

# The “Jensen Effect” and the “Spearman-Jensen Hypothesis” of Black-White IQ Differences

J. PHILIPPE RUSHTON  
*University of Western Ontario*

Arthur Jensen's research on the biological basis of mental ability has culminated in his encyclopedic new work *The g Factor* (1998) which massively confirms "Spearman's (1927) hypothesis" that Black-White IQ differences vary systematically as a function of each test's *g* loading. More generally, *The g Factor* consolidates the psychometric, neurophysiological, behavior genetic, and comparative evidence for the existence and importance of *g*, and links it to evolutionary processes. But perhaps Jensen's greatest legacy to science will be his pioneering method of correlated vectors which subsumes, under a much broader principle, his famous (1969a) hypothesis about the heritability of the Black-White IQ gap and, as Osborne (1980) dubbed it, the "Spearman-Jensen hypothesis" that Black-White IQ differences are greatest on the *g*-factor. Jensen's method of correlated vectors demonstrates that *g* (specifically a test's *g* loading) is the best predictor of that test's correlation with a given variable. In future, when a significant correlation occurs between *g*-factor loadings and variable X, the result might usefully be called a "Jensen Effect" (for that X variable), because otherwise there is no name for it, only a long explanation of how the effect was achieved. Naming it the "Jensen Effect" would honor one of the greatest psychologists of our time.

## A Personal Note

Perhaps I am the only psychologist of my generation who missed the tumultuous appearance of Arthur Jensen's (1969a) famous *Harvard Educational Review* article arguing that IQ is heritable and that genetic factors are involved in the Black-White IQ gap. The attendant brouhaha failed to reach my attention in England where I was an undergraduate student at the University of London. Two years later, however, when Hans Eysenck popularized Jensen's argument in his 1971 book *Race, Intelligence, and Education*, I was a graduate student at the London School of Economics and Political Science, and Eysenck's book created such a furore that a small group of us social psychologists decided to study

---

Direct all correspondence to: J. Philippe Rushton, Department of Psychology, University of Western Ontario, London, Ontario, Canada, N6A 5C2 <Rushton@julian.uwo.ca>.

---

INTELLIGENCE 26(3): 217-225  
ISSN: 0160-2896

Copyright © 1998 by Ablex Publishing Corporation  
All rights of reproduction in any form reserved.

the issue. Jensen's clearly argued response to seven "replies," as well as his original exposition (all usefully compiled in an offprint series by the Harvard University Press) led some of us to believe that he might well be right.

Jensenism, described as one of the great heresies of 20th century science, continued to inspire heated debate at the London School of Economics for the next two years, culminating in a physical assault on Professor Eysenck when he came to give us a lecture in 1973 on "The Biological Basis of Intelligence." I was more than just a horrified witness to this 'political action' by a dozen Maoists (proudly sporting red Mao-Tse Tung badges in their lapels). I was even featured in a newspaper photograph in a scrum around Eysenck, energetically pulling at rampaging 'demonstrators,' but wearing the fashionably long hair of the time, it might not be obvious from the photograph whose side I was on! The Maoists made no attempt to hide after Eysenck was hustled away, for the police were not to be called and there was an unfortunate sentiment that Eysenck only got what he deserved. "No Enemies on the Left" was a mantra at the L.S.E. in the early 1970s.

The first time I heard Jensen speak in person was at the 1978 annual meeting of the American Psychological Association in Toronto where he (1979) presented "g: Outmoded Theory or Unconquered Frontier?" The science was inspirational, all about reaction-time and speed-of-processing correlates of IQ. The large ballroom was filled to overflow and the audience, rapt with attention, burst into enthusiastic applause when he had finished. If only in contrast to anxious expectations, the 'infamous Dr. Jensen' struck me as warm, humane, and giving of one of the most exciting talks I had ever heard.

I eventually met Jensen in early 1981 while spending a term as a Visiting Scholar at Berkeley's Institute of Human Development. Having just written a book explaining altruism from a social learning perspective (Rushton, 1980), I was broadening my focus to encompass behavioral genetic and sociobiological viewpoints. Although many of those at the Institute of Human Development had earned international reputations for documenting the early emergence of personality traits and their power to predict social adjustment, few were interested in searching for behavior genetic causes. The reason was not hard to find. At Berkeley, any discussion of behavioral genetics was but a nervous hop, skip, and a jump away from Jensen's controversial racial hypothesis.

