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Regularities in Spearman's Law of Diminishing Returns

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Abstract

The lower average correlations among mental tests in groups of individuals of above-average IQ than is found in groups of individuals of below-average IQ implies a smaller general factor, or *g*, in the higher-IQ group, a phenomenon Spearman called the 'Law of Diminishing Returns'. This phenomenon was confirmed in six independent data sets based on three different test batteries. It implies that psychometric *g* is less general in persons of high IQ and more general among those of low IQ. Two heretofore unknown effects were revealed consistently: (1) The *g* loadings of the various tests in a battery do not differ uniformly or randomly between high- and low-IQ groups; rather, the loadings are much more variable for higher-IQ samples than for lower-IQ samples; (2) Those tests in a battery that are less *g*-loaded (where *g* loadings are based on the general population) consistently show greater decrements in their *g* loadings between low- and high-IQ groups than do the more highly *g*-loaded tests, which show relatively little difference between low- and high-IQ groups.

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1. Introduction

The 'Law of Diminishing Returns' as applied to general intelligence, or psychometric *g*, was introduced by Spearman (1927): "The correlations [between different tests] always become smaller—showing the influence of *g* on any ability to grow less—in just those classes of person which, on the whole, possess this *g* more abundantly. The rule is, then, that the more 'energy' [i.e., *g*] a person has available already, the less advantage accrues to his ability from further increments of it" (p. 219). To illustrate this 'law' Spearman presented the correlation matrix of 12 diverse tests for 'normal' and 'mentally defective' children, with the 'normal' group showing a much smaller average intercorrelation among the tests.

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Spearman's law was virtually forgotten until its revival by Detterman & Daniel (1989) and Detterman (1991), who performed the first methodologically rigorous study of the phenomenon and demonstrated its empirical reality. Since then, Spearman's law has been confirmed by at least seven independent studies based on different test batteries (Deary, Egan, Gibson, Brand, & Kellaghan, 1996; Deary & Pagliari, 1991; Evans, 1999; Legree, Pifer, & Grafton, 1996; Lynn, 1992; Lynn & Cooper, 1993; Maxwell, 1972). One study, based on rather atypical tests and excessively small subject samples, did not show smaller intercorrelations of test scores in the higher-ability group (Fogarty & Stankov, 1995: see review of studies in Jensen, 1998, pp. 585–588).

It appears to have been assumed by Spearman and all the others who have studied this phenomenon that the magnitudes of the correlational decrements in the higher-ability group are either random or roughly uniform with respect to the various tests in the correlation matrix. Detterman and Daniel (1989) state, for example, "If the finding that correlations between mental tests vary systematically by level of ability is found to be a general one, not specific to certain tests, then the implications of this finding are substantial" (p. 357).

Spearman himself never analyzed his Law of Diminishing Returns with respect to any features of the various tests used to demonstrate the effect or any of the psychometric conditions that might influence the magnitude of the effect. Probably the first investigators to discover one such condition were Deary et al. (1996, pp. 117–118), who found that the magnitude of the Spearman effect depends on the particular test on which the higher and lower scoring groups were selected. Their selection test itself was never included in the correlation matrix on which the Spearman effect was demonstrated. Their data indicated, although not conclusively, that the effect was generally larger when the higher and lower scoring groups were selected on the basis of those tests that, on average, had the higher correlations with all the other tests in the battery—the very tests which are also the more highly *g*-loaded. (An anomalous exception, out of seven diverse tests, was a highly *g*-loaded test of figural reasoning.) This finding, if further substantiated, is important because it suggests the hypothesis that the Spearman effect is intrinsic to individual differences in *g* rather than to any other ability factors independent of *g* and the effect is diminished by the degree to which variance on the test used for selecting the contrasting ability groups is unsaturated with *g*.

The purpose of the present study is to examine the as yet unquestioned assumption that Spearman's law acts unsystematically and approximately uniformly for various subtests of cognitive ability in an IQ test battery when high- and low-IQ groups are selected as above/below the median IQ of the battery's Full Scale IQ.

2. Method

2.1. Subjects

The data are from the national standardization samples of the Wechsler Intelligence Scale for Children—Revised (WISC-R) (Wechsler, 1974), the Wechsler Adult Intelligence Scale—Revised (WAIS-R) (Wechsler, 1981).

2.2. Analytic rationale

The total IQ distribution of each test was divided into those individuals with IQ 100 and below and those with IQ above 100. As the IQ distributions are almost perfectly symmetrical and very close to normal, when they are divided in this way the lower and upper distributions have means of approximately 88 and 112, with standard deviations of approximately 12, a difference equivalent to an effect size of 2σ.

Some studies that divided the distribution into several groups, rather than just two (e.g., Detterman & Daniel, 1989) had to base selection on just one or two of the subtests and omit these subtests from the correlational analysis that displays Spearman's law. Otherwise, if the total distribution was divided into several narrow-range ability groups on the basis of Full Scale IQ, it would greatly attenuate the correlations between subtests or even force into existence some artificial negative correlations between subtests, because a high score on one subtest would have to be offset by a low score on another for the individual to be selected into a particular ability group. However, when the total distribution is divided at approximately the mean into only two ability groups (henceforth referred to as the low and high groups), this artifact is negligible and, with very large subject samples, is far outweighed by the advantage of using all the subtests to examine Spearman's law. A sample of diverse tests is needed to determine if the Spearman effect accrues more to some tests than to others and to discern the nature of the tests that systematically are the most and the least affected by Spearman's law.

Two distinct phenomena are examined here: (1) establishing the existence of Spearman's Law of Diminishing Returns in the present data sets, and (2) finding whether it systematically affects some subtests more than others.

(1) Spearman's law is examined by comparing the average intercorrelation of the subtests in the high- and low-IQ groups. There is a choice of several different methods by which to calculate the average value of all the correlations in a matrix—the arithmetic mean of all of the values of r, their root-mean-square, and Fisher's Z transformation procedure. However, I have used the method that Kaiser (1968) has shown mathematically to be the best representation of the average r of a correlation matrix. It is calculated by the simple formula: Average $r=(\lambda-1)/(k-1)$, where λ is the eigenvalue of the first principal component (PC1) of the correlation matrix, and k is the number of variables. Because the average correlation is a monotonic function of PC1, the PC1 itself is the most useful statistic for the present study. PC1 is one method for estimating the general factor, or g, of a matrix (Jensen & Weng, 1994). Also, the subtests' loadings on PC1 are monotonically related to the subtests' average correlations with each of the other subtests in the matrix. The degree of similarity of the general factor obtained in the high-IQ and low-IQ groups is shown by the coefficient of congruence between the groups' PC1 vectors.

Note: The first principal component (PC1) is used consistently throughout the following analyses to represent the general factor of a correlation matrix of psychometric tests. For simplicity in exposition, however, PC1 will always be referred to hereafter simply as g.

(2) Systematic effects or regularities in Spearman's law are here explored by two means: (a) by determining whether the variation (measured by the standard deviation and the

coefficient of variation [CV]) among subtests' *g* loadings differs consistently between the high- and low-IQ groups, and (b) by determining whether some of the subtests consistently show larger differences between the *g* loadings of the high- and low-IQ groups and other subtests consistently show smaller differences between the *g* loadings of the high- and low-IQ groups. The first of these two conditions, (a), if true, would disconfirm the hypothesis that Spearman's law rather uniformly reduces the *g* loading of each and every one of the subtests in the higher half of the total IQ distribution as compared with the lower half, thereby leaving the variation among the subtests' *g* loadings alike for the higher- and lower-IQ groups. The second of these conditions, (b), if true, would reveal the common characteristics of those subtests whose *g* loadings differ the least between the high- and low-IQ groups and those subtests whose *g* loadings differ the most between the high- and low-IQ groups. The distinguishing characteristic(s) of the tests that might consistently show the largest or smallest differences in *g* loadings between the high and low groups is not explicit in Spearman's law and therefore can only be discovered empirically. Positive and significant findings for (a) and (b) would constitute an integral extension of Spearman's law.

3. Results

3.1. Analysis of the Spearman effect per se

First, it should be noted that the correlational differences between the high- and low-ability groups are not the result of differences in their standard deviation (S.D.) on the subtests. The differences between the high and low groups' subtest S.D.s are remarkably small; none showed a significant difference. The average F ratios [F=(low group's S.D./high group's S.D.)^2] for the WISC-R and WAIS-R variances were 1.06 and 0.99, respectively.

The substantiation of the Spearman effect is shown in Table 1 as the mean r of the subtest correlation matrix for the high- and low-IQ groups. The mean r of each group can be compared with the mean r in the correlation matrix for the total sample. It is seen that in every test battery and in every age group the high-IQ group consistently has the smaller mean r. Because the mean r calculated by Kaiser's (1968) method is based on the eigenvalue of the *g*, which is a variance, the significance of the difference between the values of the mean r in the high- and low-IQ groups can be tested by the F ratio of the low/high eigenvalues. The F is significant ($P < .01$) for every test except the battery with which Spearman (1927, p. 218) first demonstrated the phenomenon. Although this F is even larger than for most of the other tests, it is rendered nonsignificant by having much smaller N's. The high and low groups used in Spearman's example were described only as "normal" and "defective" children. And his tests were not described beyond their bare titles.

The interpretation of Spearman's law would be made most problematic if the general factor was altogether different in the two groups, although there is no theory predicting that such an outcome is impossible. To determine whether the correlation matrices for the high and low groups represent the same general factor, the congruence coefficient (CC) between the first principal components of the high and low groups were obtained, as shown in Table 1. The

Table 1
Statistics on high- and low-IQ groups on the WISC-R, WAIS-R, and Spearman battery

Age group	N		Mean r[a]		Congruence coefficient[b]	F ratio[c] (L/H)
	High	Low	High	Low		
WISC-R (12 subtests)						
6–11	598	601	.146	.206	0.963	1.250 *
12–16	501	497	.142	.250	0.905	1.460 *
Total[d]	2197		.396			
WAIS-R (11 subtests)						
16–24	285	315	.188	.336	0.953	1.515 *
25–54	395	405	.178	.432	0.976	1.916 *
55–74	236	244	.220	.397	0.988	1.551 *
Total	1880		.515			
Spearman battery (12 subtests)[e]						
Children	78	22	.482	.792	0.988	1.539 ns

[a] Mean correlation [calculated by the method of Kaiser, 1968] among the subtests.

[b] CC between the first principal component (PC1), or g factor, of the high- and low-IQ groups. CC < 0.80 = dissimilar factors; CC > 0.90 < 0.95 = highly similar factors; CC > 0.95 = virtually identical factors.

[c] Variance ratio (F) of the PC1 eigenvalues for low IQ/high IQ. As the eigenvalue is the standardized variance accounted for by PC1, the F ratio tests the significance of the difference between the two eigenvalues.

[d] Based on total distribution for all age groups.

[e] From Spearman (1927, p. 218).

* $P < .01$.

CCs > 0.90 indicate that the general factor is very similar in the contrasted ability groups, and in some cases (CC > 0.95) they are virtually identical.

3.2. Regularities in subtest correlations in low- and high-IQ groups

If the Spearman effect depressed all of the subtests' intercorrelations in the high-IQ group relative to the low group more or less uniformly, one would not expect the high- and low-IQ groups to differ systematically in the variation among the subtests' g loadings within each group. A corollary of this is that the subtests' g loadings should show a fairly consistent degree of depression of g loadings across the various subtests in the high-IQ group relative to the subtests' g loadings in the low-IQ group.

In fact, however, both of these expectations are consistently contradicted for all tests in all age groups. There are systematic differences in the variation of subtests' g loadings across the high-IQ and low-IQ groups; and there is differential depression of g loadings across subtests.

First, Table 2 shows two methods for measuring variation among the g loadings in the high- and low-IQ groups. The CV is allowed here, as g loadings are a ratio scale (bounded by -1 to $+1$). Its use here shows that the high–low difference in variation of g loadings holds up both for an *absolute* measure of variability (i.e., the difference

Table 2
Measures of variation in the *g* (PC1) loadings of the subtests for high- and low-IQ groups on the WISC-R, WAIS-R, and Spearman battery

Age group	Standard deviation		Coefficient of variation[a]	
	High IQ	Low IQ	High IQ	Low IQ
WISC-R (12 subtests)				
6–11	0.175*	0.089	0.402	0.172
12–16	0.274*	0.137	0.721	0.253
Total[b]	0.114		0.174	
WAIS-R (11 subtests)				
16–24	0.237*	0.135	0.516	0.220
25–54	0.149*	0.075	0.308	0.109
55–74	0.112	0.071	0.214	0.106
Total[b]	0.061		0.082	
Spearman battery (12 subtests)[c]				
Children	0.142*	0.069	0.200	0.092

[a] The *CV* ($=\text{S.D.}/\bar{X}$) of the *g* loadings in the high-IQ and low-IQ groups. No tests of significance were performed on the CVs.

[b] Based on total distribution for all age groups.

[c] From Spearman (1927, p. 218).

* The *F* test indicates the difference between the S.D.s is significant at $P<.05$.

between S.D.s) and for a measure of variation that is *relative* to the mean of all the *g* loadings (i.e., the difference between CVs). It can be seen that the high-IQ group consistently shows greater absolute and relative variation in *g* loadings, which necessarily implies also greater variation among each of the subtests' average correlations with each of the other subtests.

Second, Table 3 shows a consistent relationship between subtests and *g* differences between the high- and low-IQ groups. The correlation matrix based on the total sample (comprising all subjects in all age groups) obviously yields the most reliable estimates of the various subtests' *g* loadings. Therefore, using the *g* loadings in the total sample, I selected the three subtests that are the *most* loaded on *g* and the three subtests that are *least* loaded on the *g* factor.[1] Then, separately in the low-IQ group and in the high-IQ group, I obtained the mean *g* for the *most* and the *least* *g*-loaded subtests as indicated in the total sample. The difference between the high- and low-IQ groups on these means are shown in the first two columns of Table 3; the last column, then, shows the difference between these

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[1] In the total sample, the three most *g*-loaded WISC-R subtests: Vocabulary (0.80), Information (0.77), and Similarities (0.77); the least *g*-loaded: Coding (0.47), Mazes (0.51), Digit Span (0.51). The most *g*-loaded WAIS-R subtests: Similarities (0.82), Vocabulary (0.82), Information (0.79); the least *g*-loaded: Digit Symbol (0.65), Digit Span (0.66), Object Assembly (0.67). In the Spearman battery, the most *g*-loaded subtests in the normal group: Opposites (0.92), Observation (0.87), Absurdities (0.81); least *g*-loaded subtests: Strength of Grip (0.19), Tapping (0.25), Interpretation of Pictures (0.45).

Table 3
Mean high-IQ–low-IQ group differences on the three most and three least *g*-loaded subtests in the total samplel

Age group	Mean of low–high *g*[a]		Difference
	Three most *g*-loaded subtests	Three least *g*-loaded subtests	Most–least *g*-loaded subtests
WISC-R (12 subtests)			
6–11	– 0.090	0.176	– 0.266
12–16	– 0.012	0.199	– 0.211
WAIS-R (11 subtests)			
16–24	0.038	0.227	– 0.189
25–54	0.139	0.257	– 0.118
55–74	0.068	0.213	– 0.145
Spearman battery (12 subtests)[b]			
Children	0.091	0.296	– 0.205

[a] The mean of the high–low IQ group differences between the *g* loadings (derived within each group) of the three subtests that were identified as the *most* *g*-loaded and the three subtests that were identified as *least* *g*-loaded in the total sample.

[b] From Spearman (1927, p. 218).

mean differences (e.g., $-0.090-0.176=-0.266$). These differences are large in relation to the magnitudes of the *g* loadings and are consistently negative. Surprisingly, the *g* loadings of the high-IQ group diverge most from the *g* loadings of the low-IQ group on those subtests that *least* measure the general factor. Conversely, the *g* loadings of the high- and low-IQ groups differ very little, if at all, on the subtests that have the largest *g* loadings in the total sample. *The effect known as Spearman's Law of Diminishing Returns is produced mostly by the least g-loaded tests in a given battery.* This phenomenon, in the WISC-R and the WAIS-R batteries, can be depicted most strikingly in graphical form, seen in Figs. 1 and 2, showing the *g* loadings of the high (+) and low- (•) IQ groups plotted as a function of the subtests' *g* loadings in the total normative samples for the WISC-R and the WAIS-R.

3.2.1. Differential reliability?

The striking feature of the Spearman effect displayed in Figs. 1 and 2 raises the question of whether differential reliability of the subtests in the high- and low-IQ groups could be the cause of the effect. This cannot be definitively answered by the present study, for which subtest reliability coefficients or individual item data were not available separately for the high- and low-IQ groups. Psychometrically and logically, it is clear that if the subtest reliabilities were higher for the high-IQ group than for the low-IQ group, the observed Spearman effects would have to be authentic rather than an artifact of differential reliability. If, however, the reverse were true and the low-IQ group had appreciably higher reliabilities than the high-IQ group, the reality of the Spearman effects would be in question as merely an artifact of differential subtest reliability. Three points need to be said about this. First, note that the pattern of *g*-loading differences between the high- and low-IQ groups seen in

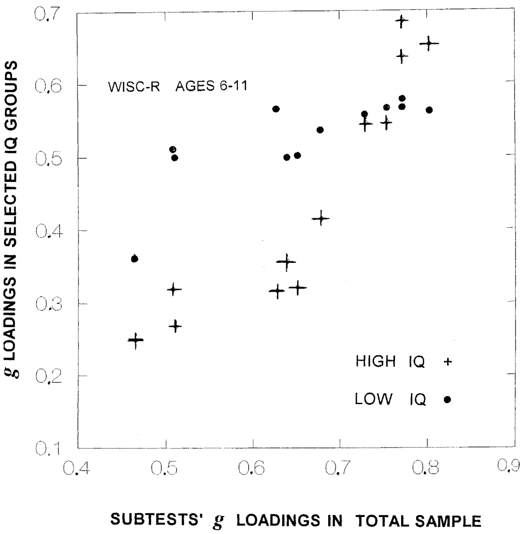

Fig. 1. The WISC-R subtests' *g* loadings in the high- and low-IQ groups plotted as a function of the subtests' *g* loadings in the total WISC-R standardization sample.

Tables 1 and 2 are so large as to make it highly unlikely that they could be due entirely to differential reliabilities. The variation among the subtest *g* loadings is far greater than the variation among subtest reliability coefficients reported in the WISC-R and WAIS literature. And this difference in variation would be even greater if the *g* loadings were corrected for

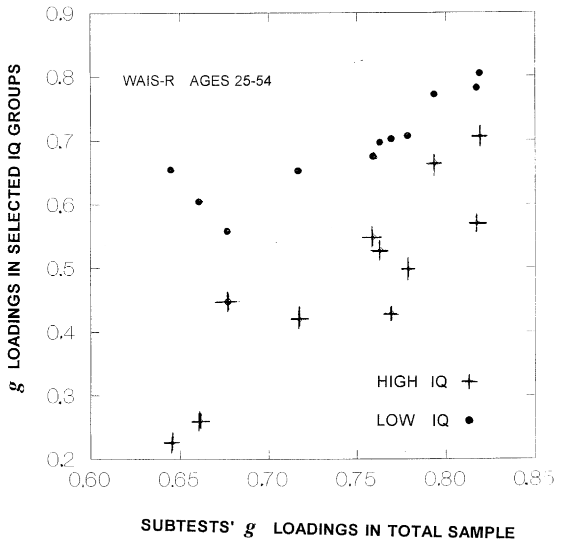

Fig. 2. The WAIS-R subtests' *g* loadings in the high- and low-IQ groups plotted as a function of the subtests' *g* loadings in the total WAIS-R standardization sample.

attenuation, as the correction factors are the square roots of the reliability coefficients (i.e., a disattenuated g loading is $g/\sqrt{r_{xx}}$), which are less variable than the reliabilities per se. Second, there is no a priori reason to assume that the subtest reliabilities differ appreciably between the high- and low-IQ groups. A study of the Spearman effect in which it was possible to calculate the subtests' split-half reliabilities from item data separately in each of the selected ability groups found that the reliabilities showed nonsignificant differences between the high- and low-ability groups and for the slight differences that appeared, the high-ability group had the higher reliability. The authors concluded that varying subtest reliability could not explain the observed variation in subtest intercorrelations (Deary et al., 1996, p. 119). The differential reliability question as it pertains to the Spearman effect in particular, however, is still problematic, because all internal consistency measures of reliability derived essentially from item intercorrelations (such as split-half, Hoyt, Kuder–Richardson 20, alpha, or parallel forms reliability coefficients) may themselves be subject to the Spearman effect. Hence, evaluating or disattenuating the *subtest intercorrelations* in high- and low-ability groups by using internal consistency reliability coefficients that are based essentially on *item intercorrelations* would only confound the differential reliability problem, if in fact Spearman's 'law' holds for item intercorrelations as well as for subtest intercorrelations. It has not yet been established clearly whether a test's internal consistency reliability itself is an integral aspect of Spearman's 'law'—a question for future empirical investigation.

4. Discussion

The newly discovered regularities in Spearman's 'Law of Diminishing Returns' that were pointed out have implications both for practical psychometrics and for g theory.

4.1. Psychometric implications

It is apparent that the total score or a derived IQ from a battery of tests that differ markedly in their g loadings in a representative sample of the general population does not provide an equally good measure of g for all levels of ability. The total scores of individuals in the upper range of the ability distribution are considerably less g loaded, and consequently are more adulterated by non-g factors and test specificity, than are the scores in the lower range. Furthermore, in high-ability groups, those tests that have the larger g loadings in the whole population systematically show the *least* decrement in g loading, and those tests that have the smallest g loadings show the *most* decrement. In low-ability groups, the g loadings of all the tests are amplified, but more so for those tests that are the least g-loaded in the whole population. These conditions imply that the best measure of g can be obtained by including in the test battery only those subtests that have the largest g loadings in the population sample that can be found. Because this stricture is likely to exclude or diminish beyond usefulness the measurement of any other ability factors of psychometric interest, one would seek other specialized tests for the assessment of various group factors or aptitudes and skills of practical significance, whatever their *g*. As *g* probably has the broadest usefulness, however, it seems most important that it should be measured in a way that allows the latent trait to be as well represented as possible throughout the full range of ability. This still requires more than a single test. A battery composed of diverse subtests is needed in order to minimize the proportion of the variance in the total test scores that is contributed by lower-order factors and test specificity. It should be possible to select or construct a large battery of highly reliable subtests having quite diverse content and information-processing demands yet maximizes their *g* variance, with all of the subtests having approximately equal *g* loadings. Also, subtests in a battery devised to measure *g* should be selected so as to minimize variance attributable to group factors and specificity. It should not be overlooked that the variance of the composite score from a battery of subtests comprises the variance contributed by each of the different common factors in the battery and the specificity of each of the subtests, in addition to error variance. The idea is to maximize *g* and minimize the rest. The purpose, of course, is to improve the measurement of *g* throughout the whole distribution, not to depreciate other ability factors, each of which should have its own test battery that maximizes the variance on the particular group factor it is intended to measure.

4.2. Theoretical implications

Almost as many theories of Spearman's law have been suggested as the number of psychologists who have written about it. Few if any theories hardly go beyond similes, metaphors, and analogies based on mechanical engines, systems theory, developmental differentiation of cognitive components, and the like, some of which seem more like ways of merely describing the phenomenon rather than explaining its dynamics. These theories have been described in at least three readily available sources, so I will not reiterate here (Deary et al, 1996; Detterman & Daniel, 1989; Jensen, 1998, pp. 585–588). The present findings, however, may serve a purpose if they provide additional constraints on theorizing about this phenomenon. Any theory now has to explain these new facets in addition to the original finding that gave rise to Spearman's law. All of the speculative interpretations of the phenomenon naturally have certain features in common, though none so far have taken account of the present finding that it is the highly *g*-loaded tests that differ the least in their loadings across different levels of ability, whereas the less *g*-loaded tests differ the most. What could be going on? Another round of theorizing may now be in order. Before elaborating any new theory worthy of an empirical test, however, the generalizability of the essential phenomena reported here should be firmly established by showing that they occur in other large test batteries besides the Wechsler scales.

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References

Deary, I. J., Egan, V., Gibson, G., Brand, C. R., & Kellaghan, T. S. (1996). Intelligence and the differentiation hypothesis. *Intelligence*, *23*, 105–132.

Deary, I. J., & Pagliari, C. (1991). The strength of *g* at different levels of ability: have Detterman and Daniel rediscovered Spearman's "law of diminishing returns"? *Intelligence*, *15*, 256–260.

Detterman, D. K. (1991). Reply to Deary and Pagliari: is *g* intelligence or stupidity? *Intelligence*, *15*, 251–255.

Detterman, D. K., & Daniel, M. H. (1989). Correlations of mental tests with each other and with cognitive variables are highest for low IQ groups. *Intelligence*, *13*, 349–359.

Evans, M. G. (1999). On the asymmetry of *g*. *Psychological Reports*, *85*, 1059–1069.

Fogarty, G. J., & Stankov, L. (1995). Challenging the law of diminishing returns. *Intelligence*, *21*, 157–174.

Jensen, A. R. (1998). *The g factor*. Westport, CT: Praeger.

Jensen, A. R., & Weng, L.-J. (1994). What is a good *g*? *Intelligence*, *18*, 231–258.

Kaiser, H. F. (1968). A measure of the average intercorrelation. *Educational and Psychological Measurement*, *28*, 245–247.

Legree, P. J., Pifer, M. E., & Grafton, F. C. (1996). Correlations among cognitive abilities are lower for high ability groups. *Intelligence*, *23*, 45–57.

Lynn, R. (1992). Does Spearman's *g* decline at high IQ levels? Some evidence from Scotland. *Journal of Genetic Psychology*, *8153*, 229–230.

Lynn, R., & Cooper, C. (1993). A secular decline in Spearman's *g* in France. *Learning and Individual Differences*, *5*, 43–48.

Maxwell, A. E. (1972). The WPPSI: a marked discrepancy in the correlations of the subtests of good and poor readers. *British Journal of Mathematical and Statistical Psychology*, *25*, 1–21.

Spearman, C. E. (1927). *The abilities of man*. London: Macmillan.

Wechsler, D. (1974). *Wechsler intelligence scale for children, revised*. San Antonio: Psychological Corporation.

Wechsler, D. (1981). *Wechsler adult intelligence scale, revised*. San Antonio: Psychological Corporation.