all levels in the organization, even at the personal level: the identification of everyone with the concept that improvement will not be achieved without his or her participation.

Leaders should be able to transmit with clarity the direction they want for the organization. They should as well set the example.

Management by Facts and Data through Evaluation

The results of any process should be evaluated and measured to be able to compare and facilitate the improvement. It is very typical that we, as human beings, compare results in a subjective manner: 'it is *better* than yesterday', 'there has been a *tremendous* improvement', and so on.

Everything *should* be assessed and *can be* assessed, even data related to personal perceptions. One of the attributes of all the results in the EFQM Model is the internal comparison and comparisons with others along the time. No results can be compared without reliable data.

Partnership Development

Suppliers and other related partners should be treated within a significant association environment. Only in this way the organization will work more effectively, with mutual beneficial relationships, built on trust, sharing of knowledge and integration.

Social Responsibility

'The long-term interest of the organization and its people are best served by adopting an ethical approach and exceeding the expectations and regulations of the community at large' (EFQM, 1999: 7).

Customer Focus

The customers, defined as the people who benefit from the product and services of the organization, are the final arbiter of quality. Depending upon their views, loyalty will be lost or assured.

Nemeroff, of Citybank, finds three principal themes in an effective service orientation to customers: '(1) intensive, active involvement on the part of senior management; (2) a remarkable people orientation; and (3) a high intensity of measurement and feedback' (Peters & Waterman, 1982: 165).

To be able to satisfy the *customer*, the organization should focus on customer requirements: the needs of current and potential customers. Actually, the complement should be the clear understanding of the *relevant* indicators

of the customer to be able to *measure* the performance through them.

INTERNATIONAL MODELS ON TQM

Edward W. Deming, originally an American statistician who was invited to cooperate with the Japanese Government in the 1950s (Deming, 1982), did an outstanding job with the JUSE (Japanese Union of Scientists and Engineers) to help this nation to recover after the war. His activities were recognized by establishing a Japanese Award on TQM which took his name.

The Deming Prize on TQM is probably the most famous quality award of the world. Originally it was dedicated only to Japanese companies, but it is being offered today as a worldwide opportunity. The award is based on a model which basically refers to the previously mentioned essentials.

In 1987, George Bush, President of the United States, stated that 'quality management is not only a strategy. It has to be a new working style, even a new thinking style. Dedication to quality and excellence is more than a business. It is a way of living, an opportunity to provide the society with the best of ourselves' (Merli, 1995: 197).

The Malcolm Baldrige National Quality Award (MBNQA) was created by a Public Law of the United States on August 20, 1987. It took the name of the Secretary of State, killed in an accident. Since then, it is the model used to grant yearly Prizes and Awards in the United States. It was designed with very much in common with the Deming Model.

The European Foundation for Quality Management is a non-profit organization, created in 1988 by 14 European organizations which were concerned with the sustainable growth and competitiveness of organizations in Europe. Since the beginning, it is committed to promote quality management as the way to excellence. As discussed in the introduction, we shall focus on this model in the following pages.

EFQM's mission is 'to be the driving force for sustainable excellence in Europe; its vision is a world in which European organizations excel' (EFQM, 1999: 3).

With the support of the European Organization for Quality and the European Commission (Directorate-General III), EFQM launched in October 1991 the European Quality Award, based on the model developed during the previous 2 years. In October 1992, King Juan Carlos I of Spain presented European Quality Prizes and the Award for the first time, at the EFQM Forum in Madrid.

During recent years, a number of National and Regional Quality Awards have been launched in different European countries; most of them use the EFQM Model of Excellence as their primary reference.

Concerning the types of prizes and awards, the EFQM has now a variety of recognition for different types of organizations, depending on size and industry. For example, the original large organization prizes and award has been extended to company divisions and Small and Medium Sized Enterprises (for the sake of simplicity, we shall refer in this entry to this SME version of the Model); on the other hand, the EFQM offers every year prizes and an award to the Public Sector.

On top of being used to assess organizations for these European Prizes and Awards, the Model has become an outstanding tool for all kinds of organizations to self-assess, determine their strengths and areas for improvement, and develop improvement plans based on them.

Today, the EFQM has a membership of almost 1000 organizations from most European countries and a wide activity sector coverage. This foundation is not only the owner of the EFQM Model, managing the European Quality Award process, but also is well recognized for the services it provides to its members and the community.

THE EFQM MODEL

As mentioned in the preceding section, we shall be referring to the Model in the SME version: it covers the same essential excellence elements as the Model for larger organizations and uses the same structure. However, the definitions and descriptions have been slightly modified and the criteria subdivided into fewer parts. For the purpose of this entry, we thought the SME version was easier to understand and transmits the same philosophy. Details on this Model can be found in the EFQM *Small and Medium Sized Enterprises*, Application Brochure, 2000.

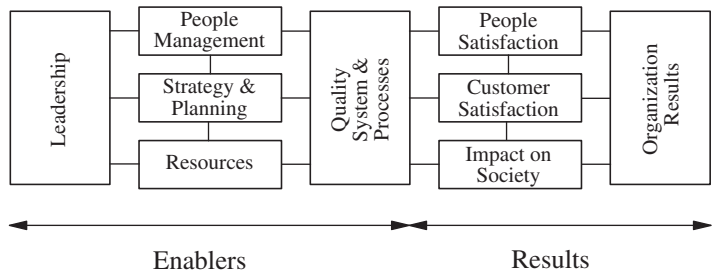

Figure 1. The EFQM Model for small and medium sized organizations.

Figure 1 shows the structure of the Model. The underlying theme is that an organization will only achieve better results if it is able to motivate people to commit to the improvement of everything they do, through self-assessment and evaluation.

The Model's nine boxes represent the criteria used to assess an organization's progress towards excellence, grouped into *enablers* and *results*. Table 1 shows the maximum number of points for each criteria that the EFQM could grant to the organization, when it applies to the European Award. The equivalent percentages indicate the criterion's relative importance to the whole.

To most organizations, *results* are often the most important aspect. The Model emphasizes that the underlying processes, methods, and procedures must be considered, because they ultimately lead to the results. As a result, customer and employee satisfaction as well as impact on society are achieved through leadership, driving strategy and planning, people management, the management of resources, and the quality system and processes, leading ultimately to the improvement of the final organization results.

The four *results* are the consequence of the five *enablers*: these describe how those results are being achieved and are therefore a better indicator for the future.

In the following paragraphs, we shall review the main aspects of each criterion.

Leadership

This criterion deals with behaviour and actions of the executive team and all other managers inspiring, supporting and promoting a culture of Total Quality Management.

Leadership has to be analysed, on one side, in terms of how the management demonstrates that it is committed to TQM and, on the other side, how actively they drive improvement within the organization and are involved with stakeholders and other external organizations.

Examples of both areas are: the way they develop values and expectations and act as role models for these values; how they prioritize, fund, organize and support improvement activities within the organization; and how they manage relationships with customers, suppliers, and other external organizations.

Strategy and Planning

Strategy and Planning has to do with the way the organization formulates, deploys, reviews and turns strategies into action plans.

The formulation based on relevant and comprehensive information, the communication and implementation and the updating and improving of those strategies and plans are the parts of this criterion.

For instance, it is important that information from customers, suppliers and other people, including the employees, has been considered; it is key that the plans are shared within the organization; on the other hand, these plans and strategies have to be reviewed and modified when necessary.

People Management

Human resources have to be managed. The organization has to release the full potential of its people.

On one side, it has to develop and review people plans such as recruitment, training, objective setting, etc. On the other hand, it has to ensure empowerment of its people, through stimulation and involvement in continuous improvement activities, for example.

Resources

This criterion means the management of other resources effectively and efficiently, such as financial, information, suppliers, materials and other resources.

The allocation and use of financial resources, the assurance of the accessibility, security and accuracy of information, the supplier relationships or the use of buildings and equipment are examples of the areas to be analysed in this criterion.

Quality System and Processes

This criterion involves delivering value for customers through management of the organization's quality system and processes.

Areas to be covered in this criterion are the way the organization focuses on customers, how it manages the quality system, the management of key processes, and the way the organization ensures continuous improvement.

Customer Satisfaction

Once we have reviewed the *enabler* part of the Model (the previous five criteria), Customer Satisfaction is the first of the *results* of the organization. In fact, it is the most important criterion in this Model, taking into account that it represents twenty per cent of the total weight.

This criterion and the next two are similar in structure: perceptions, on one side, and additional measurements relating to the satisfaction, on the other.

For example, perceptions on overall image, services loyalty, etc. are to be taken into account.

Table 1. Number of points per criterion and percentages of participation of each criterion of the EFQM Model

Criteria	Points	%
Leadership	100	10
People management	90	9
Strategy and planning	80	8
Resources	90	9
Quality system & processes	140	14
People satisfaction	90	9
Customer satisfaction	200	20
Impact on society	60	6
Organization results	150	15
Totals	1000	100

As far as other measurements are concerned, consider the following examples: defect, error and rejection rates, number of complaints, duration of relationship, etc.

People Satisfaction

The perceptions of the employees concerning the organization, such as the satisfaction with the working environment, the communications or the recognition and training opportunities, are some of the examples to be explored.

Absenteeism, sickness, complaints or turnover of employees are examples of other indirect measurements to evaluate the satisfaction of the employees.

Impact on Society

This criterion deals with the results the organization is achieving in satisfying the needs and expectations of the community in which it is located.

Areas such as reduction and prevention of noise and pollution, active involvement with communities, etc. are some of the views the society has of the organization, usually obtained through surveys and other means.

Organization Results

Financial and other measures of the organization's performance are the content of this criterion. The results the organization is achieving are in relation with its planned objectives and in satisfying the needs and expectations of everyone with a financial interest in the organization.

Profit, loss and budget results, balance sheet items and non-financial areas such as cycle times for key processes are a few areas which could be addressed.

Criteria Attributes

When the EFQM assess an application for the European Award or when an organization gets involved in a self-assessment process, it scores each of the parts or sub-criteria mentioned above looking at a number of attributes.

Enablers

The parts of the first five criteria (Leadership, Strategy and Planning, People Management,

Table 2. Range of benefits found by organizations by the application of the EFQM Model (EFQM, 1999: 9)

- Provides a highly structured, fact-based approach to identifying and assessing an organization's strengths and areas for improvement and measuring progress periodically
- Educates people on the fundamental concepts and framework for managing and improving the organization and how it relates to their responsibilities
- Integrates the various improvement initiatives into normal operations
- Facilitates comparisons with other organizations of a similar or diverse nature, using a set of criteria that is widely accepted across Europe, as well as identifying and allowing for the sharing of 'good practice' within an organization
- It offers organizations an opportunity to learn: to learn about the organization's strengths and weaknesses, about what 'excellence' means to the organization, about the organization's progress, how far it still has to go, and how it compares with other organizations

Resources and Quality System and Processes) are assessed looking from two perspectives: the *approach* the organization utilizes to satisfy the requirements of the corresponding sub-criteria, on one side, and the *deployment* or the extent this approach is implemented, on the other side.

Results

Each of the parts of the results (Customer Satisfaction, People Satisfaction, Impact on Society and Organization Results) are assessed, as well, looking at two attributes: the *magnitude* of the corresponding result (to what extent it is improving and compares favourably with own objectives and the results of other organizations); and the *scope* of those results, which refers to the extent the result covers all relevant areas of the activities and shows a full range of data.

Recently, the EFQM has developed a concept called RADAR, which encompasses those attributes in a very appealing way. RADAR is the acronym for Results, Approach, Deployment, Assessment and Review. RADAR is not only a good reminder of the attributes, but it underlines a very important subject: the importance to assess and review the approaches.

SELF-ASSESSMENT AND PERFORMANCE IMPROVEMENT

Adoption of the process of self-assessment is the EFQM's recommended strategy for improving performance (EFQM, 1999: 8).

Self-assessment is a comprehensive, systematic, and regular review of an organization's activities and results referenced against the EFQM Model. Today, many organizations are using the Model for this purpose, determining their strengths and areas subject to improvement.

Organizations carry out this cycle of evaluating and taking action repeatedly, so that they can achieve a sustained improvement. The most advanced have integrated self-assessment in the regular organization's planning cycle.

The EFQM reports, in the above, mentioned brochure, some of the benefits the organizations are finding with self-assessment (see Table 2).

FUTURE PERSPECTIVES

The well known American quality *guru*, Edward Deming (Deming, 1982) mentions that organizations will be able to reach a point of excellence when every employee is behaving like a *little scientist*, performing the activities following the cycle of observing, reflecting, checking and acting. The idea is that, when you have a critical mass of personnel capable of doing that, the improvement process is sustained.

Learning has always been key to quality. Japanese expert Ishikawa states that quality starts and ends with education (Ishikawa, 1990). The mentioned improvement cycle has embedded the learning in itself. In fact, the EFQM Model implies that feedback of the results (assessment and review) improves approaches by innovation and *learning*.

As a consequence of the above comments, it is evident that future perspectives suggest a competitive scenario where people (at least a critical mass) are fully committed and organizations are involved in a continuous learning process. Only in this way will they survive by maintaining a competitive position.

In summary, the future of organizations will only look at those which are capable of committing people to a self-assessment.

CONCLUSIONS

Total Quality Management is a key management and assessment strategy which is here to stay, providing a sound base for the future. It is not a revolutionary tool because its contents are pure logic. Importance does not lie in the theory, but in the practice: apply and do what you believe should be done in an orderly and structured way.

To help in the application of the self-assessment process, TQM Models in general, and the EFQM Model in particular, are practical tools, ready made and proved by many organizations with significant results. The psychological community can benefit from them in most organizational settings.

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RELATED ENTRIES

Applied Fields: Work and Industry, Applied Fields: Organizations, Evaluation: Programme Evaluation (General), Evaluation in Higher Education, Leadership in Organizational Settings

TRAIT–STATE MODELS

INTRODUCTION

Many psychological attributes have state as well as trait versions. This is most obvious for mood states. A classical example is Spielberger's state and trait anxiety. State anxiety is assessed via items in which the *actual mood states* have to be rated ('right now I feel . . .') whereas trait anxiety is assessed by items asking for the *general mood state* ('in general I feel . . .'). However, it is interesting to note that the concept of *states* was introduced to personality research only during the 1960s and 1970s. By contrast, the concept of *traits* has guided personality research from its very beginning, even though the distinction between states and traits appears to be as old as thinking about human mind and behaviour.

Traditionally, some psychological properties are classified as states, such as well-being and feeling anxious, while others are said to be traits such as extraversion, neuroticism, etc. However, the more general approach is certainly to assume that each psychological property is *statelike* to some degree and therefore also *traitlike* to some degree. Observed mood states are not only due to (bio-psycho-social) situations but also depend to some degree on permanent characteristics of the person. Similarly, observed trait measures not only depend on permanent characteristics of the person, but are also due to situations to some

degree. This is the substantive background for latent state–trait (LST) theory and its associated latent state–trait models to be described in the following sections.

LATENT STATE–TRAIT THEORY

In the 1990s, LST theory has been introduced defining *states* (of whatever variable) as a property of a *person-in-a-situation* and *traits* as a property of a *person*. Furthermore, specific structural equation models for longitudinal data have been developed that can be used to disentangle state and trait components of whatever variable.

Originally, LST theory was developed as a generalization of classical test theory (CTT), designed to take into account that psychological assessment does not take place in a situational vacuum. Hence, from a substantive perspective, LST theory may also be viewed as a methodological development coping with arguments raised in the person–situation debate. Whereas in CTT, aside from measurement error, there is only one single factor (persons) determining the variance of an observable variable, LST theory explicitly assumes two factors instead: persons and situations. Even though the standard models of LST theory are not designed to disentangle situation effects and the effects of interaction between persons and situations, interaction effects are an integral part of the theory.

The core of LST theory consists of two decompositions: (a) the decomposition of any observable variable into *latent state* and *measurement error* variables, and (b) the decomposition of any latent state into *latent trait* and *latent state-residual* variables, the latter representing situational and/or interaction effects. Latent state and latent trait variables are defined as special conditional expectations. A score of a *latent state variable* is defined to be the conditional expectation of an observable variable *given a person-in-a-situation*, whereas a score of a *latent trait variable* is the conditional expectation of this observable variable *given a person*.

The theory also comprises the definition of *consistency*, *occasion specificity*, *reliability*, and *stability* coefficients. The consistency coefficient is the proportion of variance of an observable variable that is due to the latent trait. Hence, it measures the degree to which the observable variable is *traitlike*. In contrast, the occasion-specificity coefficient is the proportion of variance of an observable variable due to the situation and/or the person–situation interaction on the occasion of measurement considered. Hence, it measures the degree to which the observable variable is *statelike*.

The reliability coefficient is the proportion of variance of an observable variable determined by the differences between the persons, situations, and the interaction between persons and situations. Because of the additivity of the variances of the latent trait and latent state-residual variables, the consistency and occasion-specificity coefficients add up to the reliability coefficient. If one intends to measure a trait, the consistency coefficient should be high and the occasion-specificity coefficient should be low. If one intends to assess a mood state, it should be the other way around. In both cases, however, reliability should be high.

LATENT STATE–TRAIT MODELS

The first LST models were published by Steyer and his colleagues in the late 1980s. However, there were also independent developments yielding the same class of models by Dumenci and Windle (1996), Marsh and Grayson (1994), as well as Ormel and Schaufeli (1991). Recently, Tisak and Tisak (2000) outlined the relationship of LST models to growth curve models. In the 1990s, LST models have been developed and applied in some dozens of papers (see Steyer, Schmitt & Eid, 1999, for an overview over applications and research questions to be studied via LST models).

LST models are defined by assumptions about the basic variables of LST theory. These assumptions can differ in their complexity. The assumptions defining specific models serve to identify the theoretical parameters such as reliability, consistency, and occasion specificity. Many of these models have already been described in some detail by Steyer, Ferring, and Schmitt (1992). All these models turn out to be special structural equation models.

Singletrait–Multistate Models

In the singletrait–multistate model we assume that there is a common single latent trait variable

determining the observable variables within and across each of several occasions of measurement. This trait variable is constant over time. That is, it is assumed that there is no trait change. From the perspective of Developmental Psychology, this means that there is no development. However, the model allows for change in the latent state variables between occasions of measurement. These changes are due to the fact that bio-psycho-social situations fluctuate between occasions of measurement for a given person affecting the latent state variables and, therefore, also the observable variables.

Multitrait–Multistate Models

If there are not only situation-driven fluctuations in the latent states but also trait change, we need LST models assuming invariant traits within at least two periods of time, but allowing for trait change between the two periods. In such a model we would introduce a common latent trait for each period of time. Several latent traits might also be useful if observable variables do not measure exactly the same state, for example, by parallel test forms or parallel (perfectly unidimensional) items. In these (frequently occurring) cases we may introduce variable-specific or, in item response models, item-specific latent trait variables that might be invariant over time (Marsh & Grayson, 1994). An alternative is to introduce variable-specific (or item-specific) residual factors (method factors) (Eid, 2000), the variance of which reflect the degree of heterogeneity of the variables or items considered. To summarize, several traits may be necessary for two reasons: (a) heterogeneity of the observable variables and (b) trait change over time. A model incorporating both aspects has been presented by Eid and Hoffmann (1998) studying trait change in the interest in radioactivity before and after the Chernobyl catastrophe.

True Change Models

Whereas state change implicitly occurs in all models described above, trait change is possible only in models that explicitly incorporate different traits for different periods of time. Sometimes we are interested in explaining inter-individual differences in intra-individual change. Steyer, Partchev, and Shanahan (2000) showed how to specify a structural equation model in such a way that true intra-individual change scores between neighboured occasions are the values of endogenous variables that may be explained by exogenous variables and other endogenous variables. Similarly, they also introduced endogenous latent change variables, the values of which are the true intra-individual change scores between occasion one (baseline) and any other occasion. Both classes of models may be used to study why some individuals change more (or less) than others, for example after a therapy, after an educational intervention, or in the normal developmental process. Note that these models may also be applied in probit (Eid & Hoffmann, 1998) and logistic IRT models (Steyer & Partchev, 2000).

FUTURE PERSPECTIVES AND CONCLUSIONS

LST models are just one example of how statistical models can be designed to reflect the complexity of psychological assessment. What is most fascinating and will certainly inspire future developments is that the models presented in the more recent papers mentioned above (Steyer & Partchev, 2000; Steyer, Partchev & Shanahan, 2000) comprise submodels on the individual level as well as submodels on the group level. The *individual level* is modelled via the latent variables, the values of which are scores of individuals (here persons and persons-in-situations). The *group level* is modelled via the submodel for the expectations. Models consisting of both levels bear a new opportunity for psychology: a chance to reunite Differential Psychology and General Psychology.

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RELATED ENTRIES

Personality Assessment (General), Theoretical Perspective: Psychometrics

TRIARCHIC INTELLIGENCE COMPONENTS

INTRODUCTION

In the triarchic theory of human intelligence, information-processing components are applied to experience in order to adapt to, shape, and select environments (Sternberg, 1985, 1997, 1999). A common set of universal processes underlies all aspects of intelligence.

Metacomponents, or executive processes, plan what to do, monitor things as they are being done, and evaluate things after they are done. *Performance components* execute the instructions of the metacomponents. *Knowledge-acquisition components* learn how to solve problems or simply to acquire declarative knowledge in the first place.

Analytical intelligence is invoked when components are applied to fairly familiar kinds of problems abstracted from everyday life; *creative intelligence* when the components are applied to relatively novel kinds of tasks or situations; and *practical intelligence* when the components are applied to experience to adapt to, shape, and select environments.

MEASURING ANALYTICAL INTELLIGENCE

Analytical kinds of problems, such as analogies or syllogisms, can be analysed componentially (Sternberg, 1983), with response times or error rates decomposed to yield their underlying information-processing components. Componential analysis reveals information-processing origins of individual differences in intelligence. The general strategy of such research is to (a) specify an information-processing model of task performance; (b) assign a mathematical parameter to each information-processing component; and (c) construct cognitive tasks administered in such a way that it is possible through mathematical modelling to isolate the parameters of the mathematical model. In this way, several sources of important individual or developmental differences are isolated: (a) the performance components used; (b) time to execute each component; (c) susceptibility of each component to error; (d) strategy for combining the components; (e) mental representations upon which the components act.

What are some results? Although children generally became quicker in information processing with age, not all components were executed more rapidly with age. The encoding component first shows a decrease in component time with age and then an increase. Apparently, older children realize that their best strategy is to spend more time in encoding the terms of a problem so that they later would be able to spend less time in operating on these encodings. Moreover, better reasoners spend relatively more time than do poorer reasoners in global, up-front metacomponential planning, when they solve difficult reasoning problems. Poorer reasoners, on the other hand, spend relatively more time in local planning. Presumably, better reasoners recognize it is better to invest more time up front so as to be able to process a problem more efficiently later on.

In one set of studies on knowledge-acquisition components, individuals figured out meanings of unknown words in sentences; for example, 'The *blen* rises in the east and sets in the west' (Sternberg, 1987). A componential model was able to predict word difficulty very well, and scores on the decontextualization task provided excellent prediction of individual differences in vocabulary skills.

MEASURING CREATIVE INTELLIGENCE

Creative intelligence is measured by convergent or divergent problems assessing how well people can cope with relative novelty.

In work with convergent problems, participants received novel kinds of reasoning problems that had a single best answer. For example, participants might be told that some objects are green and others blue; but still other objects might be grue, meaning green until the year 2000 and blue thereafter, or bleen, meaning blue until the year 2000 and green thereafter (Sternberg, 1982; Tetewsky & Sternberg, 1986). Their task was to predict future states from past states, given incomplete information. In another set of studies, 60 people were given more conventional kinds of inductive reasoning problems. But the problems had premises preceding them that were either conventional (dancers wear shoes) or novel (dancers eat shoes). The participants had to solve the problems as though the counterfactuals were true (Sternberg & Gastel, 1989a, b).

The more novel the test items, the higher the correlations of our tests with scores on successively more novel conventional tests. Some components better measured the creative aspect of intelligence than did others. For example, in the 'grue–bleen' task mentioned above, the component requiring people to switch from conventional green–blue thinking to grue–bleen thinking and then back to green–blue thinking again was a particularly good measure of the ability to cope with novelty.

In work with divergent reasoning problems having no one best answer, people created two each of various kinds of products (Sternberg & Lubart, 1995) in the realms of writing, art, advertising, and science. They wrote very short stories with a choice of titles, such as 'The Octopus's Sneakers'. They produced art compositions with titles such as 'Earth from an Insect's Point of View'. They created advertisements for products such as a brand of doorknob. And they solved problems such as of how humans might detect extraterrestrial aliens among them who are seeking to escape detection. What was found?

First, creativity comprises five resources and an external one: intelligence, knowledge, thinking styles, personality, motivation and environmental forces. Second, creativity is relatively although not wholly domain-specific. Correlations of ratings of the creative quality of the products across domains were lower than correlations of ratings and generally were at about the 0.4 level. Third, correlations with conventional ability tests were generally modest to moderate, but were higher to the extent that problems on the conventional tests were non-entrenched. For example, correlations were higher with fluid than with crystallized ability tests.

PRACTICAL INTELLIGENCE

A key concept has been that of tacit knowledge, which is what one needs to know in order to work effectively in an environment that one is not explicitly taught and that often is not even verbalized (Sternberg et al., 2000).