Jensen occupied an office in the School of Education, one floor up from my office in the psychology department. We easily established rapport. The question of race differences was beginning to fascinate me and on this topic, of course, Jensen was most informative. Over several lunches at *Pasand*, one of his favorite local Indian restaurants, he sketched out his views and helpfully answered queries. Back at his office he provided reprints. It was clear that Jensen's defining trait was intellectual curiosity and for him the study of race differences presented an acid test. How could the topic, which loomed so large in education and society, be avoided for ideological reasons if psychology was to be scientific and if the individual scientist was to maintain personal integrity? I came away profoundly influenced and determined to read the relevant literature.

### **International Distribution of IQ, Brain Size, and Related Traits**

Many researchers were inspired by "Jensenism." Lynn (1978, 1982) and Vernon (1982) not only pushed the envelope, but extended the 'outside of the envelope' and made the race-IQ debate international in scope with their findings that East Asians average higher

on tests of mental ability than do Whites, whereas Caribbeans (and especially Africans) average lower. As Lynn's (1997) and Jensen's (1998) most recent reviews show, East Asians, measured in North America and in Pacific Rim countries, typically average IQs in the range of 101 to 111. Caucasoid populations in North America, Europe, and Australasia typically average IQs from 85 to 115 with an overall mean of 100. African populations living south of the Sahara, in North America, in the Caribbean, and in Britain typically have mean IQs from 70 to 90. (Blacks in sub-Saharan Africa score about 2 standard deviations [approximately 30 IQ points] below the mean of Whites on nonverbal tests.)

As a budding sociobiologist, I too was inspired by Jensenism. It seemed to me that by its impact on diverse areas of behavioral science, Jensenism might help complete the Darwinian revolution. I began to review the international literature, studying not only IQ, but other behavioral traits like speed of physical maturation and longevity, personality and temperament, family structure and crime, and sexual behavior and fertility, and later brain size (Rushton, 1984a, 1984b, 1988). I have found that on these traits East Asians are slower maturing, less fertile, less sexually active, with larger brains and higher IQ scores than Africans, who tend towards the opposite in each of these areas. Europeans, I found, fell between the other two groups. As Jensen (1984) elaborated (in a commentary on my first review), a network of such related evidence provides more opportunity for finding and testing alternative theories than does any single dimension drawn from the set.

As a now avowed Jensenist, I carried out experiments finding, for example, that the amount of inbreeding depression on 11 sub-tests of the Wechsler Intelligence Scale for Children in Japan predicted the magnitude of the Black-White differences on the same sub-tests in the U.S. (Rushton, 1989). Inbreeding depression, a purely genetic effect, was a sufficiently robust predictor to overcome generalization from the Japanese in Japan to Blacks and Whites in the U.S. There really is no other explanation, other than a genetic one, for the correlation between inbreeding depression and Black-White differences.

I also calculated cranial capacities from external measurements of the head using large archival data sets including a stratified random sample of 6,325 U.S. Army personnel (Rushton, 1992), a sample of tens of thousands of men and women collected by the International Labour Office in Geneva (Rushton, 1994), and a sample of thousands of American children from birth to age seven (Rushton, 1997). After adjusting for the effects of stature, weight, and sex, the cranial capacities consistently averaged higher for East Asians than for Europeans, who averaged higher than Africans, as reviewed by Rushton and Ankney (1996) and Jensen (1998).

### **Jensen's *The g Factor***

All the issues Jensen raised in 1969 are still with us today. Indeed, much of the opposition to IQ testing and heritability would probably disappear if it were not for the stubborn and unwelcome fact that, despite extensive well-funded programs of intervention, the Black-White difference refuses to go quietly into the night.

Jensen's long intellectual march has culminated triumphantly in his latest book, *The g Factor* (1998), an exposition of the reality of Spearman's (1927) seminal concept of *g*, the general factor of intelligence. Jensen's tome does not draw back from Jensenist conclusions—that the average difference in IQ found between Blacks and Whites has a substan-

tial hereditary component, that this difference is related mainly to the *g*-factor, and that it has important societal consequences.

Chapter 11 of *The g Factor* fully documents how, on average, the American Black population scores below the White population by about 1.2 standard deviations, equivalent to 18 IQ points. This mean difference between Blacks and Whites in IQ scores has scarcely changed over the past 80 years (despite some claims that the gap is narrowing) and can be observed as early as three years of age. Controlling for overall socioeconomic level only reduces the mean difference by 4 IQ points. Contrary to purely cultural explanations, culture-fair tests tend to give Blacks slightly *lower* scores, on the average, than more conventional tests, as do non-verbal tests compared with verbal tests, and abstract reasoning tests compared with tests of acquired knowledge.

The reason, in fact, that Jensen pursued Spearman's hypothesis is that it so exquisitely solved a problem that had long perplexed him about test bias with respect to Black-White differences. He had noted that the Black-White differences are markedly smaller on tests of rote learning and short term memory than on tests of reasoning and those requiring any transformation of the information. He initially formalized these observations in his so-called Level I-Level II theory (Jensen, 1968). Level I tasks were those that required little or no mental manipulation of the input to arrive at the correct output. A clear example of Level I ability is Forward Digit Span in which people recall a series of digits in the same order as that in which they are presented. Level II tasks, however, require some mental manipulation of the input in order to arrive at the appropriate response. A clear example of Level II ability is Backward Digit Span in which people recall a series of digits in the *reverse* order to that in which they are presented. Jensen found that Black-White differences are twice as large for Backward as for Forward Digit Span. As this finding did not readily lend itself to an explanation in terms of cultural bias or in terms of any other theory Jensen knew of except his Level I-Level II notion, he kept thinking about it.

After Jensen re-read Spearman, he realized that his Level I-Level II formulation was only a special case of the more general hypothesis proposed by Spearman. Jensen began testing Spearman's hypothesis on a wide variety of psychometric tests administered to large representative samples of the American White and Black populations (Jensen, 1985, 1987). *The g Factor* summarizes the results from 17 independent data sets on a total of nearly 45,000 Blacks and 245,000 Whites derived from 171 psychometric tests. *g* loadings consistently predict the magnitude of the Black-White difference ( $r = +.63$ ). Spearman's hypothesis is borne out even among three-year-olds administered eight sub-tests of the Stanford-Binet. The rank correlation between *g* loadings and the Black-White differences is  $+.71$  ( $p < .05$ ).

Spearman's hypothesis applies even to the *g* factor extracted from performance on elementary cognitive tasks. In some of these studies, 9-to-12-year-olds are asked to decide which of several lights is illuminated and move their hand to press a button that turns that light off. All children can perform such tasks in less than one second, but children with higher IQ scores perform faster than do those with lower scores, and White children, on average, perform faster than Black children (Vernon & Jensen, 1984). The correlations between the *g* loadings of these types of reaction time tasks and the Black-White differences range from  $+.70$  to  $+.81$ .

Jensen also applied Spearman's hypothesis to East Asian-White comparisons, using the same reaction time measures. The direction of the correlation is *opposite* to that in

the Black-White studies, indicating that, on average, East Asians score higher in  $g$  than do whites. No one so far seems to have looked at East Asian-White differences on conventional psychometric tests as a function of their  $g$  loadings. From the study just mentioned, however, Jensen's prediction should be clear: One should find the mirror image of Spearman's hypothesis for Black-White differences. It might be interesting to note, in light of the above, that in an early reply to a charge of "white supremacy," Jensen (1969b, p. 240) made a remarkably presaging conjecture. He wrote: "...if I were asked to hypothesize about race differences in what we call  $g$  or abstract reasoning ability, I should be inclined to rate Caucasians on the whole somewhat below Orientals, at least in the United States."

### **The Spearman-Jensen Hypothesis**

Osborne (1980) suggested that if scientific credit was to be assigned appropriately, the "Spearman hypothesis" that Black-White differences are greater on more  $g$ -loaded subtests should become the "Spearman-Jensen hypothesis" because it was Jensen who brought Spearman's hypothesis to widespread attention, and it was Jensen who did all the empirical work confirming it. Jensen (1997) himself has noted that, "Because Spearman himself never presented it as a formal hypothesis, a few people have objected to my crediting it to Spearman. So whenever I say 'Spearman's hypothesis,' I hope you will visualize these words in quotation marks."

### **The Jensen Effect**

The Spearman-Jensen hypothesis turns out to be readily subsumable under a more general principle that, when resulting in a positive finding, we might call a "*Jensen Effect*." Recall that the Spearman-Jensen hypothesis was tested by first extracting the  $g$  factor from a variety of cognitive tests, and then relating these scores (a 'vector' of scores, i.e., with direction as well as quantity), to the mean Black-White differences on those same tests (a second 'vector' of scores). Jensen extended this method of correlated vectors to a variety of variables. Using this procedure, Jensen (1998) showed that the vector of a test's  $g$  loadings is the best predictor of that test's correlation with a variety of variables, including not only scholastic and work-place performance, but also brain size, brain pH, brain glucose metabolic rate, average evoked potential, reaction time, and other physiological factors. The Jensen Effect can be seen whenever there is a significant correlation between the vector of the sub-tests'  $g$  loadings and the vector of the same sub-tests' loadings on variable  $X$  (where  $X$  is some other, usually non-psychometric variable).

This *methodological* innovation of Jensen's may be an even greater discovery than the totality of empirical results generated by it, important though these undoubtedly are. His method of correlated vectors is fully explicated in *The  $g$  Factor* (Appendix B) and is also discussed in the opening remarks of this symposium. To honor Jensen's accomplishments into the future, I propose that when a significant correlation occurs between the two vectors the result be called a *Jensen Effect* (for that  $X$  variable), because otherwise there is no name for it, only a long explanation of how the effect was achieved.

### Jensenism Today

Chapter 12 of *The g Factor* presents Jensen's technical arguments for why he believes that race differences are about 50% genetic in origin. He emphasizes the fact that it is precisely those components of intelligence tests that are most heritable and that most relate to brain size which most profoundly differentiate Black from White groups. The heritability data are especially interesting because genetic theory and culture theories of race differences make predictions opposite to each other. Culture theory predicts that differences between races will be greater on those culturally malleable items on which races can grow apart as a result of dissimilar experiences.

*The g Factor* also cites the evidence of transracial adoption studies. Three studies have been carried out on Korean and Vietnamese children adopted into White American and White Belgian homes. Though many had been hospitalized for malnutrition, prior to adoption, they went on to develop IQs ten or more points higher than their adoptive national norms. By contrast, Black and mixed-race (Black-White) children adopted into White middle-class families typically perform at a lower level than similarly adopted white children. In the well known Minnesota Transracial Adoption Study, by age 17, adopted children with two White biological parents had an average IQ of 106, adopted children with one Black and one white biological parent averaged an IQ of 99, and adopted children with two Black biological parents had an average IQ of 89 (which is not different from that of Black children raised by Black parents in these northwestern states).

*The g Factor* also devotes a fair amount of space to racial differences in brain size. Chapter 6 reviews the literature which shows that the brain-size/IQ relation emerges most clearly using Magnetic Resonance Imaging ( $r = .44$  across eight separate studies). Chapter 12 documents the three-way racial gradient in brain size established by aggregating data from studies using four kinds of measurements: (a) wet brain weight at autopsy, (b) volume of empty skulls using filler, (c) volume estimated from external head sizes, and (d) volume estimated from external head measurements and corrected for body size. East Asians and their descendants average about 17 cm<sup>3</sup> (1 in<sup>3</sup>) larger brain volumes than do Europeans and their descendants, whose brains average about 80 cm<sup>3</sup> (5 in<sup>3</sup>) larger than do those of Africans and their descendants. Jensen (1998, pp. 442-443) calculated an "ecological" correlation (used in epidemiological studies) of +0.998 between median IQ and mean cranial capacity across the three populations of "Mongoloids," "Caucasoids," and "Negroids."

Finally, *The g Factor* considers the race differences from an evolutionary perspective. Jensen accepts the "Out-of-Africa" theory, that *Homo sapiens* arose in Africa about 100,000 years ago, expanded beyond Africa after that, and then migrated east after a European/East Asian split about 40,000 years ago. Since evolutionary selection pressures were different in the hot savanna where Africans evolved than in the cold Arctic where Mongoloids evolved, these ecological differences had not only morphological, but also behavioral effects. The farther north the populations migrated 'Out of Africa,' the more they encountered the cognitively demanding problems of gathering and storing food, gaining shelter, making clothes, and raising children during prolonged winters. As these populations evolved into present-day Europeans and East Asians, they underwent selective pressure for larger brains.

*The g Factor's* strong conclusion about race differences in fact came as something of a surprise to me. In all my discussions with Jensen about race differences since 1981, I had

been struck by his careful circumspection. More than once he went so far as to say that he doubted that methods were available for determining whether Black-White differences were heritable (including the methods of behavior genetics). As best I recall, he said something like: "We can never 'prove' for certain that the race differences in IQ are heritable in the sense that we can 'prove' something in mathematics. All empirical science can do is increase the probability that genetic factors are involved."

### Pushing Out the Envelope Even Further

Science is a never ending journey and Jensenism has traveled far since 1969. With regard to the significance of brain size, for example, early on, Jensen described brain size as unrelated to IQ (1969a, p. 73; 1973, p. 333, 349), and did not cite the literature on racial differences in brain size. Somewhat later, in *Bias in Mental Testing* (1980), he cited Van Valen's (1974) re-assessment of the literature showing a +.30 correlation between brain size and IQ along with a Table from Hooton (1939) showing a linear relation between head size and socioeconomic status. By 1984, Jensen cited Ho, Roessmann, Straumfjord, and Monroe's (1980) autopsy studies showing a Black-White brain weight difference of about 100 grams and outlined a variety of ways to examine relations between race, brain-size, and IQ. By the time of *The g Factor*, Jensen's own studies had shown that head size was related to IQ even within-families, that the head size/IQ relationship occurred on the most g-loaded tests, that Blacks and Whites differed in head size, and that the Black and White differences in head size disappeared when Blacks and Whites were matched for IQ.

The conclusion that there are racial differences in average brain size is becoming accepted. For example, Ulric Neisser, Chair of the recent American Psychological Association's Task Force Report on *The Bell Curve* (Neisser et al., 1996) acknowledged that, with respect to "racial differences in the mean measured sizes of skulls and brains (with East Asians having the largest, followed by Whites and then Blacks)....there is indeed a small overall trend" (Neisser, 1997, p. 80).

From the beginning, Jensenism did not stop with IQ. For example, Jensen (1969a, p. 86) cited studies showing the early development of motor behavior in Black infants with some Black samples at six months of age scoring nearly one standard deviation above White norms. Paralleling the behavioral precocity, Jensen (1969a, p. 87) reported evidence of faster bone development in Black infants (established using X-rays) and earlier maturation of brain wave patterns (measured using EEGs). Soon after, Jensen (1973: 289-290) suggested that race differences in the production of two-egg twins, being most common among Blacks and least common among East Asians, with Caucasians intermediate, "may be a reflection of evolutionary age." In a long footnote, he wrote: "[T]he three racial groups lie on a developmental continuum on which the Caucasian group is more or less intermediate. A related fact is that there is an inverse relationship throughout the phylogenetic hierarchy between the tendency for multiple births and the prolongation of immaturity."

As a committed Jensenist, I pursued these hypotheses with vigor and proposed a gene-based "life-history theory" familiar to evolutionary biologists as the *r-K* scale of reproductive strategy to account for the racial trade-off between brain size and egg-production, and other variables (Rushton, 1995). At one end of this scale *r*-strategies emphasize high reproductive rates while at the other *K*-strategies emphasize high levels of parental investment. This scale is generally used to compare the life histories of widely disparate species, but I

used it to describe the immensely smaller variations within the human species. Following Jensen's trail I went on to hypothesize that Mongoloid people are, on average, more *K*-selected than Caucasoids, who in turn are more *K*-selected than Negroids. My book *Race, Evolution, and Behavior* documents the reality of racial differences in over 60 physical and behavioral traits.

### Conclusion

In recent years, the equalitarian dogma has run headlong into some very bad karma. In the wake of the success of *The Bell Curve* (Herrnstein & Murray, 1994), and other recent books that provide race-realist answers to the question of differential group achievement, there has been an intense effort to get the 'race genie' that Jensen's 1969 *Harvard Educational Review* paper loosed safely back in the bottle, to squeeze the previously tabooed toothpaste back in the tube. By firmly establishing the psychometric, neurophysiological, behavior genetic, and comparative evidence for the existence and importance of Spearman's *g*, Jensen's *The g Factor* makes it near certain that such obscurantist efforts will end up shredded by Occam's razor.

### REFERENCES

- Eysenck, H.J. (1971). *Race, intelligence, and education*. London: Temple Smith.
- Herrnstein, R.J., & Murray, C. (1994). *The bell curve*. New York: Free Press.
- Ho, K.C., Roessmann, U., Straumfjord, J.V., & Monroe, G. (1980). Analysis of brain weight: I and II. *Archives of Pathology and Laboratory Medicine*, 104, 635–645.
- Hooton, E.A. (1939). *The American criminal*, