Summary

Humphreys' *g*-centered theory of intelligence deserves a fair hearing. However, the reception of a theory can be influenced by its mode of presentation. Therefore, Humphreys should vitalize his theory by using better primitive concepts, welcome all attempts at falsification, and eschew praise of behaviorist methodology.

Note

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Humphreys's "Behavioral Repertoire" an Epiphenomenon of *g*

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The clarity of thought and expression in Humphreys's target article is altogether admirable, and it is well nigh impossible to fault any of his empirically based statements or any of his reasoning and conclusions based thereon. I believe that this aspect of Humphreys's article fully accords with the overwhelming consensus of experts in psychometrics and differential psychology.

But I find myself in disagreement with Humphreys on two points of a theoretical nature: (a) Humphreys's insistence on a "pragmatic," "behavioristic" definition of *intelligence* as an acquired "repertoire" of intellectual skills and knowledge and (b) his definition of *intellectual* decided by a consensus of experts working in the area. I am in virtually complete agreement with everything Humphreys says after he makes these two points, which appear early in the article. Because he has reiterated this "behavioristic" definition without modification quite often during the past two decades, he obviously thinks it important. I have taken it seriously enough to be uncomfortable with it, and here I try to explain why.

First, the notion of a behavioral (or phenotypic) repertoire of acquired cognitive skills and knowledge: I argue that this repertoire is an epiphenomenon of a latent trait (or traits); individual differences in the size of the repertoire merely reflect individual differences in the latent trait and therefore can serve as one but not the only means of assessing or measuring individual difference in the latent trait. But I question the idea of using just one epiphenomenon as a definition of the essential phenomenon, which, in this case, is one or more latent traits.

Even pragmatically and operationally, repertoire per se seems to me a troublesome concept. Isn't it rather vacuous if all it means is anything a given person happens to know or can do that is deemed intellectual by a consensus of experts? And where does scientific objectivity come in when we allow a "consensus of experts" to decide what should or shouldn't be included in the repertoire of intellectual behavior? To be able to communicate and get on with their job, scientists must of course agree on certain formal definitions. But, as regards theoretical formulations, they need not agree except as empirical evidence compels them to. The question of which behavior is to be regarded as intellectual is a question science must try to answer and is

not to be decided by a consensus of expert opinion. Besides, I see no possibility of compelling agreement on mere opinions about which behavioral acts should qualify as intellectual, either among experts or anyone else. There has to be some objective, empirical way to settle disagreements on this kind of issue. It is an empirical question beyond the level of formal or axiomatic definition.

Even Humphreys himself seems to have some trouble with his behavioristic definition, with its conspicuous avoidance of the latent-trait aspect of what he means by *intelligence.* Note that he defines intelligence as a repertoire of skills and knowledge, but, in the very next sentence, a hint of the latent trait unavoidably slips in: "Individual differences in intelligence are monotonically *related* [italics added] to the size of this repertoire." That is, Humphreys's definition of intelligence as repertoire quickly lapses into making a distinction between intelligence and repertoire. If Humphreys accepts his definition of intelligence without compromise, individual differences in intelligence are not just related to differences in repertoire size, but they consist of differences in repertoire size.

The repertoire definition implicitly harkens back to Sir Godfrey Thomson's (1948) sampling theory of intelligence, but it gains no support from this seeming resemblance. The sampling theory itself was intended as a hypothetical model to account for a latent variable—namely, Spearman's *g.* It specifies no behavioral components, but only hypothetical "bonds," presumably existing in the brain. As formulated, it can be argued that it is empirically unfalsifiable and therefore scientifically disqualified (e.g., Loevinger, 1951, pp. 594–595).

Another disadvantage of the repertoire definition is that it looks too much like (and therefore unintentionally reinforces) what I label the *specificity doctrine,* which concerns what it is that intelligence tests measure (Jensen, 1984). This misconceived doctrine is utterly false, and everything that Humphreys says following his definition of intelligence shows that he would completely reject the specificity doctrine, as would any expert in psychometrics. The testimony of one of the plaintiffs' witnesses in the well-known trial of *Larry P. v. State Superintendent of Public Instruction,* which prohibited IQ testing of Black children in California public schools, exemplified the specificity doctrine as follows: "IQ tests measure the degree to which a particular individual who takes the test has experience with a particular piece of information, the particular bits of knowledge, the particular habits and approaches that are tested in these tests." This doctrine hides the psychometrically crucial fact that typically about 90% of the population variance in IQ (i.e., its reliability, or proportion of true-score variance) does not consist of variance attributable to "particular bits of knowledge" (i.e., single test items) but consists of the covariances of all the items.[1]

It should be noted that the item covariances are not behavioral or observable acts in any person's repertoire or test performance. Yet, at the very mention of covariance, we are invoking a theoretical construct, a latent variable (or, if it is broad enough, a latent trait). Given the increments in total covariance among highly diverse test items as more and more informationally nonredundant items are added to the pool, we are thus forced to infer latent variables. Spearman (1904) named the broadest latent variable *g* (for general factor). It is mainly *g,* not the "particular bits and pieces" of behavioral repertoire, that is of major scientific interest. It is also the chief active ingredient in the practical validity of mental tests (Jensen, 1992b, 1993b). In fact, a fairly small number of highly *g*-loaded tests composed of unusual items that could hardly be said to represent more than a tiny fraction of a person's cognitive repertoire and that even bear little resemblance to anything the person has previously encountered can measure *g* almost as well as the testing of a very much larger random sample of the person's intellectual repertoire. The variable size of people's intellectual repertoires is merely an epiphenomenon of *g.* Hence, a set of items that presumably samples people's repertoires may be used as a rough indicator of *g,* provided, of course, that the persons tested have had similar opportunities for acquiring the sampled repertoire. Besides *g,* there are other quite large latent variables, or group factors, in the mental abilities domain (e.g., verbal, spatial, numerical). Measuring individual differences in these factors is one of the major aims of psychometric technology. The "science of intelligence," however, is aimed not at estimating the size of persons' repertoires per se but at discovering the nature of the latent variables that must be inferred to explain the covariances among the diverse items sampled in the repertoires. Some types of items (e.g., Raven Progressive Matrices) reflect the latent variable more than, say, digit-span memory or speed of clerical checking. Why? Without appealing to a latent variable, in what sense can we say that the esoteric Raven Progressive Matrices test is a better sample of people's intellectual repertoires than, say, a knowledge of digits or spelling? This was the very question asked by Spearman 90 years ago and that led him to the invention of factor analysis and the discovery of *g.* Size of vocabulary is highly correlated with number series (e.g., 1, 3, 5, 7, 11, ?, ?). But what do vocabulary and number series have in common in terms of knowledge repertoire for them to be so highly correlated with each other? Even tests as different as choice

[1]The total variance of a test consists of the sum of the n separate item variances (about 10%) plus twice the sum of the $n(n-1)/2$ item covariances (about 90%).

reaction-time to nonverbal stimuli (Jensen, 1993c), inspection time (Kranzler & Jensen, 1989), and pitch discrimination (Lynn, Wilson, & Galt, 1989) are correlated to some degree with vocabulary, number series, and Raven Progressive Matrices. All these variables have the latent trait *g* in common to some degree.

The big question, then, is the nature of *g*. The answer, which is not yet fully in our grasp, will require a full-blown research program, with concerted efforts by scientists in various fields (Jensen, 1987a, 1987b, 1992a).

My suggestion for the problem of defining intelligence has been spelled out in detail elsewhere (Jensen, 1993a, in press). The gist is that the dictionary definition is adequate for popular parlance, but the term is both troublesome and wholly unnecessary in scientific discourse and should be discarded, as *phlogiston* disappeared from chemistry and *animal magnetism* disappeared from psychology. The observable phenomena with which we begin investigation are mental abilities. Two formal definitions are needed: *Ability* refers to any conscious, purposive behavioral act in response to a stimulus situation that can be objectively evaluated by some unequivocal standard (e.g., success–failure, correct–incorrect, degree of accuracy, response time); *mental* refers to any ability in which no more than a minute and negligible part of the reliable population variance is attributable to individual differences in sheer sensory acuity or motor strength and agility, as objectively assessed. A practically unlimited variety of tasks or test items can be devised that will satisfy this definition of mental ability. A "consensus of experts" is not needed beyond acceptance of these noncontroversial definitions, and, should there be disagreement about *mental,* it could be settled objectively by a correlational study. The next step is correlational analysis of individual differences in the domain of tested mental abilities in a representative sample of the general population. Items can be clustered according to their degree of intercorrelation to create relatively homogeneous subtests. A proper hierarchical factor analysis of these indicates the differing degrees of generality of the latent variables that compose the sum of the item covariances. Given a very wide variety of mental-ability tasks to begin with, the most general of the latent variables, or factors, is *g,* which, as an empirical fact, is loaded to varying degrees in all reliably measured mental abilities. And there are a good number of factors of a lower order (i.e., with less generality) independent of *g*. (The results of a great many factor-analytic studies of mental abilities have been most comprehensively surveyed by Carroll, 1993.)

If one wants to refer to *g* as "general *intelligence,*" as Humphreys does, it is simply a redundancy, for nothing is gained conceptually, and it can promote misunderstanding. The term *intelligence* invites unnecessary argument or put-down by those who wish it to mean whatever they fancy; through popular usage, it has accrued so many different and emotionally invested meanings as to be a drawback scientifically, as I have argued elsewhere (Jensen, 1987b).

Besides my questioning this point of definition, anything else I could say by way of criticism of Humphreys's article could only amount to idle cavil. What Humphreys is really discussing is *g,* and what he says about all its educational and social correlates is not only factually true, it is extremely important. It is also important that behavioral scientists, policymakers, and opinion leaders should understand it. Humphreys's clear and direct presentation assists this aim wonderfully.

Note

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