Tacit knowledge has been measured using work-related problems that present problems one might encounter on the job. Tacit knowledge has been measured for both children and adults, and

among adults, and for people in over two dozen occupations, such as management, sales, academia, teaching, secretarial work, and the military. In a typical tacit-knowledge problem, people are asked to read a story about a problem someone faces and to rate, for each statement in a set of statements, how adequate a solution the statement represents. For example, in a paper-and-pencil measure of tacit knowledge for sales, one of the problems deals with sales of photocopy machines. A relatively inexpensive machine is not moving out of the show room and has become overstocked. The examinee is asked to rate the quality of various solutions for moving the particular model out of the show room. In a performance-based measure for sales people, the test-taker makes a phone call to a supposed customer, who is actually the examiner. The test-taker tries to sell advertising space over the phone.

Results are, first, that practical intelligence as embodied in tacit knowledge increases with experience, but it is profiting from experience, rather than experience per se, that results in increases in scores. Second, subscores on tests of tacit knowledge – such as for managing oneself, managing others, and managing tasks – correlate significantly with each other. Third, scores on various tests of tacit knowledge, such as for academics and managers, are also correlated fairly substantially (at about the 0.5 level) with each other. Thus, fourth, tests of tacit knowledge may yield a general factor across these tests. However, fifth, scores on tacit-knowledge tests typically do not correlate with scores on IQ tests, whether the measures used are single-score measures of multiple-ability batteries. In some cases, the correlation is negative (Sternberg et al., 2001). Thus, any general factor from the tacit-knowledge tests is not the same as any general factor from tests of IQ (suggesting that neither kind of *g* factor is truly general, but rather, general only across a limited range of measuring instruments). Sixth, scores on tacit-knowledge tests predict performance on the job as well as or better than does IQ. Seventh, scores on tests of tacit knowledge for management were the best single predictor (over IQ, personality traits, cognitive styles) of performance on a managerial simulation. Eighth, tacit knowledge for military leadership predicted ratings of leadership effectiveness, whereas IQ and tacit knowledge for managers did not significantly predict the ratings of effectiveness.

FACTOR ANALYSES TESTING THE TRIARCHIC THEORY AS A WHOLE

Four separate factor-analytic studies support the construct validity of the theory of successful intelligence.

One study in the US (Sternberg, Grigorenko, Ferrari & Clinkenbeard, 1999) used the Sternberg Triarchic Abilities Test (STAT – Sternberg, 1993), which comprises 12 subtests. There were four subtests each measuring analytical, creative, and practical abilities. For each type of ability, there were three multiple-choice tests and one essay test. The multiple-choice tests, in turn, involved, respectively, verbal, quantitative, and figural content. Consider examples:

1. Analytical–Verbal: Figuring out meanings of neologisms (artificial words) from natural contexts. Students see a novel word embedded in a paragraph, and have to infer its meaning from the context.
2. Practical–Figural: Route planning. Students are presented with a map of an area (e.g. an entertainment park) and have to answer questions about navigating effectively through the area depicted by the map.
3. Creative–Quantitative: Novel number operations. Students are presented with rules for novel number operations, for example 'flix', which involves numerical manipulations that differ as a function of whether the first of two operands is greater than, equal to, or less than the second. Participants have to use the novel number operations to solve presented maths problems.
4. Analytical–Essay: Students analyse the use of security guards in high schools: what are the advantages and disadvantages and how can these be weighed to make a recommendation?

As predicted, confirmatory factor analysis on the data yielded separate and uncorrelated analytical, creative, and practical factors. The multiple-choice analytical subtest loaded most highly on the analytical factor, but the essay creative and practical subtests loaded most highly

on their respective factors. Thus, measurement of creative and practical abilities probably ideally should be accomplished with other kinds of testing instruments that complement multiple-choice instruments.

A second study used a revised version of the STAT (Grigorenko, Gil, Jarvin & Sternberg, 2000). This test supplements the creative and practical measures mentioned above with performance-based measures. For example, creative abilities are additionally measured by, for example, having people do captions for cartoons and using computer software to design a variety of products, such as greeting cards and a company logo. Practical skills are additionally measured, for example, by solving everyday problems presented by means of films, and by a situational-judgement inventory.

The creativity tests were moderately correlated with each other, the practical tests, highly correlated with each other. The two kinds of tests were distinct from one another, however. Exploratory factor analysis reveals that the performance-based assessments tend to cluster separately from multiple-choice assessments measuring the same skills (similar to our earlier findings of essay measures tending to be distinctive from multiple-choice measures).

In a third study in the US, Finland, and Spain, the multiple-choice section of the STAT was used to compare five alternative models of intelligence, again via confirmatory factor analysis. A model featuring a general factor of intelligence fit the data relatively poorly. The triarchic model, allowing for intercorrelation among the analytic, creative, and practical factors, provided the best fit to the data (Sternberg, Castejón, Prieto, Hautakami & Grigorenko, 2001).

In a fourth study, Grigorenko and Sternberg (2001) tested 511 Russian school children (ranging in age from 8 to 17 years) as well as 490 mothers and 328 fathers of these children. They used entirely distinct measures of analytical, creative, and practical intelligence.

In this study, exploratory principal-component analysis for both children and adults yielded very similar factor structures. Both varimax and oblimin rotations yielded clearcut analytical, creative, and practical factors for the tests. Thus, with a sample of a different nationality (Russian), a different set of tests, and a different method of analysis (exploratory rather than confirmatory analysis), this again supported the theory of successful intelligence.

FUTURE PERSPECTIVES

The Center for the Psychology of Abilities, Competencies, and Expertise at Yale is currently further testing the triarchic theory in major ways. First, we are doing instructional studies in several different subject-matter areas at a variety of grade levels with students all across the United States in order to determine whether triarchic teaching improves performance. Second, we are doing instructional studies with military officers in order to determine whether the methods work with adults. Third, we are doing studies to determine whether the triarchic ability patterns necessary for success in school and in life change over the course of the life span, emphasizing especially childhood and early adulthood.

CONCLUSIONS

Conventional tests yield a general factor of intelligence because they are limited in the scope of what they measure. When tests are augmented to include measurement of creative and practical abilities, separate creative and practical factors emerge. Instructional studies show that triarchic teaching and assessment can improve school performance.

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RELATED ENTRIES

Intelligence Assessment (General), Cognitive Ability: *g* Factor, Cognitive Ability: Multiple Cognitive Abilities, Practical Intelligence: Its Measurement

TYPE A: A PROPOSED PSYCHOSOCIAL RISK FACTOR FOR CARDIOVASCULAR DISEASES

INTRODUCTION

One of the main goals of research in psychology and health has been to find a reliable way of identifying those individuals who might have a higher risk of developing cardiovascular diseases. Focusing on personality research, since the late 1950s, a higher incidence of cardiovascular disorders, and a possible related enhanced cardiovascular responsivity to environmental stimuli, has been linked to distinctive patterns of behaviour mainly characterized by specific ways of coping with stress. More specifically, the Type A Behaviour Pattern (TABP), valued as an independent risk factor in the aetiology of cardiovascular disease (CVD), and, more recently, hostility – defined as a wide behavioural complex – represents the most fruitful area of

study in the search for behavioural aspects that are related to increased CVD morbidity and premature mortality.

From this perspective, this entry presents the state of the art of research on Type A and its potential role in the onset and development of cardiovascular diseases.

THE TYPE A BEHAVIOUR PATTERN

Over the past few decades an increasing amount of research on psychosocial factors associated with the development of cardiovascular disorders has been carried out. In this context, and mainly from the pioneering research of Friedman and Rosenman (1959), a behavioural style has been identified, the so-called Type A Behaviour Pattern, characterized by the following behavioural manifestations: competitive achievement striving, hostility, aggressiveness, rapid and explosive speech, and a sense of time urgency and impatience.

From the large existing evidence, pointing out that these behavioural manifestations are associated with the development of coronary heart disorders, nowadays it is well accepted that such a behavioural style is an independent risk factor for coronary heart disease with the same weighting as traditional risk factors such as serum cholesterol, systolic blood pressure or smoking.

TABP Assessment

As it is widely recognized, TABP assessment is mainly accomplished by the *Structured Interview* (SI; Rosenman, 1978) and the *Jenkins Activity Survey for Health Prediction* (JAS; Jenkins, Zyzanski & Rosenman, 1979), although they represent rather different configurations of TABP dimensions which are, often, differently related to health and psychosocial variables. While JAS contents are mostly concerned with achievement and work issues, basically lacking in sufficient TABP hostility representation, SI directly elicits Type-A's anger, dominant and speed-prone responses. This might be one of the possible explanations for SI's better capacity of cardiovascular disease (CHD) prediction, although, despite early conclusions, both ways of assessment seem to be equally reliable predictors of cardiovascular reactivity (Lyness, 1993).

On the other hand, most of the evidence concerning TABP psychological functioning is JAS derived. A Spanish adaptation of this questionnaire (JASEH; Bermúdez, Pérez-García & Sánchez-Elvira, 1991) was developed trying to overcome shortcomings of TABP self-reports, in general, and those of the JAS in particular. In order to improve its predictive validity, hostile Type A contents were subsequently increased as had been repeatedly demanded. This Spanish version presents good psychometric qualities and has demonstrated to be a good predictor of A–B (global and component scales) differences.

Mechanisms Linking TABP and CVD

Although different mechanisms have been considered as potential links between this behaviour pattern and CHD, most research has focused on the psychophysiological hypothesis. This hypothesis asserts that Type A individuals display greater cardiovascular and neuroendocrine reactivity and/or slower recovery of their physiological responses when exposed to various situations. In any case, these two aspects of physiological reactivity (response amplitude and duration of response-recovery) are claimed to be relevant to a possibly pathophysiological process (coronary artery atherosclerosis) underlying the clinical manifestations of CVD (myocardial infarction, angina pectoris, etc.).

Recent studies however lack consistency regarding both the association TABP–CVD (Haynes & Matthews, 1988; Miller et al., 1991) and the psychophysiological mechanism suggested (Harbin, 1989; Lyness, 1993; Miller et al., 1991). In view of these discrepancies, we can appreciate more accurately the current state of affairs; research on TABP might not, certainly, be at the end of the journey, but rather at a turning point which has been called 'the Type-A second generation research' (Williams, 1989).

TABP DIMENSIONALITY

The reviews previously mentioned sustain that relevant moderators may help to clarify inconsistent findings in TABP research. New inquiries directed to the understanding of TABP cardiovascular hyperreactivity and its relationships to

CVD have been enunciated. Perhaps the most intriguing and relevant inquiries, in terms of TABP conceptualization and predictive validity, are those referring to the multidimensional nature of the TABP construct. In other words, a gradual and more accurate approach to the understanding of TABP functioning has led to some important conclusions regarding its conceptualization as a homogeneous psychological construct: not only do TABP components not seem to function always in the same direction, but, also, they can predict just the opposite. TABP unidimensionality and the utility of a single score derived from a global assessment have been, thus, seriously questioned and new methodological and empirical strategies, as well as component-related specific hypotheses, have been developed. Individuals should not be assessed on global Type A, but on its components, in order to determine their specific contributions; moreover, TABP research should identify significant clusters, patterns or profiles of underlying behavioural components, taking into account that an equal TABP score may be reflecting heterogeneous kinds of Type A individuals (Thoresen & Powell, 1992).

In this sense, two distinctive core dimensions within TABP have been consistently identified in terms of their predictive power in different psychosocial and physiological fields: a *Hostile–Irritable–Impatient* dimension (also called 'trait dysphoric' and high-reactive Type A) and a *Competitive-Hard driving–Achievement Striving* dimension (also called 'low-reactive Type A') (Svebak et al., 1992).

Empirical research shows, then, on the one hand, a *Competitive Type A dimension* defined by the following psychosocial and psychological functioning characteristics: absence of negative emotional correlates such as depression, anxiety or emotional susceptibility, and also absence of hostility/anger, and disease or stress symptomatology (especially when the effects of the other TABP dimension are controlled); extraversion, optimism, and self-esteem correlates; active coping and planning activity under stress; better performance in different tasks, even under interfering conditions; more productivity at work and higher professional status and annual incomes. On the other hand, a *Hostile–Impatience Type A dimension* which represents a different combination of characteristics that can be mainly described as follows: clear and strong negative emotional correlates such as depression, anxiety, neuroticism or emotional susceptibility, hostile/angry manifestations, and disease or stress derived symptomatology; both avoidance and active confrontation under stressful situations and negatively affected performance under stressful instructions or disruptive conditions such as in the presence of interfering stimuli. Finally, both dimensions report experiencing more negative life events, in general.

COMPONENTS' DIFFERENTIAL TOXICITY

This componential perspective has, also, important implications from a health standpoint. TABP dimensions have proved to be predictive of different health outcomes in both men and women. Research on the potential toxicity of TABP components tends to conclude that not all its characteristics might necessarily be *coronary-prone* behaviours, but just those involved in the hostile–impatient dimension. Causal linked designs reveal a higher CVD risk for hostile–impatient Type-As (Houston et al., 1992; Julkunen, Idänpäan-Heikkila & Saarinen, 1993). In parallel, the hostile–impatience TABP dimension has also been the main one related to higher levels of cardiovascular reactivity displayed in different stressful situations (Svebak et al., 1992). These data are congruent with the extensive and more recent body of literature concerned with research into hostility and health, in general. In this sense, hostility and anger have proved to be coronary-prone behaviours and clear predictors of cardiovascular reactivity to stress, although a further refinement of these relevant psychological constructs, within a multidimensional approach, is urgently required in order to clarify the conceptual unspecificity and ambiguities that characterize the assessment and research in this field.

However, there is some evidence, also, about the predictive value of Competitiveness concerning health outcomes and cardiovascular reactivity, although this is less clear than for Hostility/Impatience (Svebak et al., 1992). These inconsistencies demand, then, (1) a more detailed analysis of TABP dimensions with respect to their psychological and physiological functioning and

their psychosocial characteristics, and (2) a better understanding of different TABP profiles and their transactions with the environment (Thoresen & Powell, 1992).

Recent cluster analyses with data from the Western Collaborative Group Study (WCGS) suggest that, although only in an exploratory stage, there may be several patterns of components in CVD risk (Houston et al., 1992): two risk TABP profiles (a hostile profile and a pressured, controlling and social dominant one), some non-health related TABP profiles and, even, some healthy or inversely CVD-related risk profiles (mainly characterized by emotional and behavioural underreactivity to provocation).

FUTURE PERSPECTIVES AND CONCLUSIONS

In summary, perhaps some of the inconsistencies observed in past studies concerning TABP have been due to a failure in considering the heterogeneous nature of the TABP. Thus, a global score may have cancelled out the opposite and/or different directions of TABP components and the possibility of yielding significant results. The available evidence tends to confirm that the use of a componential approach on TABP research may certainly increase the proportion of explained variance in health outcomes. These new approaches would help to better clarify TABP cardiovascular reactivity and CHD relationships.

Current data about TABP dimensions point out the existence of two rather different Type As in terms of their predictive psychosocial and health values. A careful and detailed observation of each dimension could lead us to a tentative hypothesis about its possible underlying mechanism of psychological and physiological functioning. In this sense, it could be postulated that hostile/impatient and competitive profiles, being both Type As, are under the control of different patterns of activation processes. While the former would be representative of a *cognitive-emotional activation* highly linked to anxiety, negative moods, and particularly vulnerable to stressful, demanding and threatening situations, the latter would be representative of a *motivational mechanism* more linked to control and achievement striving (independently of real task demands), and less vulnerability to stress. Taking into account the psychological characteristics of both dimensions, a more pervasive, frequent and lasting physiological hyperreactivity pattern may be more characteristic of hostile–impatient Type As than Competitive ones, which could put them at a higher risk of CVD. This hypothesis encourages further examination of TABP profiles and their possible repercussions on health and well-being.

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RELATED ENTRIES

Applied Fields: Clinical, Applied Fields: Health, Personality Assessment (General), Coping Styles, Anger, Hostility and Aggression Assessment, Stress, Anxiety Assessment

José Bermúdez

TYPE C: A PROPOSED PSYCHOSOCIAL RISK FACTOR FOR CANCER

INTRODUCTION

The Type C behaviour pattern, hypothesized to be related to the progression of cancer, was first elaborated and operationally defined in a study of psychosocial and epidemiological factors associated with malignant melanoma (Temoshok & Heller, 1981). Independently, British researchers had posed the question of whether there might be 'a Type C for cancer?' in an abstract published the previous year (Morris & Greer, 1980).

Assessment of Type C coping in the US has mirrored conceptualizations of how this pattern, when chronically engaged, may have negative implications for physiological and immunological functioning (Temoshok, 1987). This model was elaborated in subsequent iterations, which emphasized that the goal of coping is to maintain psychological–physiological homeostasis, and that the more closely a coping process resembles the inverted U-shaped function which characterizes homeostasis for most biological processes, the more likely it is to be adaptive and to be associated with positive health outcomes (Temoshok, 2000a). Theoretically, coping with stressors is most effective when all systems are working together in a coordinated and synchronous manner, unlike the Type C pattern in which physiological arousal is not recognized consciously, and underlying emotion is not expressed. There are two hypothetical pathways or sets of mechanisms by which Type C coping can have negative health implications, the psychosocial and the psychoneuroimmunologic (Temoshok, 1995), although it is likely that these pathways interact and synergize each other. This entry will describe the evolution of the Type C construct over the past 20 years, and summarize its concomitant assessment in studies of cancer and HIV progression (see Table 1).

ASSESSING TYPE C IN CONTRAST TO THE TYPE A BEHAVIOUR PATTERN

In studies conducted at the University of California San Francisco (UCSF) School of Medicine, Type C was operationally defined as a constellation of (a) cognitive proclivities (decreased awareness of needs, feelings, and bodily sensations, while attending to perceived needs of others), (b) verbal and non-verbal expressive patterns (repressing or not expressing emotion, particularly anger, while presenting a pleasant façade), and (c) specific coping and behavioural characteristics (unassertive, appeasing, denying or minimizing problems, compliant with external authorities; Temoshok & Dreher, 1992). An inattention to symptoms or indications that anything might be wrong was theorized to contribute to the behaviour of delay in seeking medical attention for suspicious lesions, which was found to be significantly associated with tumour thickness, the best prognostic indicator for malignant melanoma (Temoshok et al., 1984).

Table 1. Assessment of components of Type C in studies of cancer and HIV/AIDS

Assessment of Type C component		
Denial/minimization of health concerns.	Semantic differential ratings (by coders) of Type C versus Type A characteristics.	Non-assertiveness in complying with others' imposing request.
Dysynchrony between psychological self-reports and physiological stress responses to emotional stimuli.	Emotionally inexpressive (as rated from videotaped interviews).	Higher Type C scores on Vignette Similarity Rating Method.
Behaviour or medical outcome predicted		
Delay in seeking medical attention, thicker melanoma lesions.	Unfavourable immune changes associated with HIV progression.	
Lower self-report of perturbation combined with higher skin conductance distinguished melanoma patients from heart disease patients and controls.	HIV progression from asymptomatic status to AIDS or more advanced disease at 6 and 12 month follow-ups.	
	Study references	
More unfavourable melanoma prognostic indicators.	Temoshok et al., 1984 Kneier and Temoshok, 1984	
Fewer lymphocytes at site of primary melanoma lesion (poorer prognosis).	Temoshok et al., 1985 Temoshok, 1985	

Type C was conceived as equivalently maladaptive as the Type A pattern, but its polar opposite, with the theoretically adaptive Type B pattern forming the third point in this conceptual triangle of adaptation and health implications (Temoshok, 1987). Temoshok and her colleagues at UCSF adapted the Type A interview schedule, used in prospective studies to predict the development of coronary heart disease, and had raters assess videotaped patient interviews, using 17 semantic differential scales which contrasted descriptors of Type A (e.g. impatient, hostile) or Type C (e.g. passive, appeasing). Independent from the variable of delay in seeking medical attention, the semantic differential ratings of Type C versus Type A were significantly correlated with tumour thickness, the most important melanoma prognostic indicator, most strongly for patients under age 55 (Temoshok et al., 1985).

In a study of another immunologically mediated disease, HIV infection, a key aspect of the Type C coping pattern, non-assertiveness in complying with others' requests against one's own wishes, was associated with unfavourable changes in immune parameters relevant to HIV progression (Solomon, Kemeny & Temoshok, 1991).

ASSESSING PSYCHOLOGICAL–PHYSIOLOGICAL DYSYNCHRONY IN TYPE C

Another step in the assessment of Type C focused on the 'repressive' aspect of the Type C constellation. An earlier method to assess repression had contrasted responses to two scales, the Taylor Manifest Anxiety Scale (a trait measure based on reported anxiety symptoms), and the Marlowe–Crowne Social Desirability Scale (a measure of the tendency to respond in a socially desirable direction), to define 'repressors' as the group with low reported anxiety and high Marlowe–Crowne scores (Weinberger, Schwartz & Davidson, 1979). The problem with using this method in the UCSF studies was that melanoma patients assessed at the point of learning their biopsy results were found to be overtly anxious, the strength of the stressful situation overcoming any tendency to repress this emotion.

Therefore, Kneier and Temoshok (1984) devised a method to capture the dysynchrony observed in Type C individuals between their under-reported anxiety, measured as self-report of perturbation following presentation of

potentially disturbing statements on slides, and a hypothetically unattended-to and therefore unmodulated physiological stress response, as measured by skin conductance response (SCR). The Type C pattern of response was defined in this study as the sum of all conjoint responses in which the subject's SCR was above the mean SCR across all statements for that individual, in conjunction with a self-report of perturbation below that individual's mean self-report score. As hypothesized, melanoma patients had significantly more Type C dysynchronous response patterns, in contrast to cardiovascular disease patients who displayed the opposite pattern (higher reports of psychological perturbation in conjunction with lower SCR), while controls showed a pattern in which psychological and physiological reactivity were appropriately correlated (Kneier & Temoshok, 1984).

ASSESSING EMOTIONAL NON-EXPRESSIVENESS IN TYPE C

In order to understand potential mediating mechanisms by which a psychological variable could influence cancer progression, another study focused on an immune measure which is directly related to disease outcome in malignant melanoma: the number of lymphocytes at the base of the deepest invasion of the primary tumour, as rated microscopically by a pathologist. Patients' emotional expressiveness, rated across five highly inter-correlated verbal and non-verbal dimensions from videotaped interview segments concerning how they felt when first told they might have melanoma, was strongly and significantly correlated with having more lymphocytes at the base of the tumour (Temoshok, 1985). This study was important in identifying the inappropriately dampened expression of emotion as the pathogenic core of the Type C pattern.

THE VIGNETTE SIMILARITY RATING METHOD

The problem with the methods of assessing aspects of the Type C coping pattern, described above, is that they all involved a great deal of equipment, time, and/or personnel, in addition to a fair amount of demand on study participants. These factors limited the number of participants in any one study, with the consequent constraints on statistical power. Clearly, another method was needed. Thus, the Vignette Similarity Rating Method (VSRM) was developed by combining (1) a multidimensional scaling method which described a person according to similarity ratings along a number of dimensions with (2) descriptions of actual (but disguised) patients' stories from the book on Type C by Temoshok and Dreher (1992). These stories or vignettes had strong face validity, in that they elicited strong feelings of recognition by people with cancer and their loved ones. In the VSRM, three vignettes, each about 170 words, describe the emotional, cognitive, interpersonal, and behavioural reactions of a person (matched by gender to the subject) who is confronted with the diagnosis of an unspecified life-threatening disease. Each vignette presents these reactions according to a general mode or style of responding to stress: (a) hypothetically adaptive Active Coping (i.e. seeking information, asking questions of one's physician, seeking the support of family and friends, expressing feelings and needs); (b) hypothetically maladaptive Helpless/Hopeless Reaction (i.e. feeling overwhelmed, avoiding friends and family, giving up, not acting effectively); or (c) Type C (denying problems, presenting a pleasant façade to the world, not 'bothering' one's doctor with complaints, and not expressing needs or feelings to family and friends). The task for the respondent is to rate on a 1 to 5 (or 10) point scale, 'How similar do you think your reactions are to the reactions of (name of the person in the vignette)?' Higher ratings of similarity for a particular vignette indicate that a respondent identifies with that respective mode of coping. Each of the three vignettes is scored separately, yielding an Active Coping score, a Helpless/Hopeless Reaction score, and a Type C score.

The method has been shown to have high test–retest reliability, as well as high face, construct, and predictive validity (Temoshok, 2000a). In an Italian study, originally asymptomatic HIV+ individuals characterized as having Type C coping were more likely to develop symptoms of AIDS at 6 and 12-month follow-ups (Solano et al., 1993). A separate study of 200 HIV-1 seropositive but asymptomatic men and women by the same group found that higher baseline

Type C coping scores significantly predicted progression at 6 months and 12 months, among participants classified at baseline as having more compromised immunity (Solano et al., 2002). The vignettes to assess Active Coping and the Helpless/Hopeless reaction were significantly correlated in the expected directions with the UCLA Loneliness Scale, the Perceived Social Support Scale, and particularly with the Control and Commitment subscales of the Hardiness scale, suggesting that multi-dimensional components of coping have been embodied in these respective vignettes (Solano et al., 2002).

An important advantage of the VSRM is that the task of rating similarity to the emotions and behaviours of someone else, the person in the vignette, appears to minimize the typical Type C defensiveness (denial or repression) about reporting socially undesirable states and behaviours, which confounds assessment in scales composed of items which ask directly whether one feels or acts in certain ways. Another key feature which contributes to the method's validity is that the descriptions of how the person in the vignette copes are set in the context of a very relevant stressful situation (an unspecified life-threatening disease), in contrast to non-contextual coping items as they are presented on most self-report scales (Temoshok, 2000b).

DIFFERENTIATING TYPE C AND ITS MEASUREMENT FROM SIMILAR CONSTRUCTS

The individual who chronically experiences negative emotions and simultaneously has the tendency to inhibit self-expression has been defined as having a distressed or 'type-D personality' (Denollet, 1997). Studies by Denollet and his colleagues have found that type-D patients experience a chronic state of stress that may have an adverse effect on prognosis in the context of coronary heart disease. The critical difference between 'type-D' and Type C is that the 'negative' or dysphoric emotions of anger, anxiety, and depression are experienced, conscious, but suppressed by the type-D individual, while these emotions are usually unrecognized and thus subconscious and repressed by the Type C person. Thus, while both type-D and Type C have *phenotypically* similar non-expression of emotion, the '*genotypic*' or aetiological basis for this non-expression is different. Social inhibition, the tendency to inhibit the expression of emotions and behaviours in social interaction, is closely related to introversion. The negative affectivity or tendency to experience negative emotions in the type-D individual is theoretically related to neuroticism, and can be assessed adequately by measures of dysphoric mood, such as the trait form of Spielberger's State–Trait Anxiety Inventory. In contrast, Type C individuals are unable to report accurately on their repressed negative emotions because they are not aware of them. Thus, self-report scales, such as the Cortauld Emotional Control Scale, which assume that people are aware of the emotions that, subsequently, they are able to 'control', are not valid assessments of Type C (Temoshok, 2000b).

FUTURE PERSPECTIVES AND CONCLUSIONS

One of the main challenges in conducting research on the role of psychosocial factors in the progression of immunologically mediated diseases, such as cancer and HIV infection, is to devise methods to assess adaptive or maladaptive coping that have high predictive validity for biological processes and outcomes. Type C coping is particularly difficult to assess because the non-expressed, underlying negative emotions, particularly anger, are inaccessible to conscious recognition, and, thus, cannot be self-reported. This entry has described various methods of assessing the underlying emotion, as well as the manifest behavioural indicators of the Type C coping style. These assessment strategies, particularly the most recent and efficient method, the Vignette Similarity Rating Method, appear to be better able to 'capture' and encompass the complex, elusive, and multidimensional nature of the Type C coping pattern than traditional self-report scales. Ongoing and future research, using assessment methods that approximate the complex reality subsumed by this complex pattern, is aimed at understanding the mechanisms by which elements of the Type C pattern contribute to physiological and immunological processes that have implications for cancer and HIV progression.

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RELATED ENTRIES

APPLIED FIELDS: CLINICAL, APPLIED FIELDS: HEALTH, PERSONALITY ASSESSMENT (GENERAL), COPING STYLES, STRESS, ANXIETY ASSESSMENT

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UNOBTRUSIVE MEASURES

INTRODUCTION

All measures must be considered to be subject to error. We would have no way of knowing if, perchance, a measure turned out to be absolutely accurate. For example, the National Bureau of Standards has a ten gram weight (actually, because of manufacturing error just less than ten grams by about 400 micrograms, the weight of a grain or two of salt) (Freedman, Pisani & Purves, 1991). Despite the most careful weighing, done on a weekly basis, the values actually obtained for the standard weight vary by about 15 micrograms (one microgram is about the weight of a speck of dust) either way from the mean. Presumably, the mean of a long series of measures is the best *estimate* of the true weight of the standard, but there is no way of being sure of the true weight. Obviously, the way to deal with such errors, usually thought of as *random* errors, is to do the same measure several times. That is why careful carpenters measure their boards more than once before cutting them – especially if the wood is expensive. Random errors are associated with the concept of *reliability*, the expectation that if a measurement is performed twice under exactly the same conditions, very close agreement should be obtained if the measurement instrument and procedures for using it are dependable.

Another type of measurement error, though, is *bias*, i.e. consistent deviation from the 'true' value of the object or phenomenon of interest. For example, a recent news story recounted speculation that, in order to enhance the prospects of players for careers in professional American football, some collegiate coaches might have arranged the running tracks, on which the players' speed is tested, to be slightly downhill. If that is true, then the running speeds of players from some universities may be biased towards the fast end of the scale. If mothers are asked to estimate the intelligence (or good looks!) of their children, we might expect some bias to be evident, i.e. higher estimates than would be expected from other means of assessment. The bias is not reduced by replicating the measurement. Downhill is still downhill, and mother's love is constant.

The problem of bias has to be dealt with either by knowing the degree of bias so one can allow for it or by using multiple measures that do not share sources of error, i.e. bias (see Sechrest, 1979; Sechrest & Phillips, 1979). A football scout who knows that a player has been tested on a track with a downhill slant can 'allow' for that in interpreting reported running speed. We may expect that mothers will exaggerate a bit in describing their children's skills or other virtues and discount the glowing adjectives in the descriptions by some amount. But an even better way to deal with bias is to use other measures that are less biased, or not biased at all in the same way as the original measure. Of course, if a scout knows that a track has a downhill bias, that scout may simply retest

the athlete on a track known to be quite level and disregard the first, presumably biased, report. A scout might also use game films to arrive at a judgement of the speed of the player.

In social and behavioural sciences we usually have no absolute standard that can be applied, and we often should not assume that any one measure is less biased than another or unbiased altogether. The best solution is to use multiple measures of constructs and pick or devise those measures in such a way that they have minimally overlapping sources of error. A sports scout may not have any way of knowing that other running tracks are level, but if an athlete is tested on three different tracks, the average speed of those three runs is likely to be less biased (as well as having less random error) than any one of the runs. And, if all three tracks have a downhill slant, then maybe most tracks do, and the estimate of the athlete's speed is not biased with respect to estimates for other athletes.

PROBLEMS ASSOCIATED WITH SINGLE AND REACTIVE MEASURES

Social science measures are susceptible to many sources of bias, but a few of those sources of bias are particularly important because they are common and may involve relatively large degrees of bias. Different sources of bias are inherent in every measurement procedure. The biases can pose threats to the valid interpretation of a measure, in a manner akin to plausible rival hypotheses as threats to validity of experiments (Campbell & Stanley, 1963).

REACTIVE MEASUREMENT EFFECTS

A problem in measurement stems from the fact that the very act of measurement may produce a reaction on the part of the measured object that changes that object, whether temporarily or permanently. One cannot determine the tensile strength of a wire without breaking it, and one cannot determine whether a cake is as delicious as it looks without spoiling it to some degree. Asking to measure a person's height usually results in that person assuming a very erect posture that produces an estimate of height that is taller than their 'walking around' height. Similarly, giving a group of people a 'bigotry' scale is likely to result in an underestimate of the mean level of bigotry in the group, even if the scale is not explicitly labelled 'Bigotry Scale'. Some reactive measurement effects may be of limited duration or generalizability. The effect of bigotry measurement is unlikely to persist, but others may be long lasting, e.g. as when asking a person his or her opinion about something that results in reflection leading to crystallization of an opinion that may have previously been ephemeral.

Scientists and others involved in measurement in social sciences often attempt to reduce reactivity in various ways, including telling respondents that their responses will be confidential or even anonymous or that their responses will be used only for scientific purposes. Often such generic efforts to reduce reactivity are not enough, or at least not enough to be completely reassuring, in which case the response of the investigator may be to try to identify and employ a non-reactive, or at least less reactive, measure. Although all measures must be considered reactive to some degree, they are not all reactive to the same measurement issues or to the same degree. Other measures may be thought to be relatively low in reactivity because the data on which they are based were collected in spatially and temporally remote ways that should have freed them from contemporary biases. One example would be the use by historians of personal letters in order to diagnose the state of mind of the letter writer at some earlier period in his or her life.

The most obvious and attractive way of reducing reactivity is to carry out measurement activities under conditions that do not require the subject to know that he or she is being measured. Such measures have come to be known as *unobtrusive measures* (Webb et al., 1966). A young businesswoman might, for example, be invited out for lunch without knowing that she was actually being 'sized up' for a promotion. Or, computers in a school might be programmed to record sign-ons by individual students so as to provide a check on students' reports of computer use and study time. Measures may be unobtrusive because they are embedded in or derived from ongoing activities that do not make measurement a salient feature of the activity or because they are concealed in some way. The term *unobtrusive* has come to be used generically for non-reactive measures, but it would be better used to refer specifically to measures obtained without the

necessity that persons being measured be aware of the fact of being measured. It is for that reason that the original publication *Unobtrusive Measures: Nonreactive Measures in the Social Sciences* (Webb et al, 1966) was retitled *Non-reactive Measures in the Social Sciences* (Webb et al., 1981) in the revised version of the book. Some measures, e.g. many physiological measures, are not highly reactive (susceptible to bias) because they are not under voluntary control, other measures are not particularly reactive because the person being measured is mistaken about the purpose for which she is being measured, and still others because the measurement context is conducive to unbiased responding.

When people are aware of being measured, a frequent consequence is bias, even if the participant is cooperative and well intentioned. Persons being 'tested' often, very naturally, want to make a good impression, although in some specific instances, a person being measured may want to make what would ordinarily seem to be a bad impression, e.g. malingering. Persons being measured may adopt specialized roles that reflect their ideas about how they ought to behave, and those roles may not be characteristic of the persons when they are in other situations. Individuals will differ, of course, in the degree to which their characteristic responses are affected by knowledge of being measured. Bias may be limited in some instances because people believe their responses are completely appropriate. Criminals, for example, often believe that their behaviours are quite justified and therefore feel no need to disguise their statements about them.

Biases can be reduced with the implementation of multiple measures that do not share the same sources of bias. Unobtrusive measures are not free from their own sources of error, but they may not reflect the same type or degree of bias or reactivity as other measures. Unobtrusive measures, because they reflect different approaches to measurement, can often get around the limitations of reactive measures.

THE VARIETIES OF UNOBTRUSIVE MEASURES

Webb et al. (1966, 1981) provide an extensive review of unobtrusive or non-reactive measures in social science research and many fine examples can be found throughout the literature. Generally speaking, unobtrusive measures can be usefully categorized as follows:

1 *Simple observations*. Many interesting behaviours can be directly observed, often without the necessity of the observed actor being aware of the fact. Observations may be made of individuals and groups. Targets of observation may include objects and events as well as persons. For example, the nature of ceremonial events may be of great interest. Also included here are observations of physical location and clustering of people, expressive movements, language behaviour in the media or as overheard in public areas, the amount of time individuals spend gazing at public displays, or time sampling of observations to determine whether certain occurrences are linked temporally. A recent news story reported an observation that military dictators who begin to detect resistance and who desire to establish their legitimacy tend to abandon their military uniforms and don civilian attire, with recent appearances of Saddam Hussain of Iraq in regular business suits cited as an interesting example.
2 *Contrived observations*. Simple observation can be tedious as one may need to wait a long while for behaviour of interest to occur. Under such circumstances, researchers may contrive situations likely to produce relevant responses. The TV show 'You're on Candid Camera!' was based on responses of people to contrived situations. Social psychologists make extensive use of confederates in contrived situations in which the subject is unaware that he or she is a participant in an experiment. Also included in this category of contrived situations are the experiments in which unsuspecting individuals are deceived into doing things and studied in the process. Real estate companies are routinely tested for racial discriminatory practices by persons pretending to be clients. Bochner (1979) has made 'wrong number' phone calls and staged fake collapses on trains to assess individuals' helpfulness in common situations. These types of investigations can be classified as non-reactive or unobtrusive because the participants are unaware that

they are participating in an experiment. This lack of awareness implies that their reactions will be natural. Contrivances may include the use of hidden hardware such as audio- and videotapes.

3 *Physical traces*. These include both erosion and accretion measures. Measures of erosion include measurements of floor tile or carpet wear in front of various museum exhibits to determine their popularity or the wear and tear of library books to examine selective reader interest. Measures of accretion include indicators of inscriptions in public restrooms, the amount of debris left from a ticker-tape parade, or the number of cigarette packs that were thrown out with the trash in selected residential areas. Detectives regularly rely on physical traces of responses that they have never seen to solve crimes.

4 *Archives*. These include actuarial records. Materials supplied by the mass media, industrial and institutional records, sales records, and private written documents are archival records. Archival records are regularly used to track behaviours that might not otherwise be detected with reactive measures. Episodic personal and private records are in heavy use in hearings involving activities in the White House to check on the veracity of self-reports by those whose actions are in question.

It is important that unobtrusive measures not be regarded as substitutes for other kinds of reactive measures. That is the antithesis of the rationale behind unobtrusive measures. Unobtrusive measures are properly thought of as complementary to other measures such as questionnaires and interviews.

THE USES OF UNOBTRUSIVE MEASURES

The countering of bias in measurement is of focal concern in considering the usefulness of unobtrusive measures, but such measures may actually be adopted for other purposes. That is in part because an investigator may follow different strategies for dealing with bias: verification, adjustment, and avoidance. An investigator may believe that measures being used are not greatly biased, but he or she may also believe that caution requires sensitivity to possible bias. That investigator may elect to use one or more non-reactive measures in order to *probe* for bias in case it exists. For example, in a workplace study of attempts to induce exercise, a researcher may ask respondents how often they walk up stairs rather than take an elevator, and reports of workers might be regarded as generally unbiased. Nonetheless, the investigator might still elect to probe the accuracy of those reports by using occasional observers to determine whether the proportion of people climbing stairs is consistent with self-reports. If it should appear that workers tend to exaggerate their reported use of stairs, the investigator might change the questionnaire to try to elicit better data or abandon self-reports in favour of reliance on observers. A prudent investigator would at the very least be cautious in interpreting self-report data. Probing might not require large numbers of observations or observations of all subjects of interest. A second strategy is to collect sufficient data by alternative means to make it possible to estimate by how much the numbers obtained by a primary measure, likely to be a questionnaire, are off so that estimates can be appropriately discounted. Observational data might indicate that reported use of stairs is exaggerated by 25%, in which case the researcher might deflate his estimates of total physical activity by an appropriate amount. Obviously, unobtrusive measures may be used in conjunction with other measures to arrive at a summary assessment that is likely to be less biased than would have been the case for a single measure. If trainees in a programme claim to be spending ten hours per week in a computer laboratory, but actual counts of people working in the laboratory are not consistent with the claimed level of use, a researcher might adjust downward estimates of exposure to the exercises involved.

It is not always easy, however, to obtain unobtrusive measures that can be used directly and exactly in order to adjust for biases in other measures. One major problem is that more common measures such as questionnaires and unobtrusive or other non-reactive measures are not in the same metrics so that combining them is not easy. What would one do, for example, with questionnaire data indicating that people claim to eat four servings of vegetables every day and observational data indicating that many people fail to finish eating and discard portions of vegetables served to them? Such discrepant data

may lead one to question the accuracy of one set of data or the other, but the discrepancies may not translate easily into quantitative adjustments.

Which data should one trust? Certainly our inclination would likely be to distrust questionnaire and other self-report data. Campbell (1969) suggested as much in discussing the role of qualitative data in programme evaluation. Emily Dickinson once wrote the line in a poem 'I like a look of anguish because I know it's true'. That is likely to strike all of us as obviously true. Try to imagine the alternative statement 'I like a self-report of anguish because I know it's true'. And yet, there certainly must be times when self-reports are better assessments of underlying dispositions than overt behaviours. Think, for example, of the pressures towards conformity that lead people who may not be at all religious to bow their heads when other people pray, or the politeness that may prevail between politicians who dislike each other. The use of multiple and different measures cannot guarantee anything.

Under some circumstances, non-reactive measures may be available and be used alone. That may be because they are sometimes compelling, but also because they are sometimes inexpensive. In particular, archival records may be exploited, often at fairly low cost. If records are kept for reasons unrelated to any particular policy use, or at least for reasons unrelated to the purposes for which they are used in research, they may be of great value and characterized by very little bias. The identification by Dr. John Snow of a contaminated water supply as the cause of a cholera outbreak in London in the 1850s was facilitated by records kept of the location of individual cases of the infection, making it possible for Snow to map those cases onto alternative water systems (Freedman, 1991). Barthel and Holmes (1968) were able to use information in high school yearbooks to show that persons who later became schizophrenic had low levels of social activity before the onset of their illness.

ADVANTAGE AND LIMITATIONS OF UNOBTRUSIVE MEASURES

Advantages

Aside from the possibility of reducing bias in measurement, several other advantages are often associated with unobtrusive measures (Rathje, 1979; Babbie, 1989). Typically, unobtrusive measures require little, if any, effort on the part of persons being assessed, and often no physical contact with or even close proximity to participants is required. Unobtrusive measures tend to focus on behaviours and obviate the problems that may stem from inaccurate reporting on the part of respondents. Yet another advantage is that the employment of non-reactive measurement procedures is often relatively inexpensive, e.g. simple observations, physical traces, and archival records. They can be of great value in longitudinal studies.

Limitations

Unobtrusive measures, like all other measures, have limitations. In the first place, it is not always easy to identify unobtrusive measures. Unobtrusive methods are typically limited in certain areas that can be open to interrogation with more reactive methods such as interviews and questionnaires. Methods that utilize verbal communication, such as structured and unstructured interviews, have 'an ability to reach into all content areas' (Webb et al., 1966, 1981). Webb et al. (1981) provided a 'generative taxonomy' for non-reactive measures in order to facilitate thinking about them, but very often coming up with good ones is more an act of creative thinking than of straightforward science. No rules govern the process, and, hence, no limitations exist either. That means, however, that one cannot guarantee that an unobtrusive measure will be accepted by reviewers or readers of one's work. Unobtrusive measures are often novel and have no history of use in a field by means of which the case for them can be buttressed. Moreover, many unobtrusive measures do not readily fit the requirements of conventional psychometric analyses so that the usual indicators of difficulty level, variance, and so on are not available, and reliability cannot be directly computed. In the end, unobtrusive measures must have face validity, i.e. readers must see immediately and intuitively that they make sense. That is not always likely.

Unobtrusive measures may sometimes raise troubling ethical questions, for they may be obtained under conditions that at least appear to violate usual expectations about informed consent, confidentiality, and so on. Records may have been assembled with no expectation that they would ever be used for other than their original purposes, and even if confidentiality is protected at the public

level, some persons might feel that their personal confidence is breached when researchers gain access to their records. People may feel that even public behaviour is in some sense private if they have no expectation of being systematically observed. In fact, some courts have ruled that people riding in automobiles have expectations of privacy that should protect them against at least some types of observation. Ethical concerns may not rule out many unobtrusive measures, but at least they require careful consideration by researchers.

Neither are unobtrusive measures always inexpensive. Observers, for example, are expensive to train and support in the field, and unless they can produce information that is markedly better than what can be derived from questionnaires, they may not be affordable. Archives may be readily available, but the cost of mining them for usable data may be quite costly. Many other types of unobtrusive measures may be surprisingly expensive when one gets around actually to doing them. Questionnaires and interviews may be performed by mail, phone, or web sites, and the expenses associated with them, especially if multiple sites are involved, can make them a prohibitive favourite in the array of methods potentially available. As noted earlier, however, unobtrusive measures may still be useful at modest cost when used as probes into quality and bias of more traditional measures.

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RELATED ENTRIES

OBSERVATIONAL METHOD (GENERAL), PERSON/SITUATION (ENVIRONMENT) ASSESSMENT, LANDSCAPES AND NATURAL ENVIRONMENTS, POST-OCCUPANCY EVALUATION FOR THE BUILT ENVIRONMENT

UTILITY

INTRODUCTION

Utility is always subjective and refers to the amount of personal or institutional satisfaction of an alternative. The personal satisfaction associated with the outcome of good food, a holiday trip or a sports car depends on taste, interests and needs. Institutional satisfaction associated with the

outcome of employment strategies or treatment selection predominantly depends on economic considerations. It is assumed that both individuals and institutions try to maximize their utility. Choosing alternatives according to their utility lies at the heart of all summative evaluation procedures.

PRESCRIPTIVE UTILITY THEORY

Utility Function

The measurement of utility has a long history in economics, starting with the measurement of preferences on an ordinal scale. Since von Neumann and Morgenstern (1947) developed the axiomatic foundation of utility, it can be measured on an interval scale. It is derived from personal preferences for either a sure thing or a gamble (Figure 1a). The decision maker is presented with a choice between obtaining either outcome o for sure or a gamble that returns with probability p a better outcome (o^*) and with complementary probability $(1-p)$ a worse outcome (o_*). The gamble is written as $[p\ o^*, (1-p)\ o_*]$ or simply $[p\ o^*, o_*]$ (the square denotes a decision, the circle a chance node).

With o^* and o_* as best and worst outcomes and all outcomes o_i in-between, the indifference probability π_i, where the decision maker is indifferent between the sure thing and the gamble, can be determined as $o_i \sim [\pi_i\ o^*, o^*]$. Pairs (o^*, π_i) of these indifferences constitute the utility function (Figure 2a). Above the function the gamble is preferred, below the function the sure thing is preferred. For outcomes with the following preference order $o^*\ \phi o_1 \phi o_2 \phi \ldots\ o_i \ldots \phi o_*$ the corresponding indifference probabilities with $1.0 = \pi^* > \pi_1 > \pi_2 > \cdots > \pi_i > \cdots > \pi_* = 0$ (as well as their linear transformations) are the utilities of the corresponding outcomes. Whenever the preference $o_i \phi o_j$ holds, the utility measurement of o_i exceeds o_j and $\pi_i > \pi_j$.

Axiomatic Foundation

The perceived utility of outcomes is the basis for expressing preferences. These preferences are analysed in order to measure true internal utilities. If the expressed preferences with respect to outcomes of alternatives (objects, commodities, events, strategies) and gambles meet the following six axioms, utility can be measured on an interval scale.

Ordering

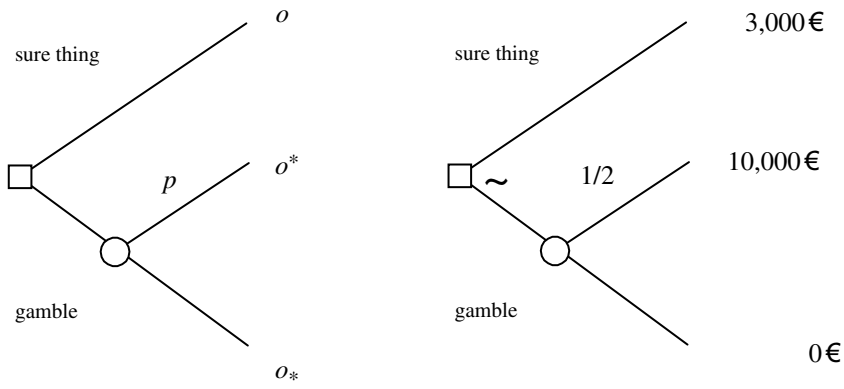
A decision maker should be able to compare outcomes and either prefer one to the other or be indifferent.

Transitivity

If one outcome is preferred to a second, and this second is preferred to a third, the first should also be preferred to the third.

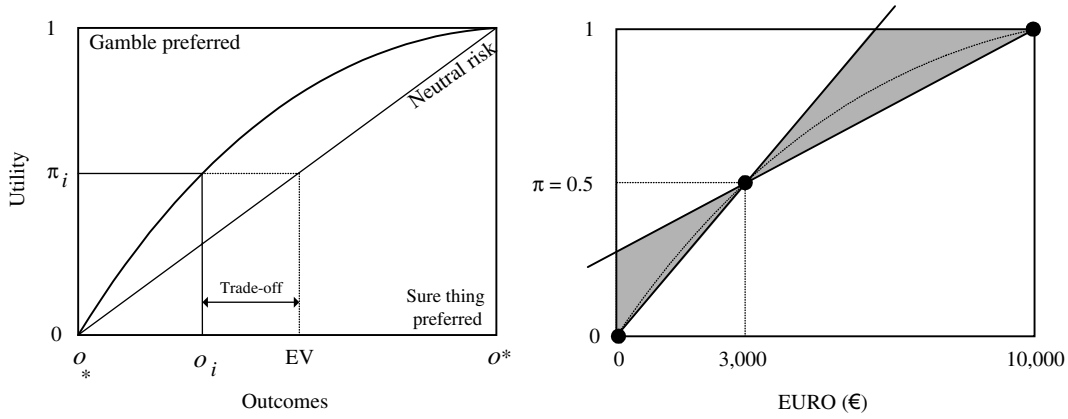
Dominance

A rational decision maker should never accept a dominated gamble whose best outcome matches



(a) The typical case (b) Finding the outcome $o_i \sim$ [½€ 10,000, €0]

Figure 1. The choice between a sure thing and a gamble.



(a) Risk averse utility function

(b) Constraints for utility functions arising from one elicited indifference

Figure 2. Utility functions.

the outcome of the sure thing and should always accept a gamble whose worst outcome matches the outcome of the sure thing.

Cancellation

Preferences for gambles must not depend on identical and equally probable outcomes.

Invariance

As long as the probabilities with which certain outcomes are obtained are the same, the form in which gambles are presented must not affect preferences.

Continuity

For a choice between a sure thing and a gamble there exists a probability p so that the sure thing is preferred and a probability p' so that the gamble is preferred.

Given the axioms, the utility of risky alternatives can be derived. Figure 3a illustrates a risky alternative with n possible outcomes of a strategy A where o_i is obtained with probability p_i. If the above axioms are met, A can be transformed into A' by replacing each outcome by its indifferent gamble taken from the utility function in Figure 2a. A' has only best and worst outcomes. A'' results when all best and all worst outcomes are combined and $\prod_A = \sum p_i \pi_i$ is the probability of obtaining the best outcome (Figures 3b and c). Since $A \sim A' \sim A''$, $\prod_A$ is the probability for the best outcome in gamble A'', the expected value (EV) of A' and the expected utility (EU) of A : $\mathrm{EU}(A) = \prod_A$. This helps: for two strategies (complex gambles) A and B it might be hard to decide whether $A \phi B$ or $B \phi A$ or $A \sim B$, but after utility measurement it is easy to establish whether $\prod_A > \prod_B$ or $\prod_B > \prod_A$ or $\prod_A = \prod_B$.

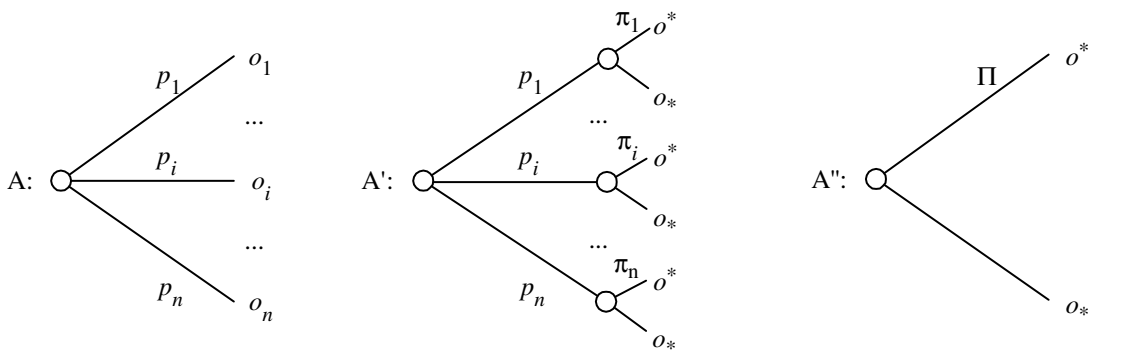
Four Steps of Measuring the Utility of Alternatives

Determine Outcome Ranges

Suppose a decision maker wants to evaluate strategies. In order to do so she has to determine the best and worst outcomes possible, which may be $E10{,}000$ at best and $E0$ at worst.

Specify Utility Functions

Determine the amount of Euro so that the decision maker is indifferent to obtain this amount for sure and the gamble of obtaining either $E1000$ or $E0$ with $\pi = 1/2$. Usually 5000 Euro for sure is preferred to the risky alternative with EV= $E5000$, and so is $E4000$. Assuming indifference holds for $E3000$, the utility function has to pass through the three points given in Figure 2b and is limited to the shaded area. Often the utility function is sufficiently well specified by eliciting just one well-chosen indifference point.



(a) Strategy *A* (b) Replacement of outcomes (c) Summarizing of branches

Figure 3. Three steps to determine the utility of a strategy *A*.

Find Out about the Alternatives

The decision maker has to establish the outcomes and their probabilities. This is a process of information seeking that may be assisted by experts.

Determine Probability Π

All outcomes are substituted with their indifferent gambles (taken from the utility function of step two, Figure 2a) in order to determine $EU(A) = \prod_A = \sum p_i \pi_i$.

The Concept of Risk

In many domains utility functions are concave, since the EV of the gamble exceeds the utility of the gamble. This is interpreted as decision makers being risk averse. Compared with the sure thing, a gamble is indifferent when its higher risk (bad) is traded-off by its higher EV (good). In other words, people and institutions tend to focus on avoiding bad outcomes at the expense of possibly missing good outcomes. Concavity is also a common result in value measurement. Here the concavity is interpreted as diminishing marginal value or satisfaction. The more there is of a common good, the less one additional unit will add to overall value.

Extensions

Subjective Probabilities

Savage (1954) broadened the concept of EU to subjective expected utility (SEU). Probabilities were no longer thought of as objective like relative frequencies. Subjective probabilities reflect degrees of belief, the extent to which a person believes certain outcomes will be obtained.

The Multiattribute Case

Often a single alternative may result in many outcomes on a variety of dimensions (attributes) (Keeney & Raiffa, 1976). For example, the institution's expected utility of a hiring decision may depend on the candidate's placement costs, salary, performance and soft skills. Ideally the utility of alternatives that vary on n dimensions can be derived from n unidimensional utilities according to SEU principles and the relative importance of the dimensions.

The Utility–Value Relation

The concepts of utility and value are similar but utility measurement is often restricted to the evaluation of alternatives involving risk whereas value assessment applies to cases of no risk. Compared with value assessment, the measurement of utility is more demanding (see Dyer & Sarin, 1979, for conditions of equivalence).

DESCRIPTIVE UTILITY THEORIES

Since empirical findings do not always support the normative and prescriptive theories outlined previously, descriptive theories of utilities have

been proposed that better describe decision makers' actual behaviour.

Among such theories, prospect theory by Kahneman and Tversky (1979) is known best. It proposes that the utility of outcomes are evaluated in comparison to a reference point (status quo) as gains or losses. The utility function for gains is concave, for losses convex, and steeper for losses than for gains. Prospect theory explains why decision makers deviate from SEU predictions. Prominent examples are risk seeking behaviour in the domain of losses and risk avoiding behaviour in the domain of gains. Other theories are disappointment theory where utilities partly depend on a priori expectations, and regret theory, where utilities depend on the loss with respect to the a posteriori best alternative.

APPLICATION TO PSYCHOLOGICAL ASSESSMENT

Cronbach and Gleser (1965) have introduced the utility concept to psychological assessment. The utility of classification strategies depend on actual probabilities of hits, misses, false alarms and correct rejections multiplied by the associated costs and benefits.

FUTURE PERSPECTIVES AND CONCLUSIONS

Prescriptive utility theory can help to identify promising alternatives. Descriptive utility theories explain and predict actual decision behaviour and help to protect against common traps. Taking both viewpoints into account will improve decisions, ensuring higher utilities and better lives for individual decision makers as well as institutions.

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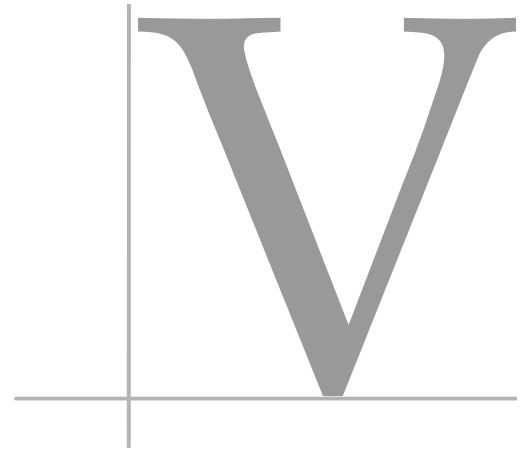
RELATED ENTRIES

Assessment Process, Decision, Values, Validity (General), Standards for Educational and Psychological Testing



VALIDITY (GENERAL)

INTRODUCTION

Tests and other forms of assessment are designed to provide information that will be useful for some purpose. The degree to which the information provided by a test score is useful, appropriate, and accurate is described by the psychometric concept *validity*. Validity is the extent to which the inferences (interpretations) derived from test scores are justifiable from both scientific and equity perspectives. For decisions based on test scores to be valid, the use of a test for a particular purpose must be supported by theory and empirical evidence, and biases in the measurement process must be ruled out.

Validity is not an intrinsic property of a test. As many psychometricians have pointed out (e.g. Cronbach, 1971; Messick, 1989; Shepard, 1993), in judging the worth of a test, it is the inferences derived from the test scores that must be validated, not the test itself. Therefore, the specific purpose(s) for which test scores are being used must be considered when evaluating validity. For example, a test may be useful for one purpose, such as patient diagnosis, but not for another, such as evaluating the treatment of patients.

Contemporary definitions of validity in testing borrow largely from Messick (1989) who stated 'validity is an integrated evaluative judgement of the degree to which empirical evidence and theoretical rationales support the *adequacy* and *appropriateness* of *inferences* and *actions* based on test scores or other modes of assessment' (p. 13). From this definition, it is clear that validity is not something that can be established by a single study and that tests cannot be labelled 'valid' or 'invalid'. Given that (a) validity is the most important consideration in evaluating the use of a test for a particular purpose, and (b) such utility can never be unequivocally established, establishing that a test is appropriate for a particular purpose is an arduous task. In the remainder of this entry, specific forms of evidence for validity as well as some validation frameworks will be discussed. Before describing these concepts and practices, the following facts about validity in testing should be clear: (a) tests must be evaluated with respect to a particular purpose, (b) what needs to be validated are the inferences derived from test scores, not the test itself, (c) evaluating inferences made from test scores involves several different types of qualitative and quantitative evidence, and (d) evaluating the validity of inferences derived from test scores is not a one-time event; it is a continuous process. In addition, it should be noted that although test developers must provide evidence to support the validity of the interpretations that are likely to be made from test scores, ultimately it is the responsibility of the users of a test to evaluate this evidence to ensure the test is appropriate for the purpose(s) for which it is being used.

TEST VALIDATION

To make the task of validating inferences derived from test scores both scientifically sound and manageable, Kane (1992) proposed an 'argument-based approach to validity'. In this approach, the validator builds an argument based on empirical evidence to support the use of a test for a particular purpose. Although this validation framework acknowledges that validity can never be established absolutely, it requires evidence that (a) the test measures what it claims to measure, (b) the test scores display adequate reliability, and (c) test scores display relationships with other variables in a manner congruent with its predicted properties. Kane's practical perspective is congruent with the *Standards for Educational and Psychological Testing* (American Educational Research Association [AERA], American Psychological Association [APA], & National Council on Measurement in Education [NCME], 1999), which provide detailed guidance regarding the types of evidence that should be brought forward to support the use of a test for a particular purpose. For example, the *Standards* state:

> A sound validity argument integrates various strands of evidence into a coherent account of the degree to which existing evidence and theory support the intended interpretation of test scores for specific uses ... Ultimately, the validity of an intended interpretation ... relies on all the available evidence relevant to the technical quality of a testing system. This includes evidence of careful test construction; adequate score reliability; appropriate test administration and scoring; accurate score scaling, equating, and standard setting; and careful attention to fairness for all examinees ... (p. 17)

GATHERING VALIDITY EVIDENCE

To build a validity argument for a test, there are several types of evidence that can be brought forward. Traditionally, the major forms of validity evidence are *content validity*, *criterion-related validity*, and *construct validity*. Each of these terms is described more completely in separate entries of this encyclopedia. Briefly, content validity evidence involves gathering data from content experts regarding the degree to which the behaviours sampled on the test represent the behaviours the test is designed to measure. Criterion-related validity evidence involves evaluating correlations among test scores and other variables related to the construct measured. Predictive and concurrent validity are special cases of criterion-related validity that involve correlating test scores with future or current criterion performance. Construct validity involves gathering data that show test scores are indicative of the construct measured. Many test theorists (e.g. AERA et al., 1999; Messick, 1989) consider content and criterion validity to be subcomponents of construct validity because such evidence assists in evaluating test-construct congruence.

Regardless of the types of data gathered to evaluate validity and the labels we apply to the validity evidence, two factors guiding test validation are evaluating construct representation and construct-irrelevant variance. Evaluating construct representation means inquiring whether all important aspects of the construct are measured by a test. Evaluating construct-irrelevant variance involves ruling out extraneous behaviours measured by a test. An example of construct-irrelevant variance is 'method bias', where test scores are contaminated by the mode of assessment. Campbell and Fiske (1959) proposed a *multitrait–multimethod* framework for studying construct representation (e.g. convergent validity) and construct-irrelevant variance due to method bias (discriminant validity).

Contemporary test validation is a complex endeavour involving a variety of studies aimed toward demonstrating that a test is measuring what it claims to measure and that potential sources of invalidity are ruled out. Such studies include (1) dimensionality analyses to ensure the structure of item response data is congruent with the intended test structure, (2) differential item functioning analyses to rule out item bias, (3) content validity studies to ensure the relevance and appropriateness of test content, (4) criterion-related validity studies to evaluate hypothesized relationships among test scores and external variables, and (5) surveys of invested stakeholders such as test-takers and test administrators. Relatively recent additions to test validation are studies focusing on social considerations associated with a testing programme including unintended consequences such as narrowing the

curriculum to improve students' scores on educational tests. It should also be noted that evidence of adequate test score reliability is a prerequisite for supporting the use of a test for a particular purpose since inconsistency in measurement due to content sampling, task specificity, ambiguous scoring rubrics, the passage of time, and other factors adds construct-irrelevant variance (i.e. error variance) to test scores.

FUTURE PERSPECTIVES

Validity was, is, and always will be the ultimate criterion for evaluating the worth and defensibility of a particular test for a particular purpose. Validity theory will evolve to address issues such as distinguishing between 'constructs' and 'content domains' as well as determining the degree to which the social consequences of a testing programme should be considered when evaluating a test. Test validation activities will evolve as statistical procedures evolve and as we expand the types of data we gather to evaluate tests. Recent statistical advances in test validation include applications of structural equation modelling to construct validity (e.g. Pitoniak, Sireci & Luecht, 2002; Reise, Widaman & Pugh, 1993) and applications of multidimensional scaling to content validity (Sireci, 1998a). Examples of newer types of data gathered to evaluate validity include item response (reaction time) data (e.g. van der Linden, Scrams & Schnipke 1999) and the coding of item features to gauge the specific cognitive processes measured by test items (e.g. Sheehan, 1997; Tatsuoka, 1993). Another relatively recent development that has the potential to affect validity is computer-based assessment. It is likely that computer-based assessment will allow us to measure psychological constructs that are not measurable in the more traditional paper-and-pencil format (Huff & Sireci, 2001).

CONCLUSIONS

Given that validity is the ultimate criterion for judging the worth of a test for a particular purpose, it is not surprising that theories of test validity and methods for test validation are as old as the process of testing itself (Sireci, 1998b). Validity studies are critically important for maintaining the scientific credibility of educational and psychological assessment. As we seek to learn more about the validity of a test for a particular purpose, we gradually improve our ability to measure psychological constructs, which remain some of the most intractable constructs of modern science. Psychological assessment is at the heart of scientific psychology. Validity is the heart of psychological assessment.

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RELATED ENTRIES

Validity: Content, Validity: Criterion-Related, Validity: Construct, Classical Test Theory, Reliability, Theoretical Perspective: Psychometrics

VALIDITY: CONSTRUCT

INTRODUCTION

Construct validity is recognized as the fundamental and all-inclusive validity concept insofar as it specifies what categories, traits or factors a test measures (Anastasi & Urbina, 1997; Cronbach, 1988; Messick, 1989). Professional standards addressing validity were first codified in the 1954 *Technical Recommendations for Psychological Tests and Diagnostic Techniques* (American Psychological Association, 1954). At that time, four separate and distinct types of validity were specified: construct, content, predictive, and concurrent. The former two types of validity were subsumed within criterion-related validity and the resulting three types of validity were referred to as the holy trinity (Guion, 1980). Each type of validity was largely associated with a specific use of tests as separate and exclusive methods of validation became entrenched by different camps of test developers and users (Shepard, 1993). In employment, many developers of personnel or certification tests argued that content validation approaches were sufficient, while developers of biodata instruments and other selection instruments relied exclusively on criterion-related strategies. When viewed as separate and exclusive types of validity, construct validity was considered appropriate when making inferences about traits that were not directly observable such as intelligence or conscientiousness.

A construct is a concept or characteristic an assessment attempts to measure. Latent anxiety, emotional stability, managerial performance, and conscientiousness are constructs typically discussed in the psychological literature. However, ability to design a web-page, mathematical reasoning ability, oral communications, and ability to trouble-shoot technical problems with equipment are also examples of constructs. A detailed description of the construct and an articulated definition which delineates the knowledge, skills, abilities, processes, and characteristics to be assessed should accompany descriptions of attributes that are measured.

CONSTRUCTS

Construct validity has emphasized the role of educational and psychological theory in test construction and focused attention on the need to develop hypotheses that can be supported or disconfirmed through validation studies. Cronbach and Meehl (1955) express the need to make one's theoretical ideas and hypotheses as explicit as possible and propose the concept of a 'nomological net'. Simply stated, they hypothesized a construct with various connections to other behaviours and measures and noted that validation studies would provide evidence of which relationships exist among observable measures as well as instances when a plausible rival hypothesis exists. Campbell and Fiske (1959) offered a conceptual and empirical framework for construct validation. Conceptually, any measure of a given construct have stronger relationships with other measures of the same construct while having weaker relationships with measures of different constructs. The former process is referred to as convergent

validation evidence and the latter process is referred to as discriminate validation evidence. Guion (1998) has suggested comparing the weight of evidence supporting specific inferences from test scores to the weight of evidence opposing such inferences. Empirically, such evidence would often take the form of correlations between similar and different constructs using similar and different methods. Methods may include the type of assessment items used (e.g. multiple-choice, constructed-response) or the actual measurement tool employed (e.g. structured interview, observations, oral presentation, portfolio, test).

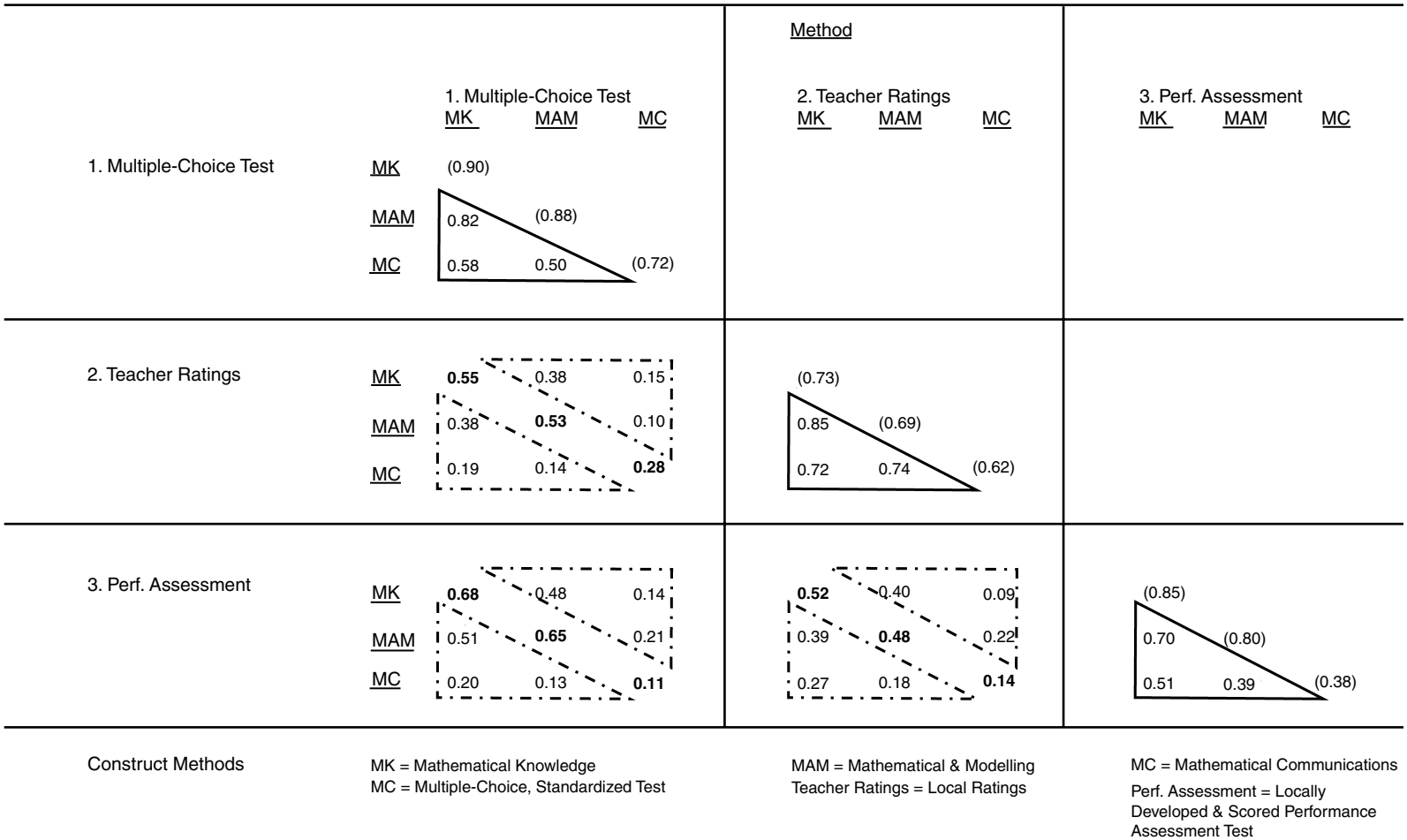
CONSTRUCT EVIDENCE: CONVERGENT AND DISCRIMINATE EVIDENCE

Table 1 provides a hypothetical example (based on an example provided by Campbell and Fiske, 1959: 82) where three constructs are measured by three different methods. This multitrait–multirater matrix is one method used to determine the convergent and discriminate evidence central to findings of construct validity. In this example we examine three different traits or constructs relating to quantitative reasoning, (a) mathematical knowledge, (b) mathematical applications and modelling, and (c) mathematical communication, with three measures: (1) a standardized multiple-choice test, (2) teacher ratings, and (3) a performance assessment. The solid triangles illustrate the correlations of different constructs measured by the same method and the dotted triangles illustrate the correlations of the same construct measured by different methods. The principal diagonal is the reliability of each method and construct (in parentheses), and the three short diagonals illustrate the overall relationship between different methods or measures of the same construct (in bold). These latter correlations would be considered the validity coefficients because they illustrate the relationship between the different measures of the same construct; however, all the data in such a matrix can provide confirming or discriminate evidence relating to validation of the measures and constructs.

Evaluation of the correlational matrix should proceed from a logical construct theory. 'In effect, discriminant validity is a necessary test of construct validity, even a stronger test in this sense than is convergent validity because it implies a challenge from a plausible rival hypothesis' (Angoff, 1988: 27). In the above example, the validity correlations (in bold) should be higher than correlations between different constructs (both when the same method is used as well as when different methods are used). For example, the validity coefficient between mathematical knowledge measured by the standardized test and teacher ratings should be higher than the correlation between mathematical knowledge and applications and modelling measured by either the test or the teacher's ratings. The data in Table 1 do not provide a clear and unambiguous support for construct validity through the convergent or divergent evidence. The data illustrate a moderately strong relationship between different constructs within the same method, suggesting some degree of method-specific variance may confound these measures. That is, it appears that teacher ratings of all three constructs are highly related, just as test scores of all constructs are highly related. In most instances, the relationship between different constructs measured with the same method exceeds the intra-construct correlations, resulting in a lack of discriminant validity. One possible reason for this may be that quantitative reasoning is a unidimensional construct; while another possibility is that the methods used to measure these constructs were not sensitive enough to detect differences. In addition, the performance measure of mathematical communications has a relatively low internal reliability, resulting in lower validity coefficients than intercorrelations with other constructs.

Personality traits or specific skills and abilities are more commonly employed in psychological and industrial-organizational contexts. Discriminant and convergent evidence may be established when test and non-test measures of the same construct are highly related. In employment settings, correlations between supervisory ratings, performance assessments, and cognitive ability tests are often conducted to provide such evidence (e.g. physical strength, and endurance). All physical ability testing are, to some degree, measures of constructs, and job performance criterion ratings of incumbents' effectiveness in lifting, pulling, or carrying should be related to performance on selection measures corresponding to this construct (Hogan & Quigley, 1996). Many occupations such as firefighter, police officer, and some military occupations will

Table 1. Hypothetical example of the multitrait–multirate method



require minimum physical abilities that are related to job performance. Evidence establishing the relationship between the actual physical ability measures and job criterion ratings can aid in establishing convergent validation evidence. Similarly, psychological literature contains many studies relating the strength of relationships among subtests of well established personality or intelligence tests, as well as with other measures of the same constructs. For example, many studies have been conducted examining the 'big five' personality dimensions (agreeableness, conscientiousness, emotional stability, extroversion, and openness to experience) (Barrick & Mount, 1991). Such convergent evidence has also been widely used in cognitive ability testing and other areas, specific abilities and skills have been identified and reported separately (Jaegar, Linn & Tesh, 1989).

CONSTRUCT-IRRELEVANCE AND INTERNAL STRUCTURES OF AN ASSESSMENT

Convergent and discriminant evidence alone are not adequate in establishing evidence to support the validity of inferences made from assessment scores or results. Messick (1989) noted that construct irrelevant sources of variance also present a challenge. Such irrelevant variance can be introduced when an employment test uses language that is at a much higher reading level than required of a job, when a popular clinical psychological personality test is used for promotion or retention without adequate evidence of job relatedness or when a mathematics achievement test uses complex constructive-response tasks that require proficiency in English language that may overshadow the mathematics construct it is intended to measure.

The 1999 *Standards for Educational and Psychological Testing* (AERA, APA & NCME, 1999) state that validation begins with 'an explicit statement of the proposed interpretation of test scores along with a rationale for the relevance of the interpretation to the proposed use. The proposed interpretation refers to the construct or concepts the test is intended to measure' (AERA et al., 1999: 9). They describe five sources of evidence that can contribute to a validation argument and be used in evaluating a proposed interpretation of test scores for a particular use: (1) content, (2) relationships between test scores and other variables, (3) internal structure of the test, (4) response processes, and (5) consequences of testing. Validity is a unitary concept and such distinctions refer to various sources of evidence rather than distinct types of validity. However, several of these sources of evidence are more directly related to the traditional view of construct validation.

Construct validity theory has focused attention on the role of psychological theory in test construction and the need to develop hypotheses that can be proved or disproved as validation evidence gradually accumulated over time (Anastasi & Urbina, 1997). Evidence of relationships between test scores and other variables includes two distinct types of evidence: (a) empirical evidence relating a predictor to a criterion, and (b) relationships between two measures of the same construct. This latter form of evidence encompasses both convergent and discriminant evidence and has been discussed above.

Evidence based on the internal structure of the test may examine the relationship among items or tasks and how test scores may relate to specific aspects of a construct.

A test developer initially sets out to measure a trait or skill (i.e. construct) by developing tasks or writing items that would apparently relate to this trait or skill. Correlational analyses are typically used to determine the relationship among items on a test and between items and total test score. High intercorrelations among items or tasks provide evidence that items measure a similar construct. Correlational matrices help to show such relationships among items or variables.

Exploratory factor analysis is based on correlational analyses and is often used when a test developer is uncertain about the relationship of items or tasks to one of more constructs or when a researcher wishes to identify common constructs or traits across a variety of measures. The primary purpose of exploratory factor analysis is to simplify the description of the data by reducing the number of variables or dimensions. Factor analysis reduces variables (items, tasks, dimensions) by finding clusters of highly correlated variables which are minimally correlated with other clusters of variables. For example, when a test or inventory is intended to measure several facets of a construct (e.g. communication may have receptive, expressive and written communication

facets) evidence of item heterogeneity may support inferences concerning the validity of subcomponents of the test. Evidence concerning whether certain tasks or items function differently for different groups may also provide evidence relating to the internal structure of the test. Factor analysis and measures of internal consistency are examples of specific forms of statistical analyses commonly used to accumulate evidence of the internal structure of a test or other measure. Related methods such as cluster analysis, linkage analysis, and canonical correlations are similarly based on the assumption that similar patterns of correlations among items or tasks provide evidence of a single construct (Guion, 1998). Multidimensional scaling graphically plots pairs of variables based on their relationship, using graphically distance to simplify data on items, tasks, or variables.

When there is a strong hypothesis about constructs and how they are measured, confirmatory factor analysis is preferred. With this approach, the researcher specifies the expected factors and the relationship among different measures (e.g. items, tasks, tests) and the fit of data to the a priori model confirms or disconfirms the model. In the case of factor analysis, the concern is with the structure of individual differences with respect to a specified domain of variables (Torgerson, 1983). Similarly, structural equation modelling and other methods of causal modelling have provided important advances in validation because they can provide evidence concerning the causal relationships between constructs and the paths whereby a predictor affects criterion performance (Schmidt, Hunter & Outerbridge, 1986).

FUTURE PERSPECTIVES AND CONCLUSIONS

Construct comes from construe, and construct validity evidence is a method of construing or organizing data to explain test scores, what they measure and what they mean. With the release of the most recent edition of the *Standards for Educational and Psychological Testing* (AERA, APA & NCME, 1999), construct validity has transformed from one of the trinitarian methods of obtaining validation evidence to the fundamental and all-inclusive validity concept. Comparisons of the relationship between tests and external measures of a construct can provide convergent and discriminate evidence. Analysis of the internal structure of a test and its scores or subcomponents can provide construct evidence for the validity of test scores and their interpretation. Correlations among items and measures provide the simplest form of such internal evidence, while factor analysis, cluster analysis and multidimensional scaling are more sophisticated approaches to examine the relationship among items and measures or to evaluate an a priori model. Structural equation modelling and multidimensional scaling are increasingly used to examine the relationship among substantive and methodological variables that influence the level of construct evidence. However, given the new testing standards, all forms of evidence, including content and criterion-related, will be subsumed as construct evidence. The application of this new and emerging concept of test validity over the next decade is likely to change our operational approaches and overall views of validation approaches.

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RELATED ENTRIES

Validity (General), Validity: Content, Validity: Criterion-Related, Multimodal Assessment, Multitrait–Multimethod Matrices, Factor Analysis: Exploratory, Factor Analysis: Confirmatory, Classical Test Theory, Standard for Educational and Psychological Testing

VALIDITY: CONTENT

INTRODUCTION

Content validity is the degree to which an assessment represents the content domain it is designed to measure. When an assessment is judged to have high content validity, the content of the assessment is considered to be congruent with the testing purpose and with prevailing notions of the subject matter tested.

Evaluating content validity is an important part of validating the use of a test for a particular purpose, especially when the test is educational in nature, such as when it is desired to measure a person's knowledge of specific subject matter (e.g. achievement and licensure tests). Although the process of test validation is dynamic and a test is never 'validated' per se, in many cases, evidence of content validity is a fundamental component for defending the use of a test for a particular purpose.

Content validity is a notion with which lay people can easily identify and understand. For example, parents and teachers expect items on an elementary mathematics test to be consistent with the elementary mathematics curriculum taught in the schools. Similarly, the general public expects items on a test used to license public accountants to be congruent with the tasks public accountants confront when performing their duties. The evaluation of test content vis-à-vis testing purpose is a natural first step in judging the utility and quality of an assessment. Thus, it is not surprising that the term content validity was included in the earliest efforts to develop standards for test development and evaluation (i.e. American Psychological Association [APA], 1952).

ASPECTS OF CONTENT VALIDITY

There are at least two aspects of content validity: *domain definition* and *domain representation*. Domain definition refers to the operational definition of the content domain tested.[1] This operational definition is often accomplished by providing descriptions of the content areas and cognitive abilities the test is designed to measure. To adequately define the content domain, several different sources may be used, depending on the purpose of the assessment. These sources include basal textbooks and curriculum objectives for educational tests, job analysis results for employment or licensure tests, and theories of mental abilities and functioning for aptitude tests.

Content domains are often formally defined using test specifications. These specifications,

which are typically in the form of a two-by-two grid listing the content areas along one dimension and the cognitive levels along another dimension, specify the relative weights that are assigned to each of these facets of the content domain. Most technical manuals for tests include these descriptions and specifications. By reviewing the descriptions of the content areas and cognitive levels measured on an assessment, along with the percentages of items that are designed to measure each area/level, one can get a good sense of how the test developers conceptualized the content domain. An understanding of this conceptualization is critical for evaluating the appropriateness of a test for a particular purpose.

Domain representation refers to the degree to which an assessment represents and adequately measures all facets of the content domain tested. The degree to which the content of an assessment spans the entire domain (domain coverage) is one important aspect of domain representation. Another important aspect is domain relevance, which addresses the relevance of each test item to the domain tested. By evaluating domain coverage it can be ascertained whether the entire content domain is being measured, as well as whether critical facets of the content domain are underemphasized. By evaluating domain relevance, the adequacy and importance of each test item for measuring the content domain can be scrutinized. In addition, problems of content-irrelevance can be identified. The current version of the *Standards for Educational and Psychological Testing* (AERA, APA & NCME, 1999) underscores the need for providing evidence of domain representation:

> Test developers should provide evidence of the extent to which the test items and scoring criteria represent the desired domain. This affords a basis to help determine whether performance on the test can be generalized to the domain that is being assessed. (p. 45)

CONTENT VALIDITY STUDIES

Most, but not all, studies of content validity require content experts to review test specifications and items according to specific evaluation criteria. Thus, a content validity study typically involves gathering data on test quality from professionals with expertise in the content domain tested. Content validity studies differ according to the specific tasks presented to the experts and the types of data gathered. One example of a content validity study is to give content experts the test specifications and the test items and ask them to match each item to the content area, educational objective, or cognitive level that it measures. In another type of study, the experts are asked to rate the relevance of each test item to each of the areas, objectives, or levels measured by the test. Extensive discussions of such studies are provided by Crocker, Miller, and Franks (1989), Hambleton (1984), and Sireci (1998a). The data gathered from these studies can be summarized using simple descriptive statistics, such as the proportion of experts who classified an item as it was listed in the test specifications or the mean relevance ratings for an item across all areas tested. A 'content validity index' can be computed for a test by averaging these statistics over all test items. More sophisticated procedures for analysing these data have been proposed by Aiken (1980) and Crocker et al. (1989).

Sireci and Geisinger (1992, 1995) introduced a newer method for evaluating test content that requires content experts to make judgements regarding the similarity of the content measured by pairs of test items. These similarity data are analysed using multidimensional scaling to determine if the structure of the experts' similarity ratings is congruent with the structure outlined in the test specifications.

Other studies that also provide evidence of content validity are job analyses (referred to as practice analyses for licensure testing) and sensitivity reviews. As mentioned earlier, job analyses are often conducted to operationally define the content domain to be tested. Data gathered from such analyses can be used to derive weights (e.g. proportions of test items) for specific content areas as well as to defend the specific areas tested. In a sensitivity review, experts in cultural diversity inspect test items to check whether content bias may be present (Sireci & Mullane, 1994). Such studies can identify items that introduce construct-irrelevant variance, such as differential familiarity of item context across cultures or sexes.

FUTURE PERSPECTIVES

The term 'content validity' was widely used by the psychometric community until the middle 1970s when Messick and others proposed a unitary conceptualization of validity centred on construct validity (e.g. Guion, 1977; Messick, 1975; Messick,

1989). Proponents of this unitary conceptualization of validity suggest using terms such as 'content representativeness' in place of content validity because content validity focuses on the test itself rather than on inferences derived from test scores. This perspective was incorporated into the current version of the *Standards for Educational and Psychological Testing* (AERA, APA & NCME, 1999), which uses the phrase 'evidence based on test content' in place of content validity. However, many test specialists believe content validity is a legitimate term since evaluating test content is a critical aspect of defending the legitimacy of inferences derived from test scores (e.g. Sireci, 1998a, 1998b). Regardless of debates over terminology, the fundamental qualities described by content validity (i.e. domain definition and representation) will remain important criteria for evaluating assessments for as long as assessments are used to make inferences regarding individuals' knowledge, skills, and abilities.

CONCLUSIONS

Historically, as the stakes associated with psychological assessments increased, the methods used to evaluate the assessments also increased. The concept of content validity and the process of content validation emerged to address the limitations of purely statistical (correlational) approaches to test validation (Sireci, 1998b). Clearly, for interpretations of assessment results to be valid (a) the content of a test needs to be congruent with the testing purpose, and (b) the content areas to which an assessment is targeted need to be adequately represented. Thus, content validity is a prerequisite for valid interpretation of many educational and psychological assessments. In evaluating content validity, the adequacy of the domain definition, the degree to which the test represents the content domain, and the relevance of the test items to the domain should be studied.

Note

1 The terms 'content domain' and 'construct' are sometimes used interchangeably. As the 1985 version of the *Standards* stated 'there is often no sharp distinction between test content and test construct' (American Educational Research Association [AERA] APA & National Council on Measurement in Education [NCME], 1985: 11).

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RELATED ENTRIES

VALIDITY (GENERAL), CRITERION-REFERENCED TESTING: METHODS AND PROCEDURES, VALIDITY: CRITERION-RELATED, VALIDITY: CONSTRUCT, THEORETICAL PERSPECTIVE: PSYCHOMETRICS CLASSICAL TEST THEORY, STANDARD FOR EDUCATIONAL AND PSYCHOLOGICAL TESTING

VALIDITY: CRITERION-RELATED

INTRODUCTION

Criterion-related validity involves verification that a test score is systematically related to an external variable. The current view on validity in the 1999 *Standards for Educational and Psychological Testing* (AERA, 1999) stresses the unity of psychological theory, evidence, and consequences in supporting the validity of a test used for a particular purpose. Seldom is there a direct use of a test for decision-making, however, that cannot be cast into a framework in which criterion-related validity applies.

For many types of educational and psychological tests, the accurate prediction of a criterion of interest is the primary virtue of the test score. Investigations of criterion-related validity justify using a test for employee selection, college admission, or clinical diagnosis when they demonstrate a correlation between scores on the predictor test and a relevant criterion of success or correct classification and treatment. However, many situations arise in test use in which the relevance of criterion-related validity is less apparent. When an achievement test is used in a high-stakes environment to identify students unprepared for high school, or when a licensure exam is used to deny a teaching credential, the justification for test use is typically based on the relevance of test content to high school coursework or teaching practice. In these settings, poor test performance presumably indicates likely failure in the criterion situation. The difficulty of distinguishing the importance of test content, the statistical relationship of a test to a criterion, and the construct interpretations of both characterizes the unitary view of validity in the 1999 *Standards*. Thus, the approach to validity described here should be understood in the broader context of current professional standards on validity as a unitary concept.

Studies of criterion-related validity represent one area of test validation research in which quantitative evidence is used to endorse or challenge the legitimacy of actual test use. The combined roles of theory and judgement are critical in forming validity arguments. Yet their influence in actual test use (e.g. individualizing instruction for students in an elementary school) is documented directly in the relation of the test score to an external variable closely matching the desired outcome (e.g. higher achievement from instruction matched to students' developmental level). In this sense, criterion-related validity has been described as an 'external aspect of construct validity' (Heubert & Hauser, 1998). This is precisely why criterion-related validity is so important when tests are used to make high-stakes decisions.

THE CRITERION PROBLEM

Establishing the criterion-related validity of a test presumes the availability of a measurable outcome of interest. A test designed to predict success in a job training programme requires a reliable, valid measure of that success to establish criterion-related validity. This measure could be a supervisor's rating of job performance, a direct measure of productivity such as sales transactions or units assembled, an evaluation of a work sample, or simply the number of days present on the job. Actual measures of criterion performance frequently receive less attention than the tests designed to predict them, rendering the criterion itself the weak link in the argument supporting validity of the predictor.

Although the criterion problem has received much attention in the literature, particularly in personnel and military psychology criterion measurement remains plagued by problems of inadequate construct definitions and poor instrumentation. A supervisor's rating of an employee's performance can be influenced by a host of factors irrelevant to the construct of interest, such as a response set that homogenizes staff ratings to prevent employee tensions or some other halo effect based on employment history.

A quantitative measure of success in school, such as grade-point average, is influenced by course-taking patterns, varying standards, and lack of agreement within an institution about the meaning of grades. The measured outcome of a response to treatment may be a subsequent clinical assessment influenced by the biases of an examiner. In each of these examples, inadequate criterion measurement confounds the interpretation of findings from a criterion-related validity study.

PERTINENT DATA AND LIMITATIONS

In most settings, criterion predictions are based on a linear regression model of the form

$$Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \beta_3 X_{i3} + \cdots + \beta_p X_{ip} + \epsilon_i, \quad (1)$$

where Y_i is the score of person i on the criterion, X_{ij} is the score of individual i on predictor j, β_j is the raw-score regression weight of predictor j, β_0 is the intercept, and ε_i is the error of prediction. The X_{ij}'s may be, for example, subscores on a test of general cognitive ability and Y_i an achievement composite. Estimates of the regression weights and intercept would come from a random sample of reasonable size given the number of predictors in the model. The squared multiple correlation between Y and the X_j's describes the strength of the linear relationship in equation (1), and the standard deviation of the ε_i's indicates the average magnitude of a prediction error. Cross-validation techniques are sometimes used to evaluate the stability of a prediction equation in repeated random sampling (Mosteller & Tukey, 1977).

Unfortunately, the data needed to obtain unbiased estimates of the true relationship between a predictor and criterion are seldom available as random samples from the population of interest. Typically, samples from the bivariate or multivariate distribution of predictor(s) and criterion are available only for the subpopulation that satisfies the selection rule being validated. A medical school entrance exam may yield scores for the entire applicant pool, but grades exist only for the students still enrolled when the validity data are gathered. The selection effects present in these data may involve either explicit selection on the predictors or criterion, or a more complex phenomenon. Careful analysis of the sampling conditions that produce the data for a criterion-related validity study can reveal selection to be multivariate and even probabilistic in the sense that other potential influences on selection are unknown. These circumstances make estimating correlations and prediction equations problematic.

MODELLING SELECTION IN PREDICTION SETTINGS

If selection is multivariate and/or probabilistic, equations that predict the performance of future applicants based on a selected sample are biased. Specification error exists in the choice of predictors, i.e. the selection mechanism yielding the sample is not explicitly part of the prediction equation. Analytic procedures have been developed to adjust correlation coefficients and regression parameters for this type of specification error. The Pearson–Lawley corrections for range restriction due to explicit or incidental selection are the most widely used adjustments in education and psychology. In the simple case of explicit selection on a single predictor, the adjusted predictor–criterion correlation for the unselected population is

$$R_{XY} = [(S_X/s_X)r_{XY}]/[1 + (S_X^2/s_X^2 - 1)r_{XY}^2]^{1/2}, \quad (2)$$

where r_{XY} is the predictor–criterion correlation in the selected sample, and S_X and s_X are the predictor standard deviations in the unselected population and selected sample, respectively. Multivariate selection problems are discussed in Gulliksen (1987).

The Pearson–Lawley corrections belong to a group of methods that address specification error in regression models (Muthen & Joreskog, 1983). More recent approaches model the selection process with available surrogates for true selection variables (Rosenbaum & Rubin, 1983). These approaches estimate the probability of selection for each observation in the sample (a propensity score), and use that probability as a predictor in the regression equation. The propensity score can be estimated by regressing a dichotomous indicator (1 = selected, 0 = not selected) on the selection variables to yield an equation of the form

$$\text{logit}(p_i) = \gamma_0 + \gamma_1 Z_{i1} + \gamma_2 Z_{i2} + \gamma_3 Z_{i3} + \ldots + \gamma_q Z_{iq} + \epsilon_i, \quad (3)$$

where p_i is the probability of selection for person i and $Z_1, \ldots, Z_q$ are the explicit selection variables (note that a probit function can also be used). Including the propensity score as a predictor in equation (1) adjusts other parameter estimates for selection bias (Little & Rubin, 1987).

VALIDITY GENERALIZATION AND SITUATIONAL SPECIFICITY

A major concern in establishing criterion-related validity evidence is whether local conditions of test use influence the predictor–criterion relationship in such a way that validity evidence collected in one setting does not apply in another. This describes the hypothesis of situational specificity (Ghiselli, 1966). The methods of validity generalization expand the modelling described earlier to include distinct features of local validation studies and to estimate their influence on variation in criterion-related validity evidence.

The methods of validity generalization identify sources of variation in the correlations between predictors and criteria across validity studies. These include differences across studies in (1) sampling error, (2) range restriction, (3) predictor and criterion reliability, (4) validity of the criterion, (5) errors in the recording of data, (6) factorial composition of predictors, and (7) true situational specificity (Schmidt & Hunter, 1977). The first three of these are simply statistical artefacts that influence any criterion-related validity study; the others represent aspects of variation across studies with more complex implications for the validity generalization hypothesis. This hypothesis is tested by determining the proportion of variance in observed validity coefficients due to artefacts and then removing that variance from the interval estimate of the true validity of the predictor.

Since the early 1980s, empirical studies using these methods have repeatedly demonstrated that much of the variance in predictor–criterion correlations can be explained by statistical artefacts. However, the estimates of cross-study variance are based on assumptions about, for example, the independence of errors in estimating validity coefficients or the comparability of predictors and criteria across studies (Hedges, 1988). The 1999 *Standards* recommend clear articulation of these assumptions when relying on the results of a validity generalization study as support for local use of a test for prediction, selection, or placement.

The sensitivity of validity generalization procedures to violated assumptions has been considered by Hartigan and Wigdor (1989). Like any meta-analytic technique, validity generalization relies on samples of available criterion-related validity studies for inferences about true validity. Hartigan and Wigdor argue that few such samples are randomly drawn from a population of settings in which the test's validity for selection, placement, or clinical diagnosis is of interest. Sampling conditions, such as a tendency toward higher validity coefficients in published studies, can produce unknown biases in inferences from validity generalization studies. When results are used to support the local use of a test, the similarity of the local setting to the effective population sampled is critical.

For the most part, the methods of validity generalization have been used in analyses of correlation coefficients because the measurement units of predictors and criteria may be only roughly comparable across studies. Although these methods have been extended to regression slopes and intercepts, studies of the generalizability of regression equations have been limited because of the need for comparable predictor and criterion units of measurement. These conditions do occur in academic settings with a common, nominal grading scale or in organizations such as the military in which multiple training sites use the same predictor and criterion measures. Bayesian and empirical-Bayesian methods have been developed for estimating slopes and intercepts across colleges or training sites in these cases (Novick, Jackson, Thayer & Cole, 1972; Braun, Jones, Rubin & Thayer, 1983). Such methods use prior distributions on the parameters to shrink estimates of slopes and intercepts toward common values across studies.

DIFFERENTIAL PREDICTION AND PREDICTIVE BIAS

Uses of tests for prediction, selection, and clinical diagnosis require demonstration of dependable relationships between predictors and outcomes for examinees with different background characteristics. In some prediction contexts, the

influence of background variables is critical to a classification function the test might serve; in others, it is inimical to fair test use.

In clinical diagnosis or job placement, criterion-related validity hinges on the test or test battery discriminating among individuals in need of different treatments or better suited for particular job training programmes. This type of *differential* prediction (i.e. a test's ability to measure accurately differences among individuals that suggest distinct courses of action) requires several types of empirical evidence related to the probability of correct classification. If a profile of test scores is used to recommend a psychological treatment, then the reliabilities of differences between tests are of interest. Correlations with external variables that support the convergent and discriminant validity of the profile, usually considered as an aspect of construct validation, become inseparable from the battery's effectiveness in placing individuals in appropriate treatment categories. Adequate reliabilities of difference scores and patterns of correlations with external variables consistent with clinical outcomes together suggest the validity of a classification function based on profile scores.

The influence of background characteristics in predicting criterion performance of candidates in personnel selection or college admissions can have a direct impact on the fairness of a single selection rule for all candidates. Thus, the criterion-related validity of a test-based decision should be supported by analyses of differences between prediction systems for subgroups of an applicant pool defined by gender, ethnicity, or other demographic characteristics of social importance to fair selection. Prediction systems might differ in the conditional variance of criterion scores given the predictors, or in the slopes and intercepts of the prediction equations. The former suggests greater certainty in decisions made about members of one group because there is less chance of error in the prediction system for that group. The latter suggests predictive bias, namely that the expected criterion scores for members of each group differ systematically depending on whether predictions are based on a within-group or combined-group regression equation (Cleary, 1968).

Although empirical studies have demonstrated contrasting prediction systems within an organization for groups defined by gender or ethnicity, attributing the differences to predictive bias or showing the systems are unfair has been difficult in practice. Comparisons of within-group regression equations are limited by the same real-data problems as criterion-related validity studies in general. Statistical artefacts such as differential range restriction can produce apparent differences between prediction systems (Linn, 1983). Moreover, when differences are stable, combined-group equations often favour the focal group in the comparison by yielding predicted scores higher than those based on the within-group equation. The type and quality of the criterion measure (e.g. a hands-on measure of job performance vs. a test of job knowledge) can also influence differences between prediction systems (Wigdor & Green, 1989).

FUTURE PERSPECTIVES AND CONCLUSIONS

Local criterion-related validity studies serve important purposes despite the methodological concerns discussed. A well-designed local validation study clarifies local norms for test and criterion performance as well as local standards for selection and placement. Such studies are essential in the high-stakes testing environments that have become common place in psychology and education. Without this information, it is difficult to evaluate the possible effects of statistical artefacts on assessments of criterion-related validity, let alone know the extent to which situational specificity exists. Recognizing the limits of local validation helps to establish an interpretive framework for understanding and using test results, drawing from other perspectives on test validity described in this volume. Even if a local validation effort fails to produce conclusive evidence on the defensibility of selection, placement, or clinical practices, its role in clarifying the issues to be resolved remains important. In this context, combining the results of local validation efforts with knowledge from generalized validity builds the foundation of criterion-related evidence required by the 1999 *Standards* and needed to make informed decisions from test results.

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RELATED ENTRIES

VALIDITY (GENERAL), VALIDITY: CONTENT, VALIDITY: CONSTRUCT, PREDICTION (GENERAL), PREDICTION: CLINICAL VS. STATISTICAL, THEORETICAL PERSPECTIVE: PSYCHOMETRICS, CLASSICAL TEST THEORY, STANDARD FOR EDUCATIONAL AND PSYCHOLOGICAL TESTING

V VALUES

INTRODUCTION

The goal of this entry is to summarize current approaches to human values assessment. Values are (1) beliefs about preferable end states or behaviours, and (2) internal criteria that guide information processing, evaluation of the internal and external world of a person, and selection of behaviour. Values are part of the system of personal meanings, including personal identity and purpose in life.

The entry begins with a summary of theories of values and methodological dilemmas concerning the measurement of values. Following this, selected measures are described and the entry ends with a short review of current research trends and future perspectives in the field of value assessment.

THEORY AND DEFINITION OF VALUE

There have been two general and contrasting approaches to the study of human values: an objectivistic and subjectivistic approach. According to the objectivistic approach value is an autonomous property: an objective quality inherent in the structure of reality which can be recognized and described (realism – Aristotle, Aquinas), or a metaphysical idea which cannot be observed, but which is knowable by intellectual

intuition (idealism – Plato, Sheler). From this point of view, a person lives in a world of values which are given, and human recognition of values can be in agreement or in disagreement with the objective order of values.

According to the subjectivistic approach human values are the results of a valuing process. One of the most important characteristics of a human being is an ability to create values of different kinds: spiritual values like moral, aesthetic, cognitive, and religious ones, or economic and material values.

This basic distinction can give rise to controversy about the status of value judgements which can be right and true or wrong and false, or which are arbitrary and incapable of any justification. A social scientist's approach to the study of values is usually derived from the subjectivistic conception, for the main subject of his or her study is the personal (subjective) construction of the world. Thus, in social sciences, a value is a belief about what is good or bad, right or wrong, worthy or unworthy, desirable or undesirable, and so forth. However, on the social or cultural level values are treated as intersubjectively valid conventions – 'objective' – which means that values on a collective level are shared by groups of people and/or organizations.

According to economic criteria which influence the current theory of values, value is the worth of a thing, and valuation is estimation of this worth. In psychology, values are defined in terms of beliefs about preferable end states or behaviours, and/or internal criteria that guide evaluation of the internal and external world of an individual and the selection of behaviour. The idea is expressed in a classic definition given by Kluckhohn: 'A value is a conception, explicit or implicit, distinctive of an individual or characteristic of a group, of the desirable which influences the selection from available modes, means, and ends of action' (1951: 395).

Personal values as beliefs are closely related to the self. Both cognitively and humanistically oriented writers have pointed to the general relevance of values for personality integration and well-being (Allport et al., 1960; Feather, 1975; Maslow, 1971; Rokeach, 1973). Values stand for a sense of continuity in life in spite of the changes, and in this way contribute to personal identity. The system of personal values underlies the process of meaning-making concerning oneself, the external world, and one's relation with it. Moreover, commitment in personal goals and strivings which are formulated in close correspondence to personal values contribute to our understanding of the world and provide the basis for meaning of life.

One of the most widely accepted definitions of value, as formulated by Rokeach, is as 'an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end-state of existence' (1973: 5). Hofstede defines value as 'a broad tendency to prefer certain states of affairs over others' (1980: 15). Such values operate as criteria by which a person evaluates things according to their importance. The values influence selectivity of perception, information processing, and they provide non-specific guidelines for the selection of goals. Schwartz, who considers values as cognitive representations of human goals, proposed a comprehensive definition: 'Values (1) are concepts or beliefs, (2) pertain to desirable end states or behaviours, (3) transcend specific situations, (4) guide selection or evaluation of behaviour and events, and (5) are ordered by relative importance' (1992: 4).

VALUES ASSESSMENT: WHAT TO MEASURE AND HOW TO MEASURE?

Basic assumptions concerning the nature of values affects the way in which values are assessed. Morris (1956), for example, proposed a distinction between *operative values* which function as criteria for estimation of stimuli and choices, and *conceived values* which are beliefs about what is preferable or desirable in life. Such a conceptual distinction is reflected in value measurement. When values are defined as operative criteria underlying human choices, the best way to investigate such values is to observe respondents' decision making behaviour on the basis of their preferences. However, conceived values can be investigated by asking people to say which value is more important for them than others.

Another assumption concerns the organization of values by the individual. Assuming that values are hierarchical by nature, an ipsative design for their measurement has been proposed (Rokeach,

1973). The fact that personal values are integrated into a system has important implications for the study of values, which should cover a broad scope of values simultaneously considered by a person who, for example, is to rank them on the basis of their relative importance. This idea constitutes a main difference with assessment techniques in personality questionnaires in which the items are usually additive, and has been applied in numerous measures for value assessment. As Rokeach argues: '*life is ipsative*, because decisions in everyday life are inherently and phenomenologically ipsative decisions' (1985: 162), and moreover such methods are sensitive to stability and change.

In spite of the common agreement that values function as a whole system, the assumption about a necessarily hierarchical order of values is not universally accepted. The non-hierarchical view allows for a more flexible measure of values which are rated according to their importance on independent scales, and the person can use their full range (Morris, 1956; Schwartz, 1992).

Another methodological problem concerns the potential influence of social desirability which limits the reliability of values assessment. Self-report measures, especially concerning values, are prone to socially desirable responding, so the measures and specific results ought to be checked in this respect.

When a list consists of a number of values of different kinds, for example terminal and instrumental, there is a problem of possible shifting on the subjective scales of importance that respondents use when assessing values. In order to avoid this problem, anchoring techniques can be introduced prior to the rating of the values (Schwartz, 1992).

The ipsativeness of some value measures causes problems with validity and reliability, as well as with the statistical interpretation of the data. Extreme ranks are more valid and reliable than middle ranks. To overcome the limitations of possible statistical interpretation of the data from ranking (and pair comparison) design, scores need to be converted into an interval-scale.

MEASURES OF VALUES

Measures of values are merely verbal measures, in structured and self-report formats. The most commonly used designs are judgement and magnitude estimation. The former involves the ranking of a set of proposed values in a list of alternative responses, with a paired comparison task as a particular variant of this format. Magnitude estimation involves the rating of each of the values on a proposed list (Davis, 1991).

General measures cover a broad range of human values, and specific domain measures focus on a defined type of values, such as interpersonal or social values, work values, moral values, or values related to health.

The most well-known measures of values are introduced in Table 1. (For a description of some other scales see: Braithwaite & Scott, 1991; Davis, 1991.)

CURRENT RESEARCH TRENDS

Numerous psychological studies of human values focus on similarities and differences in value preferences of particular groups and/or nations (Feather, 1975; Hofstede, 1980; Rokeach, 1973).

Stability and change of values on an individual as well as a social level represent another extensively investigated subject matter. Both longitudinal researches and cross-sectional comparisons show that value priorities are relatively stable over the life span of individuals, and do not change very much in society across time and social changes.

Other research focuses on empirical classification of values and on the basic structure of value systems. Cross-cultural research in numerous countries reveals ten universal motivationally distinct types of values (see: Table 1; Schwartz, 1992), and the existence of underlying dimensions that organize value systems: Openness to Change versus Conservation and Self-Enhancement versus Self-Transcendence. On the other hand Hofstede (1980) has found four basic dimensions: power distance, uncertainty avoidance, individualism, and masculinity–femininity. The results obtained by Johnston (1995) suggest two general dimensions underlying both the terminal and the instrumental values measured by RVS: individualism-achievement and collectivism-affiliation.

Some studies concern the relationship between values and traits, attitudes, or goals (Bilsky & Schwartz, 1994). One of the most intriguing questions deals with the relationship between

Table 1. The most important instruments for assessing values

Author	Method	Scales/Content	Items	Format
Charles Morris (1956)	The Ways of Living	13 'ways of living'; for example: 'cultivate independence, show sympathetic concern, wait in quiet receptivity'	Each way of living is described in a few sentences and represents a conception of a desirable life articulating definite value orientation	Rating: from 7 – 'I like it very much', to 1 – 'I dislike it very much'
Gordon W. Allport, Philip E. Vernon, Gardner Lindzey (1960)	The Study of Values (SV)	Six scales corresponding to six types of values: theoretical, economic, aesthetic, social, political, and religious	45 questions about preferences based on comparisons: part I – 30 questions with two alternative answers; part II – 15 questions with four possibilities. Each value enters 20 times.	Part I: indicating preferences by distribution of 3 points between two answers (3 and 0, or 2 and 1) Part II: ranking four possibilities from 4 – the most preferred, to 1 – the least preferred
Milton Rokeach (1973)	The Rokeach Value Survey (RSV)	Two lists of values: terminal values referring to desirable end states, and instrumental values referring to means and modes of human conduct	Two lists of 18 values; each value is described by label and explanatory phrase. Examples of terminal values are: comfortable life, equality, freedom, salvation, true friendship; examples of instrumental values are: clean, forgiving, helpful, honest, responsible.	Rank-ordering each set of values: from 1 – most important to 18 – least important
Shalom H. Schwartz (1992)	The Schwartz Value Survey (SVS)	Ten universal types of values: Power, Achievement, Hedonism, Stimulation, Self-Direction, Universalism, Benevolence, Tradition, Conformity, and Security	56 specific values defined in terms of general motivational goals; the values are named, with explanatory phrases in parentheses	Rating each value 'as a guiding principle in my life', using a 9-point scale: from 'supreme importance' (7), to 'not important' (0) and 'opposed to my values' (−1)
Leonard V. Gordon (1976)	The Survey of Interpersonal Values	Six interpersonal values: support, conformity, recognition, independence, benevolence, and leadership	30 sets of three statements	Choosing the most and the least important alternative

(*Continued*)

Table 1. Continued

Author	Method	Scales/Content	Items	Format
George W. England (1975)	The Personal Values Questionnaire (PVQ)	Two main value orientations in managers: pragmatism and moralism	66 concepts, such as productivity, my coworkers, or ambition, related to two main values	Rating the concepts on two dimensions: importance – high, average, or low, and meaning – the degree to which the concept is pleasant, right, or successful
Donald E. Super (1970)	The Work Values Inventory (WVI)	15 scales designed to measure values related to work motivation; for example: achievement, associates, creativity, economic return, and prestige	45 items; each scale has three items referring to work related values	Rating according to importance, using a 5-point scale

values and behaviour, and takes that as a starting point for possible prediction of goal activities undertaken by the person. Research in this field draws attention to modification of values, and, as a consequence, attitudes and behaviours, through a self-confrontation procedure. This method is based on cognitive dissonance between one's own preferences and the preferences of a particular reference group.

It is also possible to assess values by referring to ego development, self-actualization, self-transcendence, or psychological maturity. All these notions presume a definite role of a personal value system and valuation process in motivation and personality functioning. Such studies are often founded on the phenomenological-existential notion that one's life can be regarded as meaningful, when a person is able to find a relation between his or her behaviour and values. Similar methods deal with value systems of personal ideologies, ethical attitudes, and moral reasoning.

Research concerning work values has pointed to the relevance of value congruence between the person and organization. Organizational work values influence the choice of work and function as predictors of success in organizational settings. Other studies focus on the structure of values, value profiles and patterns, and value change (Roe & Ester, 1999).

FUTURE PERSPECTIVES

To compare the value systems among different groups of people, often originated from various nations or cultures, we need to examine the homogeneity of their preferences prior to intergroup comparisons. The reason for avoiding group comparisons, defined a priori by such variables like sex, age, or education, is that measures based on a central tendency can disguise real preferences or even value orientations of the subgroups in a given sample (Pitts, 1981).

Current methodological explorations are concerned not only with the validity and reliability of different value measures or the potential influence of social desirability on values assessment but also tend to develop new instruments based, for example, on a circumplex model (Locke, 2000). Current studies also search for new possibilities of psychometric and psychological interpretation of values and valuation by means of structural equations, multidimensional scaling and smallest space analysis (SSA), used for example to identify the underlying subset of values (Schwartz, 1992).

Asking for more specific interpretation of otherwise general values allows for comparisons among the personal worlds of different people and even among the worlds of different cultural

groups or communities. If on the methodological level people have the opportunity to express their specific interpretations of values, there is more chance that personal or cultural differences, as expressed in their own language, are revealed.

In the future the researcher can pay more attention to unique meanings of common values. As Hermans and Hermans-Jansen argue: 'each common value of each group is interpreted, more or less consciously, by each individual as part of his or her own personal narrative (i.e. valuation system)' (1995: 21). In cross-cultural or intra-group comparisons we are accustomed to referring to collective meaning of each value, like freedom or love. However, on an individual level we refer to personal interpretation of values (Hermans & Oles, 1994). Personal valuation refers to construction of a system of personal meanings, containing cognitive interpretations of personal experience combined with affective connotation. As the process of valuation includes cognitive, affective and motivational aspects of valuing, questions regarding the relationship between values and activities expressed in personal projects (Horley, 2000), or worries defined as increasing attention and perception of threats to valued goals (Schwartz et al., 2000), can be addressed. Currently developed measures designed to investigate disorganization of personal valuation (Hermans & Oles, 1996; Oles, 1991) tend to measure values indirectly by assessing virtues (Cawley III et al., 2000), or operating life philosophy (Boyatzis et al., 2000).

CONCLUSIONS

Over the past decades an interest in the problem of values has remained and has even grown. The psychological approach to value assessment deals with one of most prominent human phenomena: the ability to value. Despite the complexity of the subject under investigation researchers use rather simple methods for answering the questions arising in this field. Over the years, the design of the measures (ranking, or rating procedure) has not changed very much. The interest of researches, however, tends to change from the assessment of a priori defined values or value orientations to discovering basic or latent dimensions of value systems, on the one hand, and to the process of personal valuation, on the other hand.

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RELATED ENTRIES

Personality Assessment (General), Qualitative Methods, Attitudes, Theoretical Perspectives: Constructivism

V VISUO-PERCEPTUAL IMPAIRMENTS

INTRODUCTION

The assessment of visuo-perceptual impairment after acquired brain injury is a difficult task in clinical practice. There are different reasons for this, the first being that, unless the deficit is so evident that it becomes a handicap for everyday living, many people who are visuo-perceptually impaired are normally not even aware of their impairment. Second, the tests and tasks used to evaluate or assess visual and perceptual functioning may lack the necessary accuracy to be able to detect subtle variations. Third, organizing a precise and effective neuropsychological assessment of visuo-perceptual functions requires a thorough understanding and knowledge of the concept and theory regarding these functions. And fourth, people sustaining brain injury normally have cognitive, emotional, and behavioural disorders that normally interact with the visuo-perceptual deficit, especially attention, language, memory, and motor impairments. The correct neuropsychological assessment of these functions requires a trained neuropsychologist with expertise in this field.

The assessment of visuo-perceptual functioning must be preceded by a careful neuro-ophthalmological examination of the most elementary components of vision. This is due to the fact that visual defects may be confused with visual agnosic problems. In addition, it is necessary to delimit elementary and higher visual functions which are not always clearly differentiated.

The neurological exploration of visuo-perceptual functioning must include:

(a) Examination of visual fields.
(b) Assessment of visual perception of objects and pictures.
(c) Assessment of visuo-spatial orientation.
(d) Assessment of colour perception recognition.

(e) Assessment of visual scanning.
(f) Assessment of neglect.

THE EXAMINATION OF VISUAL FIELDS

In neuropsychology, the examination of the visual fields is important in order to detect hemianopsia and quadrantanopsia. Examination of visual fields is generally carried out in neuro-ophthalmology through perimetry in a task in which the patient maintains his/her gaze on a fixed point and must detect the appearance of a stimulus in another part of the perimeter of the visual field. The patient must therefore simultaneously perceive two points. After certain injuries to the occipital cortex, the ability to perceive two points simultaneously is impaired and such patients can only perceive one stimulus at a time. However, it is important to take into account that the results of visual field perimetry testing may be affected by attentional problems. In such cases, mistakes may be more determined by the attentional disorder than by visual field problems.

Another important part of the neuro-ophthalmological examination is the examination of eye movements and of the direction of the gaze, especially the elementary or reflex movements and the complex or psychomotor movements. The *reflex movements* examined here consist of a reflexive tendency to fix and follow the gaze on a point or object situated in the central visual field as the object moves to the right or to the left. This type of eye movement is associated with the lower part of the brain stem and the cortical posterior oculomotor centres. The *psychomotor movements* are studied in a more complex task, in which, for example, the patient must move the gaze to the opposite side of the object as the object remains in the visual field. These movements are associated with the anterior oculomotor centres of the brain and to the anterior zones of the frontal lobes which connect to these oculomotor centres. The examination of eye movements may be done clinically as well as by means of different electroencephalographic methods.

The Seville Neuropsychological Battery (BNS) (León-Carrión, 1998) includes the assessment of hemianopsia and hemi-inattention. A computer-adapted tachistoscopic letter cancellation test was developed in order to assess inattention and hemianopsias. The subject maintains the gaze fixed on a white point that appears at the centre of the computer screen while different letters appear in the centre of each of the four quadrants into which the computer screen is divided. The subject must not shift the gaze from the central white point and should press the space bar only when the letter 'O' appears.

The task is made up of three sub-tests: tachistoscopic attention of both eyes, tachistoscopic attention of the right eye and tachistoscopic attention of the left eye. In the first sub-test, the subject must use binocular vision, while in the second and third sub-tests, monocular vision of first the right, then of the left eyes are assessed separately. Using a discriminant function technique, Perez-Gil and Machuca (1999) reported a prediction rate of 66% of patients with brain injury, both severe and mild and normal controls. In a study by Tellado et al. (1999) a clear tendency of Alzheimer's Disease patients to commit a greater number of omissions was observed, thereby identifying a lower number of elements in the tachistoscopic tests that make up the BNS.

ASSESSMENT OF VISUAL PERCEPTION AND RECOGNITION OF OBJECTS AND PICTURES

To assess the visual perception of objects and pictures, different consecutive activities are examined. These activities examine the capacity to examine an object, to distinguish the essential features of an object and then to integrate these features into a pattern, the capacity to discriminate essential and non-essential characteristics, and the capacity to self-correct failed analysis.

The most relevant tests for the evaluation of visual perception and recognition of pictures and objects follow:

(a) *Luria/Christensen's Investigation of Higher Visual Functions* (Christensen, 1975). This test, which evaluates visual reception, is a qualitative clinical analysis of the perception of objects and their pictorial representation and the analysis on the basis of visual agnosia. The subject must first carefully examine different pictures of

simple clear objects and later identify complicated or confusing objects. Then pictures of scribbled objects, or of overlapping figures, must be examined and named (as Poppelreuter Overlapping Figures, 1917). Other times the subject will perform a few examples of Raven's Coloured Progressive Matrices Test (1965). People with occipital-parietal or frontal lesions, or with lesions in the right hemisphere, tend to err on these tests. No psychometric data has been provided because in the experimental and clinical traditions the Luria/Christensen Investigation yields more than in the psychometric tradition.

(b) *Recognition of Pictured Objects* (Warrington & Taylor, 1973). In this task subjects must identify familiar objects under two distorting conditions. The first condition is made up of 20 drawings that have been enlarged. The second condition is made up of 20 familiar objects photographed from a conventional and a non-conventional perspective.

(c) *Other tests*. There are other tests which evaluate visual perception and recognition such as the Face Recognition Test (Warrington and James (1967), the Test of Facial Recognition (Benton & Van Allen, 1968) or the Visual Form Discrimination Test (Benton et al., 1983). There are also tests designed to evaluate visual organization which use ambiguous, incomplete, fragmented, or fragmented and distorted figures. Examples of these are the Street Completion Test (Street, 1931) and the Hooper Visual Organization Test (Hooper, 1958). The Hidden Figures Test (Thurstone, 1944) evaluates visual organization using visual interference.

ASSESSMENT OF VISUO-SPATIAL ORIENTATION

Visuo-spatial orientation is assessed by evaluating the individual's ability to orient in space: up and down, right and left. Tests assessing these functions involve the analysis of spatial relationships and the arrangement of the lines which compose familiar figures, or discovering the similarities and differences between mirrored lines and figures, or drawing these figures, and so on. A similar task involves analysing the positions of the hands of a clock. Other tasks evaluate spatial orientation by showing the patient a map and asking for directions, asking the subject to draw a plan of his/her room, or to plan the route one would take to go from the office to the building's exit, and so forth.

ASSESSMENT OF COLOUR PERCEPTION AND RECOGNITION

The ability to selectively sense different light wavelengths allows the visual system to create the perception of colour. Colour vision is determined by the perception of the complex interactions of the proportions of wavelengths reflecting from a surface and the intensity of light. The areas involved in colour perception are the upper regions of both the left and right visual fields and the lower secondary pathway from the visual area in the occipital lobe to the temporal lobe.

Different tests can be selected for the assessment of colour perception and recognition. Among the more commonly known classic tests are:

(a) *The Farnsworth–Munsell 100-Hue and Dichotomous Test for Colour Vision* (Farnsworth, 1943). The patient must sequentially order colours which have subtle differences. Although this is a difficult task, it is very useful as it includes non-verbal assessment of any problems with pure sensory perception of colour.

(b) *The Colour Perception Battery* (De Renzi & Spinnler, 1967). This is a short battery that includes the Ishara plates, colour matching, colour naming, pointing to colour, memory for colour, and colour drawing. This battery seems to have a good discrimination validity.

(c) *Colouring of Pictures and Wrongly Coloured Pictures* (Damasio et al., 1979). This was created to distinguish colour agnosia from colour anomia. It consists of choosing a crayon from a multicoloured set and fill in drawings of a familiar figure with its own appropriate colour (e.g. banana with yellow). In the Wrongly Coloured Pictures Test subjects must name the wrong coloured pictures.

ASSESSMENT OF VISUAL SCANNING

Traditionally, visual scanning is assessed by means of two tests:

(a) *Elithorn's Perceptual Maze Test* (Elithorn et al., 1964). This test consists of a series of triangular or rectangular V-shaped lattices with dots randomly placed at various intersections of the lattice. The subject must find a pathway starting from the bottom towards the top and pass through as many dots as possible. The test highly correlates with both verbal and non-verbal intelligence tests and is very sensitive to brain damage, especially to lesions of the right hemisphere. This test is more related to the experimental tradition than to the psychometric tradition. Nonetheless, the test–retest correlation has been informed as 0.81.

(b) *Talland's Line Tracing Task* (Talland, 1965). This task is very similar to those found in line-mazes in the cross-word puzzle section of the newspaper. It consists of asking the subject to find, among all the lines, which is the one that connects one object to another.

ASSESSMENT OF NEGLECT

Clinicians define neglect as failure of the individual to report, respond to, orient towards, or interact with objects or people generally (but not always) situated in the visual field opposite to the hemisphere in which the brain lesion is located. Left neglect after right brain damage is more common than right neglect. Normally, people with neglect have problems with objects situated on the left side, in dressing and washing his/her left side, in eating from the left side of the plate, in seeing the left part of drawings, and so forth. It is insidiously disruptive and affects daily living activities. Hemi-inattention is another term used to refer to a patient's failure to attend or respond to a stimulus specific to a hemifield.

Cancellation tests are the most common tasks used to assess neglect and among them Bells Test (Gauthier et al., 1985) and Start Cancellation (Hallingan et al., 1991) are widely used. In this type of test, patients must localize and cross out or tick different-sized letters or stars, or a letter, star or word of a given size on a page covered with letters or words. Generally, individuals with hemi-inattention will neglect the targets situated in a hemifield of the page. The Assessment of Inattention and Neglect from the Seville Neuropsychological Test Battery (León-Carrión, 1998) is a computerized tachistoscopic test in which subjects must detect the letter 'o' when it appears in the centre of one of the four quadrants into which the computer screen has been divided. Another test used for assessing neglect is the Line Bisection Test (Schenkenberg et al., 1980), in which the patient is asked to bisect a 20 cm line drawn on an A4 paper. Abnormality is considered for a bisection point of 6.5 mm or more from the midpoint. In the Clock Drawing Task the patient is asked to draw the face of a clock from memory; failure to draw a complete circle with the numbers 1–12 written and spaced inside the circle is considered abnormal. Another test is the Behavioural Inattention Test (Wilson et al., 1987).

FUTURE PERSPECTIVES AND CONCLUSIONS

Disorders of visuo-spatial perception, visual agnosia, and neglect are common neurological illnesses and a great many patients are not aware of having these disorders. Even though current neuropsychological testing and clinical exploration are very useful in detecting these disorders, during the coming years the relationship that exists between the nature of neglect, the localization of the lesion, and the sensitivity and specificity of the neuropsychological tests currently in use should be established. This is important given that some of these tests may be measuring different aspects of visuo-perceptual disorders.

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RELATED ENTRIES

Applied Fields: Neuropsychology, Neuropsychological Test Batteries

V VOLUNTARY MOVEMENT

INTRODUCTION

Voluntary movements are the only means by which the human mind can communicate with the outside world and other minds. Be it speech, facial expression, manipulation of objects, gesturing or simply pressing a button – the mind cannot manifest itself otherwise than by directing movements of the body. Consequently, the range of behaviours that could be subsumed under the heading 'voluntary movement assessment' is infinite.

This entry will concentrate on a very limited range of motor behaviours which neuropsychological tradition considers as giving rise to 'high level' disorders of motor control. They are summarized in Table 1. The rather vague and ill-defined term is meant to signify that disorders are neither purely motor nor purely mental but arise at the interface between mental processes and motor control or, respectively, between the mind and the body.

One class of such disorders is frequently subsumed under the term 'apraxia'. They are

Table 1. Summary of voluntary movement disorders

Disorder	Assessment
Apraxia	Presentation of meaningless gestures for imitation Verbal request for demonstration of meaningful gesture Presentation of tools and objects for demonstration of use
Grasping and groping	Presentation of stimuli in immediate vincinity of hand
Utilization behaviour	Presentation of tools and objects without instruction to use them
Imitation behaviour	Presentation of gestures or actions without instruction to imitate them

characterized by spatially misoriented or awkward movements. Other than in 'elementary' motor disorders the same movements which give rise to errors in one condition can successfully be performed in other conditions and success or failure depend on factors not directly related to motor control. Such factors may be the communicative meaning of a gesture or its relationship to tools and objects. Another class of 'high level' motor problems is constituted by well executed and apparently purposeful movements which do not conform to the subject's intentions.

Even this restricted range of motor behaviours is very heterogeneous. There is thus no standard assessment for all of them. Selection of appropriate diagnostic measures depends on the examiner's conjectures of likely disturbances in the individual patient. These are guided by knowledge of the brain – behaviour relationships, by the patients' own complaints and by observation of their spontaneous behaviour.

APRAXIA

The concept of apraxia was elaborated by Hugo Liepmann (1908) nearly a hundred years ago. Liepmann noted that patients with left sided brain damage committed errors when performing motor actions with either hand. Most of these patients were also aphasic but he found apraxic patients without aphasia, and argued convincingly that faulty motor actions could not be explained as being a sequel of language impairment. He proposed instead that only the left hemisphere is capable of translating a concept or mental image of a desired action into appropriate motor commands. The nature of left hemisphere motor dominance and its relationship to language gave rise to various conflicting interpretations and remains an unsettled question after 100 years of research (Rothi et al., 1997; Heilman & Rothi, 1993; De Renzi, 1990; Geschwind, 1975; Kimura & Archibald, 1974).

Three kinds of actions are traditionally investigated for a clinical diagnosis of apraxia, because they yield clear manifestations of apraxic errors: imitation of gestures, demonstration of meaningful gestures, and use of tools and objects.

Imitation of Gestures

Patients understand the request to imitate (if they do not, apraxia cannot be diagnosed) and try to attain a gesture resembling the demonstration, but the resulting posture is spatially wrong. The problem concerns the definition of the target posture rather than its motor execution, and patients commit errors also when asked to replicate the gestures on a mannikin or to match photographs of the same gestures performed by different persons seen under different angles of view (Goldenberg, 1995, 1999).

Clinical Assessment

It is preferable to test meaningless gestures as they give an uncontaminated insight into the ability to imitate the shape of gestures. Imitation of meaningful gestures may be accomplished by recognition of their meaning and subsequent reproduction without copying the shape of the gesture. The examiner sits opposite the patients and demonstrates the gestures 'like a mirror' using the right hand for left hand imitation and vice versa. Patients should always use the hand ipsilateral to the lesion. They are allowed to start imitation only immediately after demonstration. The severity of impairment may vary according to which body parts are involved. Whereas imitation of hand postures is impaired only in patients with left brain damage, imitation of

finger postures and – to a minor degree – also foot postures is sensitive to both left and right brain damage (Goldenberg, 1996).

Meaningful Gestures

Patients are unable to demonstrate meaningful gestures on command. Such gestures may either have a conventionally agreed, more or less arbitrary, meaning like 'somebody is nuts', 'military salute', or 'okay', or they may indicate objects by miming their use. Outside the testing situation the deficit can be observed when aphasic patients try to express themselves in spite of severe language impairment. They either do not employ gestures at all or produce amorphous and incomprehensible gestures.

Clinical Assessment

Usually, diagnosis concentrates on miming of object use, because aphasic patients may not understand the verbal label of gestures with conventional meaning, whereas comprehension of the object name can be facilitated by showing either the object (e.g. a hammer, a key, a screwdriver) or a picture of it. Even with this help, understanding of the instruction may be problematic. A diagnosis of apraxia should be made only if patients respond to the presentation of the object with a movement of the hand which can be clearly distinguished from spontaneous 'baton' movements accompanying attempts of verbal expression. A further difficulty is posed by the great variability of gesture performance in normal subjects. For example, the replacement of the absent object by the hand ('body part as object': e.g. brushing teeth with the index rather than demonstrating the manipulation of a toothbrush) is a strategy frequently employed to indicate an absent object when the verbal label is lacking (e.g. when trying to buy a toothbrush in a country the language of which one does not speak). There are, however, errors which unequivocally indicate apraxia:

- Perseveration of a more or less amorphic movement (e.g. a circling movement above the table or repeated hitting of the fist against one's chest).
- Pointing to the location where the object should be applied (e.g. pointing to the mouth for a toothbrush or to the table for a pencil).
- Searching movements of the hand and fingers which eventually result in a recognizable pantomime ('conduite d'approche').

Use of Tools and Objects

Use of tools and objects is awkward and faulty. For example, patients press the knife perpendicularly into the loaf rather than making a slicing movement or press the head of the hammer upon the nail and turn round rather than hitting the nail. Difficulties increase when patients perform chains of actions involving multiple tools and objects (e.g. preparing a meal), and when actions require comprehension of technical and mechanical constraints and mechanical problem solving (e.g. fixing household repairs or handling unfamiliar electronic equipment).

Clinical Assessment

Patients are presented familiar objects like a padlock with a key, a hammer and a nail, a comb, or binoculars and are asked to use them. More demanding probes are to provide a sheet of paper, a perforator, and a folder, and to ask the patient to punch the paper and insert it into the folder, or to ask the patient to put together a pocket lamp from its parts. Multi-step actions involving several objects like preparation of coffee or a meal and performance of technical tasks put demands on memory and executive function over and beyond specific knowledge of tool and object use (Schwartz et al., 1999).

Kinematic Measurement

Clinical assessment of apraxia can be complemented by kinematic registration of the path and temporal evolution of movements (Bizzi & Mussa-Ivaldi, 1990; Jeannerod et al., 1995). Abnormal kinematic features have been documented when patients with apraxia imitated movements or performed pantomime of object use (Poizner et al., 1995; Hermsdörfer et al., 1996), but it is not sure whether they reflect disturbed motor control. It may be that difficulties arise at a higher level and concerns not motor control but the determination of the target which should be reached by appropriate motor actions. Degradation of

movement kinematics may be due to subsequent hesitancy and insecurity and thus be a reaction to rather than the cause of problems.

MOTOR ACTIONS NOT CORRESPONDING TO SUBJECTS' INTENTIONS

Grasping and Groping

When getting in touch with an object, the affected hand grasps it. It may also grope for visually perceived objects located in its proximity and grasp them. Few patients are able to suppress the grasp reaction by an effort of will. The majority have to interfere with their sound hand to loosen the grasp. They may sit on their hand or permanently place an object into it to prevent it from clenching external objects.

Clinical Assessment

The examiner moves a finger or a comparable object over the palm exerting some pressure on skin. The patient's hand will grasp it even when explicitly advised not to do so. For eliciting groping an object is held close to the patient's hand and slowly withdrawn. The hand follows the object in spite of an explicit advice not to do so.

Utilization Behaviour

Patients use objects which happen to be within their grasp in a way which is appropriate to the object but not to the situation. For example, they may take glasses which the examiner has laid down and put them on their nose, or they may take a stamp and repeatedly press it on a sheet of paper.

Clinical Assessment

Care must be taken to distinguish utilization behaviour from enhanced suggestibility of brain damaged patients. If, for example, the examiner interrupts testing and puts objects on the table without commenting on their purpose and waits for the patient's reaction (Lhermitte, 1983), patients may understand this as a non-verbal invitation to use the objects. It is therefore preferable to have attractive objects (e.g. glasses, matchbox, cigarettes, a pack of cards, a filled bottle and a glass) installed in the periphery of the table already when the patient enters the room, to engage the patient in an unrelated conversation or test, and to observe their spontaneous behaviour (Shallice et al., 1989).

Imitation Behaviour

Although not requested to do so, patients imitate gestures and actions of the examiner or other persons. For example, patients may take off their glasses when the examiner does so or repeat back questions rather than answering them. An explicit command not to imitate can stop imitation but introduction of a pause is sufficient for reappearance of imitation. When asked why they imitated patients are puzzled and say nothing or they claim that they thought this was the implicit request made by the examiner (De Renzi et al., 1996).

Clinical Assessment

The diagnosis rests mainly on observation of spontaneous behaviour during conversation and testing. Avoidance of non-verbal requests to imitate can be very difficult when gestures are introduced explicitly for provoking imitation behaviour.

FUTURE PERSPECTIVES AND CONCLUSIONS

The selection of topics for this entry may be accused of a certain arbitrariness. It might be argued that utilization and imitation behaviours are behavioural rather than motor problems while reaching and grasping may be considered as demanding high level motor control and hence deserving inclusion in this entry too. Possibly, this arbitrariness points to the deeper problem of distinguishing between mental processes and their motor expression. The delineation and assessment of disorders of voluntary motor control depends heavily on theoretical models of brain behaviour relationships. It is likely that further evolution and progress of cognitive neuroscience will change the daily routine of clinical assessment of voluntary motor disorders.

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RELATED ENTRIES

APPLIED FIELDS: NEUROPSYCHOLOGY, NEUROPSYCHOLOGICAL TEST BATTERIES

WELL-BEING (INCLUDING LIFE SATISFACTION)

INTRODUCTION

Over the past quarter century, measures intended to assess Subjective Well-Being (SWB) have substantially increased, in terms of both the number of measures available and the sophistication of these measures. In this entry, we will briefly review a selected sampling of such measures, as well as some of the issues surrounding assessment in this domain. After defining the relevant constructs, we will present sections on measurement issues, measures of life satisfaction, measures of positive affect, general measures of well-being, and measures of low negative affect. A section focused on future issues and directions will be followed by a final section of conclusions.

DEFINING SUBJECTIVE WELL-BEING

Most investigators engaged in research on SWB conceptualize it as a multi-faceted domain of interest, rather than as a unitary construct. A representative definition is provided by Diener, Suh, Lucas, and Smith (1999): 'Subjective well-being is a broad category of phenomena that includes people's emotional responses, domain satisfactions, and global judgments of life satisfaction' (p. 277). People's emotional or affective responses (including both moods and emotions) represent 'on-line' (Diener, 2000: 34) evaluations of events that are happening to them. Judgements of life satisfaction represent broader, more cognitively based evaluations of one's life as a whole (Pavot & Diener, 1993), and domain satisfactions represent evaluations of specific aspects of one's life (e.g. work satisfaction, marital satisfaction). These components often are substantially correlated; yet, when measured separately, they frequently account for unique variance when predicting overall SWB, and therefore are properly assessed independently with specifically dedicated instruments. Although early attempts at assessment often involved very simplistic measures (in many cases, a single item) intended to capture the whole domain of SWB, most contemporary measures incorporate multiple-item formats and are focused on only one component of SWB.

MEASUREMENT ISSUES

Researchers who intend to assess some aspect of SWB should be aware of a number of factors which could influence the validity of their efforts. In this section, we will briefly present some of the more prominent threats to validity, and suggest some possible methodological strategies which should serve to reduce these threats.

Reliability Issues

As noted above, many early efforts to assess SWB relied on a single item embedded in a multiple purpose questionnaire. Although single-item measures do appear to have some degree of validity,

their test–retest reliability is often relatively low (Schwarz & Strack, 1999), and their internal consistency is impossible to determine. For reasons of reliability, the use of single-item self-report measures of SWB should be avoided, where possible, in favour of multiple-item measures. Most contemporary measures of SWB incorporate a multiple-item structure, and as a consequence typically have good psychometric characteristics.

Contextual Influences

Summarizing evidence from a number of studies, Schwarz and Strack (1999) made a strong case that momentary mood states or relatively trivial contextual events (e.g. finding a dime) can influence reports of global SWB, under some circumstances to a substantial degree. Single-item measures of SWB are particularly vulnerable to momentary contextual influences. A methodological step that can serve to reduce the influence of momentary contextual effects is to assess the respondent's SWB on multiple occasions, rather than at only one point in time. These multiple assessments can then be averaged into a composite SWB score. This procedure can effectively reduce the effects of momentary contextual influences, assuming that the contextual influences at Time 1 are different than at Time 2, and so on.

Response Artefacts

As is true with all self-report measures, self-reported measures of global SWB can be influenced by response artefacts. Some response artefacts, such as impression management or social desirability, are of particular concern. In the case of impression management or social desirability, one strategy is to compare reports of SWB obtained in face-to-face interviews with reports obtained under anonymous circumstances (Diener et al., 1999). The usual strategies for reducing measurement error in other self-report instruments should be incorporated into designs assessing SWB as well.

Alternatives to Traditional Self-Report

Despite the fact that the predominant methodology in SWB research has been the use of traditional global self-report measures, recent studies have included measures that provide an alternative to traditional self-report. One important alternative is the Experience Sampling Method (ESM; Sandvik, Diener & Seidlitz, 1993). Using ESM techniques, respondents are cued (e.g. by a pager or palm computer) to respond, at random moments during their everyday routines, with brief reports of their immediate SWB. Typically, a relatively large number of such reports are completed, over perhaps a period of two to four weeks. Although they still represent self-report data, such assessments avoid many of the threats to validity discussed above, and begin to approach the optimal assessment technique of a continuous readout of emotional experience as discussed by Kahneman (1999).

Although the methodological details are beyond the scope of the present entry, other alternatives to self-report are worthy of mention. Physiological measures, ratings by informants, ratings of facial expression, and memory measures can serve as important adjuncts to self-reports of SWB by providing convergence and external validity for self-report measures (e.g. Sandvik, Diener & Seidlitz, 1993).

MEASURES OF LIFE SATISFACTION

Measures of life satisfaction generally fall into two categories: multidimensional or global satisfaction with life measures, and domain satisfaction measures. Global satisfaction with life measures usually are intended to assess the respondent's satisfaction with life as a whole, or, in the case of multidimensional measures, with a set of critical life domains. Domain satisfaction measures are focused on just one life domain, such as job satisfaction, marital satisfaction, satisfaction with housing, and so on. Domain satisfaction measures tend to be developed and used in rather specific research situations (e.g. research on marital quality), and as such may not be as broadly applicable as the global or multidimensional life satisfaction instruments. For this reason, we will offer examples of multidimensional or global life satisfaction measures only.

Prominent among the early life satisfaction measures from the gerontological/geriatric literature is the Life Satisfaction Scale (Neugarten, Havighurst & Tobin, 1961). Variants of this scale include the Life Satisfaction Index A (LSIA),

the Life Satisfaction Index B (LSIB), and the Life Satisfaction Rating (LSR). Each of these scales is multi-faceted; subsets of items are designed to measure each of several aspects of SWB (e.g. zest vs. apathy, positive self-concept, congruence between desired and achieved goals). These scales are most appropriate for the assessment of older adults.

The Satisfaction With Life Scale (SWLS; Pavot & Diener, 1993) was designed to assess an individual's satisfaction with life as a whole, rather than measuring satisfaction with specific domains such as work, marriage, or finances. The 5-item SWLS offers the advantages of a multiple-item measure, yet its brief format is sparing of time and space when it is incorporated into a battery of instruments. The SWLS has been shown to have good internal consistency and moderately high temporal stability, yet it has also been demonstrated to possess sensitivity to change, such as improvement during therapy (see Pavot & Diener, 1993). The SWLS is available in several languages, and has been used in a number of cross-cultural studies. The SWLS is suitable for the assessment of people from a wide range of ages, and educational levels. The scale, along with fairly extensive normative and cross-cultural data, is presented in Pavot and Diener (1993).

The Multidimensional Students' Life Satisfaction Scale (MSLSS; Huebner, 1994) is a 40-item measure designed to assess the life satisfaction of preadolescent students (Grades 3–5). Subscales of the MSLSS focus on the factors of self, school, living environment, friends, and family. The MSLSS has demonstrated good psychometric characteristics, and closes a significant gap by providing a measure of life satisfaction for this age group.

MEASURES OF POSITIVE AFFECT

Before presenting examples of measures of positive affect, it should be noted that most affect-focused measures include subscales measuring both positive and negative affect. Often, the scores for positive affect and negative affect are determined, and then the score for negative affect is subtracted from the score for positive affect. This difference score is usually referred to as affect balance (Bradburn, 1969), and can be used as a general index of SWB. However, some investigators prefer to use positive and negative affect scores separately, and not conflate them into a single index.

A ground-breaking measure of affect measurement is Bradburn's (1969) Affect Balance Scale (ABS). The scale consists of ten questions concerning affective experiences which the respondent may have experienced 'during the past few weeks' (five relating to positive affective experiences and five relating to negative affective experiences), to which the respondent provides a 'yes' or 'no' answer. Scores on the ABS typically are moderately correlated with other indices of SWB.

Kammann and Flett's (1983) Affectometer 2 was developed following the pattern of Bradburn's ABS, but the Affectometer 2 incorporates a frequency response scale, rather than relying on 'yes' or 'no' responses, and includes 40 items. Ten facets of SWB are assessed, with each represented by four items of the scale. The Affectometer 2 retains high internal consistency (coefficient alpha = 0.95) despite its multi-faceted design, and correlates well with other measures of SWB.

A more recent and frequently used measure of both positive and negative affect is the Positive and Negative Affect Schedule (PANAS; Watson, Clark & Tellegen, 1988). The positive affect and negative affect subscales of the PANAS include ten affective adjectives each; respondents report the degree to which they have experienced each of the emotions, over a specified time frame, on a 5-point scale. The time-frame instructions of the scale can be adjusted to prompt the respondents to report their immediate affective experience, or to reflect a longer period of focus (e.g. 'over the past few days', 'the past few weeks' or 'the past year'). The two subscales have good internal consistency, are substantially uncorrelated, and have demonstrated good convergent and discriminant validity (Watson et al., 1988), although they assess primarily high arousal and activation forms of affect.

An alternative set of affective adjectives, based on the pleasant/unpleasant dimension of the circumplex model of emotion, has also been used with good results in SWB research. Examples of these pleasant/unpleasant affective adjectives are presented in Diener and Emmons (1984). Several studies have demonstrated that

measures of life satisfaction and SWB tend to be located in the pleasantness octant of the mood circumplex, whereas personality characteristics relating to depression were found in the unpleasantness octant of the circumplex. This evidence suggests that adjectives clustering along either end of the pleasant/unpleasant affective dimension are more representative of SWB than adjectives derived from alternative rotations of affective space. Therefore, measures incorporating adjectives derived from the pleasant/unpleasant dimension may well be useful to the researcher who is attempting to assess the affective components of SWB.

GENERAL MEASURES OF WELL-BEING

In addition to instruments which focus on one or another of the components of SWB, such as life satisfaction or positive affect, some contemporary measures adapt an omnibus approach and include an array of items designed to assess all of the components of SWB. A good example of this type of measure is the Oxford Happiness Inventory (OHI), which has been developed by Michael Argyle and his colleagues (Argyle, Martin & Lu, 1995). The OHI is a 29-item measure which includes items relating to both satisfaction with life and emotional experiences. The OHI correlates strongly with other measures of positive mood and satisfaction, and shows a negative correlation with depression (Argyle et al., 1995). The OHI also has been shown to correlate with personality dimensions such as extraversion and neuroticism. The OHI has demonstrated good internal consistency and test–retest reliability (Argyle et al., 1995), and represents a good, medium length instrument for those wishing to assess all components of SWB with a single measure.

MEASURES OF LOW NEGATIVE AFFECT

Along with measures of life satisfaction, positive affect, and affect balance, measures of negative affect can also be employed in the assessment of SWB. Low scores on measures of depression, anxiety, neuroticism, and other types of negative affect can provide both a complementary index of the respondent's emotional state, and a degree of discriminant validity to the well-being measures as well.

One measure that is frequently used in well-being designs is the Center for Epidemiological Studies Depression Scale (CESD; Radloff, 1977). The 20-item CESD is heavily used as a depression screening device for community work, and its brevity and sensitivity lend themselves to use in a battery of measures intended to assess SWB.

Another commonly used index of low negative affect is the personality trait of neuroticism. Numerous studies have found measures of neuroticism to be strongly negatively correlated with SWB. Many research efforts have included the revised NEO Personality Inventory (NEOPI-R; Costa & McCrae, 1992). The NEOPI-R is a comprehensive 240-item personality inventory which measures five factors of the personality: neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness. In many studies, neuroticism has been shown to be strongly negatively correlated with SWB. In situations where administering a 240-item inventory is not practicable, a shorter version, the 60-item Five Factor Inventory (NEO-FFI; Costa & McCrae, 1992), is also available.

FUTURE PERSPECTIVES

A number of proposals have been offered with regard to the future directions of research on SWB. Diener et al. (1999) proposed the increased use of non-self-report measures in future research designs. They suggest that non-self-report measures provide an important complement to self-report, avoid many of the potential response artefact problems of self-reports, and that non-self-report measures often tap into different aspects of well-being from traditional self-report measures. Also, the same researchers have urged that future investigators create more sophisticated research designs, such as longitudinal, cross-cultural, experience-sampling method, and experimental designs (Diener et al., 1999). Designs appropriate for the application of causal modelling methodologies would be particularly useful in helping to disentangle the numerous correlational relations

which have been demonstrated between SWB and other variables.

Diener (2000) proposed that researchers work toward a 'national index of SWB' (p. 40). He suggests that surveys, utilizing experience-sampling methods and including nationally representative samples, could be used to compile a national index, which in turn could provide important insights into the circumstances under which citizens of various countries experience an optimal sense of SWB. Such an index could provide information to both policy-makers and individuals alike, informing their choices in terms of implications for SWB.

Assessment of SWB has evolved considerably in the past 25 years. Simple survey designs, often including only a one-item measure, have given way to much more complex instruments and strategies. Important advances have been made in the area of non-self-report measures and in the complexity of techniques used for statistical analysis. The next 25 years should see the development of techniques and databases that allow us to come much closer to definitive assessments of SWB.

CONCLUSIONS

A wide array of instruments and methodologies are available to researchers interested in the assessment of well-being. The available self-report instruments vary significantly in terms of their length, psychometric qualities, and appropriateness for various age groups of respondents. In addition, a number of non-self-report assessment techniques are available as alternatives to self-report measures. As is true with any form of psychological assessment, potential users of well-being assessment instruments must be mindful of a number of threats to the validity of their data, and take care in developing their research designs in order to minimize potential contamination of their results. The references provided in this entry should provide the reader with a good general overview of well-being assessment as it is currently being conducted, as well as some important issues for future research.

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William Pavot and Ed Diener

RELATED ENTRIES

Personality Assessment (General), Quality of Life, Optimism

WISDOM

INTRODUCTION

A first approach to the definition of wisdom from a psychological perspective is its treatment in dictionaries. The major German historical dictionary, for instance, defined wisdom as 'insight and knowledge about oneself and the world ... and sound judgement in the case of difficult life problems'. Similarly, the Oxford Dictionary includes in its definition of wisdom: 'Good judgement and advice in difficult and uncertain matters of life.'

In a next step, psychologists further specified the content and formal properties of wisdom-related phenomena. These initial efforts for the most part were theoretical and speculative. G. Stanley Hall in 1922, for example, associated wisdom with the emergence of a meditative attitude, philosophic calmness, impartiality, and the desire to draw moral lessons that emerge in later adulthood. Furthermore, writers emphasized that wisdom involves the search for the moderate course between extremes, a dynamic between knowledge and doubt, a sufficient detachment from the problem at hand, and a well-balanced coordination of emotion, motivation, and thought. In line with dictionary definitions, such writings refer to wisdom as knowledge about the human condition at its frontier, knowledge about the most difficult questions of the meaning and conduct of life, and knowledge about the uncertainties of life, about what cannot be known and how to deal with that limited knowledge (for an overview see Kramer, 2000; Staudinger, 1999; Sternberg, 1990).

Wisdom certainly is a phenomenon rich in history and connotations. Some even argue it is a phenomenon that defies empirical investigation. And certainly the application of scientific methods changes the phenomenon under study. Nevertheless, it seems useful to study and assess wisdom as it may help us to learn more about conditions that facilitate the development and well-balanced integration of human mind and character.

SOME HISTORICAL BACKGROUND TO THE PSYCHOLOGICAL STUDY OF WISDOM

Since the beginning of human culture, wisdom has been viewed as the ideal endpoint of human development. Certainly, the psychological study of wisdom is still rather young compared to its philosophical treatment when considering that the very definition of philosophy is 'love or pursuit of wisdom'. Important to recognize is that the identification of wisdom with individuals (such as wise persons), the predominant approach in psychology, is but one of the ways by which wisdom is instantiated. In fact, in the general historical literature on wisdom, the identification of wisdom with the mind and character of individuals is not the preferred mode of analysis. Wisdom is considered an ideal that is difficult to be fully represented in the isolated individual.

Throughout history, the interest in the topic of wisdom has waxed and waned (Baltes, in press). In the Western world, the question of whether wisdom is divine or human was at the centre of wisdom-related discourse during the Renaissance. An initial conclusion of this debate was reached during the later phases of the Enlightenment. Recently, in conjunction with value pluralism and the need for orientation characteristic of post-modern times, interest in the concept of wisdom has been revived. Finally, archeological-cultural work dealing with the origins of religious and secular bodies of wisdom-related texts in China, India, Egypt, Old Mesopotamia and the like has revealed a cultural and historical invariance with regard to wisdom-related proverbs and tales (Baltes, in press). This relative invariance gives rise to the assumption that concepts such as wisdom with its related body of knowledge and

skills have been culturally selected because of their adaptive value for humankind.

Among one the major reasons for the emergence of the psychological study of wisdom in the late 1970s and early 1980s was the search for the potential of aging or more specifically, the search for domains or, types of intellectual functioning that would not show age-related decline.

IMPLICIT (SUBJECTIVE) THEORIES ABOUT WISDOM AND THEIR ASSESSMENT

Most empirical research on wisdom in psychology, so far, has focused on further elaboration of the definition of wisdom. Moving beyond the dictionary definitions of wisdom, research assessed the nature of everyday beliefs, folk conceptions, or implicit (subjective) theories of wisdom. The pursuit of answers to questions such as What is wisdom?, How is wisdom different from other forms of intelligence?, Which situations require wisdom?, What is a wise act?, What are the characteristics of wise people? have been at the centre of psychological wisdom research during the 1980s (for a review see Staudinger & Baltes, 1994).

Wisdom in these studies is 'assessed' in two ways. Either participants are asked to sort adjectives according to their similarity (Clayton, 1975) or their probablity to co-occur in one person (Sternberg, 1985). Such ratings were subsequently analysed using multidimensional scaling. In other studies, participants were asked to rate items describing a wise person, a non-wise person, and non-relevant characteristics to which degree they reflect their prototype of a wise person (Holliday & Chandler, 1986). These ratings were then entered into a factor analysis. In both cases, the stimulus material (adjectives, items) was developed based on pilot studies in which participants described their concept of a wise person. Characteristics that were mentioned most often during those interviews were subsequently turned into questionnaire items.

From this research on implicit theories of wisdom and wise persons, it is evident that people in Western samples hold fairly clear-cut images of the nature of wisdom. Four findings are especially noteworthy. First, in the minds of people, wisdom seems to be closely related to wise persons and their acts as 'carriers' of wisdom. Second, wise people are expected to combine features of mind and character and balance multiple interests and choices. Third, wisdom carries a very strong interpersonal and social aspect with regard to both its application (advice) and the consensual recognition of its occurrence. Fourth, wisdom exhibits overlap with other related concepts such as intelligence, but in aspects like sagacity, prudence, and the integration of cognition, emotion, and motivation, it also carries unique variance.

EXPLICIT THEORIES AND ASSESSMENT OF WISDOM

A more recent line of empirical psychological inquiry on wisdom addresses the question of how to measure behavioural expressions of wisdom. Within this tradition, three lines of work can be identified (Staudinger & Baltes, 1994): (1) assessment of wisdom as a personality characteristic, (2) assessment of wisdom in the Piagetian tradition of postformal thought, and (3) assessment of wisdom as an individual's problem-solving performance with regard to difficult problems involving the interpretation, conduct, and management of life.

Assessing Wisdom as a Personality Characteristic

Within personality theories, wisdom is usually conceptualized as an advanced if not the final stage of personality development. Wisdom, in this context, is comparable to 'optimal maturity'. A wise person is characterized, for instance, as integrating rather than ignoring or repressing self-related information, by having coordinated opposites, and by having transcended personal agendas and turned to collective or universal issues. The assessment of 'optimal maturity' poses the problem that it is a highly desirable characteristic. Thus, most of the extant operationalizations suffer from the skewed distributions due to social desirability. Walaskay, Whitbourne and Nehrke (1983), and Ryff and Heincke (1983), for example, have undertaken the effort to develop self-report questionnaires based on the Eriksonian notions of personality development, especially integrity or wisdom. Other attempts have used extant personality questionnaires to

assess wisdom, in the sense of self-development and maturity. For instance, Wink and Helson (1997) used a personality measure and open-ended responses to assess practical (i.e. interpersonal skill and interest, insight, clear thinking, reflectiveness, tolerance etc.) and transcendent wisdom (i.e. transcending the personal, recognizing the complexities and limits of knowledge, integrating thought and effort, spiritual depth). More recently, Ardelt (1997) employed Haan's Ego Rating Scale and Block's California Q-sort to operationalize a cognitive, reflective and affective component of wisdom.

Assessing Wisdom as Neopiagetian Form of Mature Thought

Central to Neopiagetian theories of adult thought is the transcendence of the universal truth criterion that characterizes formal logic. This transcendence is common to conceptions such as dialectical, complementary, and relativistic thinking. Such tolerance of multiple truths, that is of ambiguity, has also been mentioned as a crucial feature of wisdom. A number of different approaches all linked to this basic understanding can be distinguished: dialectical thinking, complementary thinking, relativistic thinking, reflective judgement. Usually, these kinds of mature thought are assessed as performances. Thus, participants are asked to respond to a fictitious problem. The answers are subsequently coded according to respective coding schemes reflecting ascending levels of mature thought (e.g. Basseches, 1984; Blanchard-Fields, 1986; Kitchener & Brenner, 1990; Kramer & Woodruff, 1986; Labouvie-Vief, 1980). Reported interrater agreements usually range between 75% and 85%.

Assessing Wisdom as Expert-Level Judgement and Advice in Fundamental and Difficult Life Dilemmas

Besides these measures of wisdom as a personality characteristic, or as a feature of mature thought, there is also work that attempts to assess wisdom-related performance in tasks dealing with the interpretation, conduct, and management of life. This approach is based on lifespan theory, the developmental study of the ageing mind and ageing personality, research on expert systems, and cultural-historical definitions of wisdom (Baltes, Smith & Staudinger, 1992). By integrating these perspectives, wisdom is defined as an expert knowledge system in the fundamental pragmatics of life permitting exceptional insight, judgement, and advice involving complex and uncertain matters of the human condition (Balles et al., 1992).

The body of knowledge and skills associated with wisdom as an expertise in the fundamental pragmatics of life entails insight into the quintessential aspects of the human condition, including its biological finitude and cultural conditioning. Wisdom involves a fine-tuned and well-balanced coordination of cognition, motivation, and emotion. More specifically, wisdom-related knowledge and skills can be characterized by a family of five criteria: (1) rich factual knowledge about life, (2) rich procedural knowledge about life, (3) lifespan contextualism, (4) value relativism, and (5) awareness and management of uncertainty (see Baltes & Staudinger, 2000 for an extensive definition).

To elicit and measure wisdom-related knowledge and skills, in this approach participants are presented with difficult life dilemmas such as the following: 'Imagine someone receives a call from a good friend who tells him/her that he/she can't go on anymore and has decided to commit suicide. What would the person/what would you do and consider in this situation?' Participants are then asked to 'think aloud' about such dilemmas. The five wisdom-related criteria are used to evaluate these protocols. To do so, an expert panel of raters is selected, and extensively trained and calibrated in using the five criteria to evaluate the response protocols. Every rater is trained on only one criterion to avoid halo effects. And always two raters apply the same criterion to establish interrater reliability. Across over 3000 response protocols now the reliabilities of the five criteria range between 0.72 and 0.93. Reliability of the wisdom score averaged across the five criteria even reaches a Cronbach alpha of 0.98. The exact training procedure and the calibration protocols are described and included in the Rater Manual that can be obtained from the author (Staudinger, Smith & Baltes, 1994).

As one indicator of external validity, it was demonstrated that when using this wisdom paradigm to study people who were nominated as wise according to nominators' subjective beliefs about wisdom, it was found that wisdom nominees also received higher wisdom scores than comparable

Table 1. Selected wisdom measures (after Staudinger, 2000)

Theoretical background	Wisdom components/criteria	Assessment format	Reliability[a]	Author
Implicit theory: prototype of a wise person	Sagacity, reasoning ability, learning from ideas and environment, judgement, expeditious use of information, perspicacity	Similarity ratings	$0.89 \leq \alpha \leq 0.97$	Sternberg (1985)
Implicit theory: prototype of a wise person	Interpersonal skills, judgement and communicative skills, social unobtrusiveness, exceptional understanding, general competence	Prototypicality questionnaire	$0.83 \leq \alpha \leq 0.90$	Holliday and Chandler (1986)
Explicit theory: wisdom as personality characteristic	Integrity versus despair	Self-report questionnaire Adult ego-development scale	0.76	Walaskay et al. (1983–84)
Explicit theory: wisdom as personality characteristic	Cognitive, reflective, affective components	Interviewer rating (Haan's ego ratings, California Q-sort)	Ego ratings $0.51 \leq \alpha \leq 0.62$ Q-sort items $0.85 \leq \alpha \leq 0.93$	Ardelt (1997)
Explicit theory: wisdom as personality characteristic	Practical wisdom (interpersonal skills, insight, clear thinking, reflectiveness, tolerance) Transcendent wisdom (transcending the personal, recognition of the limits of knowledge, integration of thought and affect)	17 items of adjective check list Coding of open-ended responses	$0.75 \leq \alpha \leq 0.86$	Wink and Helson (1997)
Explicit theory: wisdom as postformal thought	Relativistic and dialectical thought	Coding of open-ended responses to fictitious problems according to levels of relativistic and dialectical thought	85% and 86% Interrater agreement	Kramer and Woodruff (1986)
Explicit theory: wisdom as expert-level knowledge and judgement in difficult and uncertain matters of life	Rich factual and procedural knowledge, about life, lifespan contextualism, value relativism, awareness and management of uncertainty	Expert raters evaluate open-ended responses to fictitious life problems quality according to 5 wisdom criteria	Individual criteria $0.65 \leq \alpha \leq 0.94$ Overall wisdom $\alpha = 0.98$ rater reliability	Baltes and Staudinger (2000)

[a]Reliabilities refer to scale consistencies or interrater agreements (per cent agreement or Cronbach α).

control samples of various ages and professional backgrounds (Baltes & Staudinger, 2000). Convergent and discriminant validity was established with regard to extant measures of cognitive and personality functioning. In line with the historical wisdom literature, that portrays wisdom as the ideal combination of mind and virtue, it was found that wisdom-related performance was best predicted by measures located at the interface of cognition and personality, such as a judicious cognitive style, creativity, moral reasoning. Neither intelligence nor personality independently of each other made a significant contribution to wisdom-related knowledge and judgement (Staudinger, 1999). Assessment contexts have to be considered as well. It was demonstrated that wisdom-related performance could be enhanced by one standard deviation if participants were asked to bring a partner with whom they discussed the life problem before reflecting by themselves and responding (Staudinger & Baltes, 1996).

FUTURE PERSPECTIVES AND CONCLUSION

The concept of wisdom represents a fruitful topic for psychological research (a selection of wisdom measures is described in Table 1): (1) the study of wisdom emphasizes the search for continued optimization and the further evolution of the human condition, and (2) in a prototypical fashion, it allows for the study of collaboration among cognitive, emotional, and motivational processes. Future research on wisdom will be expanded in at least three ways: (1) the further identification of social and personality factors as well as life processes relevant for the ontogeny of wisdom, (2) further attempts to develop less labour-intensive assessment tools, and (3) gaining better understanding of the interplay between self-related wisdom and wisdom about others.

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RELATED ENTRIES

Applied Fields: Gerontology, Intelligence Assessment (General), Cognitive Decline/Impairment, Intelligence Assessment through Cohort and Time

WORK PERFORMANCE

INTRODUCTION

Assessing the performance of people at work is one of the most relevant topics in organizational life. For a manager it is essential to be able to adequately assess the performance of his/her employees. All decisions regarding promotion, assessing training needs, transfer decisions, or dismissal are (ideally) related to the (relative) success of employees. This evidently stresses the importance of performance assessment.

In this entry, a brief overview will be presented of how work performance is usually assessed in organizations. The aim is neither to be complete nor to go into great detail, but a comprehensive overview will be provided that can be of help for interested practitioners. Those looking for more detail are referred to relevant handbooks. The entry will be concluded with a section discussing recent developments and future perspectives.

JOB ANALYSIS PRECEDES MEASUREMENT OF PERFORMANCE

For most organizations it is imperative to have a good insight into the relative successfulness of their employees. Not only are most HRM decisions based on performance evaluations, but these decisions may also affect the organization's strategic decisions with respect to future investments. Although most managers will intuitively have an idea which of their co-workers is most successful, intuitions are not sufficient for taking important decisions. Managers have to be accountable for their decisions. And employees are becoming increasingly dissatisfied when their performance is not adequately and fairly assessed. Consequently, organizations nowadays put a great interest in having adequate and objective methods for performance measurement in place.

First, it has to be stressed that measuring job performance is not as straightforward as it initially may look. Jobs can be seen as a configuration of tasks and duties which are derived from the division of work within the organization, and therefore also reflect the organizational processes (Roe, 1999). Modern organizations are flexible and dynamic entities that have to deal with a changing and highly competitive environment. In order to adapt to environmental changes, organizations occasionally rearrange and restructure their processes. In many instances jobs within the organization do reflect these changes, which means that the set of tasks and duties within a job may be susceptible to rearrangement. Job content therefore is not a static concept, and thus the performance that is required in a job changes over time as well.

Another implication is that similar job titles may have different contents in various organizations, there may even be a difference in content between similar job titles between organizational departments. The required performance in a job

is highly dependent upon expectations and priorities within the organization. These are the main reasons that there are no universal instruments and tests to measure work performance. Only in very large organizations, such as the Army, and the police force, in which many similar jobs with standard job content can be found, have standard performance tests been developed for specific job components (i.e. physical tests, knowledge or skills tests).

But in most cases we first have to know what the particular job is about, and what people in this organization are expected to do before an individual's performance can be adequately assessed. Or in other words, first it has to be assessed what the 'core elements' of that job are. This implies that a criterion has to be developed on which the decisions can be based.

A job description might be a useful source of information in this respect. However, in those cases where a job description is lacking, or appears to be no longer adequate, a job analysis may be necessary.

Although a job analysis can be carried out for several purposes (*cf.* Algera & Greuter, 1998), the primary aim in this case is to understand what the particular job is about, and what kind of performance is required. This means that it has to be assessed what the critical, or core, elements of the job are. Furthermore, it is necessary to assess what the most important demands are and, of course, to what extent the job incumbent's capacities are addressed (i.e. how hard the person has to work). And in some instances the *effects* that the job demands have on the worker may be taken into account, in particularly when there may be undesirable health implications.

After it has been assessed what the core or critical elements of a job are and what capacities are needed from a worker to carry out this job, a criterion can be developed. This means that it has to be determined what should be regarded as 'good', 'average', or 'bad' performance in that job. An evaluation of performance enables a description of the relative performance strengths and weaknesses within and between workers.

Multiple Criteria

Since a job is likely to have multiple components, or elements, the next question to be answered is whether a multiple criterion should be used, or whether the scores for each component should be combined into a 'composite score'. To answer this question it first has to be decided how the information is going to be used. For reasons of inter- or intra-individual comparison a multiple score might be most useful; however, in many instances a rank order might be necessary. In the latter situation important questions are which of the various sources of information are most important, and how can the information be combined. Sometimes a job analysis has made clear that some areas of performance are very critical to the job, while other elements are less critical. In that case high scores on the critical job elements may compensate a low score on the less critical elements. In other cases a weighing formula may be used. But then again, an extensive discussion should take place in the organization, in order to decide what a valuable worker is, and how the various types of information might reflect this decision.

PERFORMANCE MEASUREMENT

After it has been decided what job elements should be included, i.e. what kind of performance should be measured, one can start thinking about *how* to measure performance on those elements.

There are many ways to conceptualize and operationalize performance measures (Landy & Farr, 1983). Ultimately, organizations are interested in measuring the employee's contribution to the organizational goals. Depending on the individual's hierarchical position in the organization his/her performance may be closer or more distant to the organizational goals. For instance, the performance of the CEO is more closely related to the organization's overall goal than the performance of a worker on the shop floor. This means that depending on the hierarchical position in the organization different performance operationalizations have to be developed (Smith, 1976). On the other hand, the higher one gets up the occupational ladder, the more difficult it is to find objective indicators that can be solely attributed to the individual's behaviour.

Apart from different conceptualizations and operationalizations, there are also different sources of information to be considered. In general, three different kinds of data can be used for performance assessment: objective data,

personnel data, and judgemental data (Guion, 1965; Landy & Farr, 1983).

Objective Data

Objective data refers to production output, results of work behaviour. Traditionally, output data is seen as the most important source for performance assessment. The simplicity of merely counting what the person has achieved is indeed very appealing. However, this simplicity is deceiving. First of all, there are several output measures to be considered: output quantity, output quality, effectiveness, and efficiency. It is evident that the various parameters are not unrelated, although the relation between the various parameters cannot always be easily assessed. A sales person who makes huge sales, but also appears to have a lot of customer complaints (i.e. high quantity, but low quality), may on the longer term not be effective.

Even with respect to efficiency there are two different perspectives: the perspective of the organization and the perspective of the individual. An organization is likely to measure efficiency in terms of output in relation to money, and/or time, or the amount of scrap, while the individual may conceive efficiency primarily in terms of time and effort investment. This means that something which is efficient from the organization's perspective need not necessarily be efficient from the individual's perspective.

Furthermore there are circumstantial factors that are beyond the individual's control, which may have an influence on the individual's production. For instance, when the number of arrests a police officer makes is considered as output measure, the crime rate in his/her precinct is a relevant circumstantial factor that is beyond the individual's control.

The performance of a nurse cannot be measured by merely counting the number of patients that she has been dealing with that day, or that week, or that month. It is evident that the 'quality of the care' should also be included in the assessment. Quality in this respect relates to professional skills and knowledge of the nurse, but also to her interpersonal skills (i.e. being friendly, and being able to comfort patients, etc.). Sometimes the organizational constraints (the number of patients at the ward, available staff) restrict the nurses with respect to how much time they can spend with patients, and thus may have a negative effect on the quality of the care provided, and thus the nurses' performance. These examples illustrate that measuring output is not as simple as it may seem. Other circumstantial factors that may influence the production are: working conditions, and incentive system (*cf.* Landy, 1989).

In order to be sure that the 'count' is reliable a decision has to be made on the measurement interval; this period should be sufficiently long to allow for some fluctuations.

The most important problem with respect to output assessment, however, is that it is increasingly difficult to find good objective measures. Clearly defined jobs with a repetitive work cycle, which could be found in industrial settings, are relatively easy to assess (Shirom, Westman & Melander, 1999). However, since these jobs tend to have negative effects on a worker's mental health and well-being they have increasingly been restructured.

Personnel Data

Personnel files contain all kinds of information with respect to 'organizational behaviour': absenteeism, promotion, disciplinary actions, number of salary increases, accidents etc. This may be a valuable source of information with respect to performance assessment. But then again, organizations first have to decide what they value most in their personnel: do they value the person with a high production quote, or the person who has a record of not being absent over the past 10 years?

Yet again some remarks have to made with respect to the validity of these kinds of information. First of all various studies have shown that organizational registration systems are far from perfect (*cf.* Landy & Farr, 1983; Koslowsky & Dishon-Berkovits, 2001). Much depends on how conscientious information is being registered, and whether this is done uniformly and standardized over all departments in the organization. Absence registration, for instance, appears to be rather problematic. First of all absence has to be categorized in 'excused' and 'unexcused' absence. Secondly, absences might be recorded in number of absences (irregardless of length), or absolute number of days per year.

In addition, absence registration is easier for employees who are expected to check in each day than for employees who are visiting customers and clients. Organizational climate and management style appear to be very important factors in this respect (Bolwijn & Kumpe, 1996). To what extent is the organization's climate focused on 'controlling' rather than 'motivating' people? With increasing flexibility of working times, and tele-work facilities, it is evident that absence registration is getting more difficult. Many companies have recognized that management style should change accordingly.

Other sources of information in personnel files may have different biases. Promotions and salary increases rely heavily on supervisors' judgements (Landy, 1989). Judgemental data is subject to various kinds of perceptual biases (see next section).

In summary, this does not mean that production data, or information in personnel files, cannot be used for assessing a worker's performance. It only illustrates that these type of data have to be used very carefully and that one has to ask first what the validity and reliability of this kind of information might be. A first step must be to establish that there is a clear relation between these sources of information and the elements of the job that have been identified in the job analysis as relevant to the job performance.

Judgemental Data

A major category of information is the judgement of a supervisor or expert. Supervisors are often asked to rate their subordinates' performance. The type of ratings employed varies considerably. They may range from very rough, unstructured evaluations ('Give a quality rating on a scale from 1 to 5') to more structured methods. Unstructured ratings are very unsatisfactory, because it remains unclear how the supervisor's evaluation is related to the worker's behaviour. Heneman (1986) amongst others has demonstrated that supervisory opinions correlate rather low with objective performance data. It is very likely that inter-personal aspects (likes and dislikes) are interfering with supervisory judgements. Extensive research (*cf.* Landy & Rastegary, 1988) has demonstrated that judgemental information is subject to various types of rating errors (i.e. leniency–severity errors, halo errors, central tendency errors) which appear to be very hard to avoid.

The more structured methods contain specific aspects or behavioural categories that can either be ticked to be present, or evaluated on rating scales. These methods represent attempts to come forward with more objective rating methods that might reduce rating errors. Various sorts of these type of instruments are available, i.e. Checklists, Mixed Standard Rating Scales, Behaviourally Anchored Rating Scales (BARS), Behavioural Observation Scales (BOS). Mixed Standard Rating Scales are based upon a procedure in which items are obtained from experts (usually supervisors) which discriminate between good and poor performance. One performance dimension usually is described with three items: representing 'good performance', 'average performance', and 'poor performance'. Evaluation studies indicated that it appears to be very difficult to apply this type of scale, since it triggers a high percentage of inconsistent responses (Prien & Hughes, 1987; Wiersma & Latham, 1986).

In particular, the Behavioural Anchored Rating Scales (Smith & Kendall, 1963) represent attempts to develop unambiguous rating scales with clearly identified behavioural categories.

According to Landy (1989) the results with respect to avoiding rating errors with the BARS approach are rather disappointing. However, since it is a very laborious and time consuming procedure to develop these scales (use of Critical Incidents), the great advantage of the BARS approach may be that more time and effort is devoted to the whole procedure of performance assessment, and therefore may result in a more considerate approach to the problem.

Peer assessment, i.e. performance rating by colleagues, which is sometimes applied in teams, suffers mainly from the same type of problems. For that reason judgemental data have to be treated very carefully.

Table 1 contains an overview of frequently used types of methods.

Work Samples

Sometimes other ways of assessing work performance are used, such as 'work samples'. Work samples are a selection of tasks that exemplify the actual job. A typical example is a 'programming

Table 1. Methods used for performance assessment (*cf.* Landy, 1989)

Output assessment
Production quantity and quality
Efficiency (time, effort)
Behavioural indicators
Absence registration
Disciplinary records
Promotions
Judgemental ratings
Comparison methods
Ranking individuals from high to low
Pair-wise comparison of individuals
Checklists
Containing statements with free format rating
Forced Choice format (with multiple choice options)
Behaviour oriented rating scales
Mixed Standard Rating Scales
Behaviourally Anchored Rating Scales (BARS)
Behavioural Observation Scales (BOS)
Work samples

test' for computer programmers. The great advantage of this approach is that usually a lot of time has been spent on developing a clearly defined set of tasks that are executed under more or less standardized conditions. As can be imagined this enhances comparison between workers, and therefore may provide a reliable and valid assessment of performance. A drawback of this approach is that it is rather time-consuming and laborious to develop and to administer, and therefore very costly. However, when the development is combined with the development of an assessment centre, since there is a high resemblance with assessing an individual's potential, this may have the advantage of 'economy of scale'.

FUTURE PERSPECTIVES AND CONCLUSIONS

Economic changes, like globalization of the economy, have increased economic competition. Organizations are forced to respond to new environmental challenges, and they do that in different ways. A general tendency to rationalize organizational processes, and increased use of information technology, can be observed. At present the core concepts in organizations are 'innovation', and 'productivity improvement'. And although most organizations recognize that competitive success is highly dependent on people and how their skills are used, the progress and development in HRM with respect to performance improvement systems has been rather disappointing (*cf.* Algera & Kleinbeck, 1997). Apart from the Productivity Measurement and Enhancement System (ProMES), developed by Pritchard and others (Pritchard, 1990), most attention has been devoted to technical and organizational processes. ProMES is an intervention technique primarily focusing on people. The technique is based on goal-setting and feedback techniques (see Locke & Latham, 1990; Naylor, Pritchard & Ilgen, 1980) that aim to enhance the performance of organizational units. The basic characteristics of ProMES are to develop performance indicators, using a bottom-up design methodology for key result areas (products) that can be controlled by the work group. Feedback then is given periodically to the group. This might help the group to adjust their work processes and thus to improve their performance.

The success of this approach is dependent on the success of developing adequate performance indicators for the organizational units. These usually are indicators of a higher aggregation level, than individual performance indicators. When people are working together, and the final result is highly determined by successful co-operation of the team members, it is very difficult to assess the value of the contribution of an individual, in particular when interdependency between team members is high. The issue of 'ownership' of performance is very hard to resolve. Usually the performance of the unit, or group, is considered to be the result of a group process, of which the individual's contribution is an indispensable part. Assessing the performance of the individual is like assessing the individual's contribution to the group process, which means focusing on assessing the person's role in the group, using concepts like 'co-operative behaviour'.

At the same time modern management styles are focusing on motivating people rather than control, by making use of goal setting theories (Management by Objectives). When goals have been clearly defined and mutually agreed upon by the supervisor on the one hand and the group, or individual, on the other hand, performance measurement is a matter of assessing to what

degree these goals are obtained. This approach acknowledges that there are various strategies that may lead to the same result. The choice of strategy is usually left to the job incumbent(s), although there may be more or less 'organizational standards' to tackle certain problems. This type of approach usually applies to highly qualified professionals (i.e. consultancy).

The issues of 'ownership of performance' also applies to some extent to situations in which people are part of large scale man–machine systems, or where people have to supervise continuous processes (nuclear powerplant, chemical processes, aeroplane pilots). Generally speaking the increasing dependency on technology in many jobs makes it difficult to distinguish the individual's contribution from the total 'system performance'. In those cases the focus is on how people have behaved during 'system performance', i.e. did they follow the safety instructions adequately?, and how do they perform when certain scenarios are being trained in a simulator?

Most western economies have changed from an 'industrial' to a 'service oriented' economy in the past decades. This means that in many jobs the emphasis is no longer on production of goods, but on services that have to be rendered. While goods are tangible and usually produced for consumption at a later time, 'services' are not tangible and production and consumption very often coincide. Concepts like 'client friendliness' and 'service orientation' require particular behavioural styles or 'scripts', and may even require workers to display particular kinds of emotions. In particular, when the company wants to propagate a particular atmosphere, or climate (i.e. 'safety': cabin crew in aeroplanes, staff in McDonalds' restaurants have to radiate that they are part of a 'happy family') (Briner, 1999).

In these type of jobs the behaviour and emotions displayed are part of the 'production process', and performance assessment boils down to rating to what extent behaviour and emotions have been adequately displayed.

And finally, a recent development concerns the fact that increasingly work is being organized in projects, which is being assigned to a team. Team members are then going through the whole 'life cycle' of a project, which means that roles change according to the life cycle of the project. This means that jobs tend to be more flexible with respect to job content, and less predefined. Organizations, therefore, nowadays focus much more on 'competence management' (i.e. making sure that staff do have the required skills and knowledge). Because in modern organizations 'success' seems to be the only criterion.

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RELATED ENTRIES

Applied Fields: Work and Industry, Total Quality Management, Personnel Selection, Assessment in, Centres (Assessment Centres), Physical Abilities in Work Settings, Performance

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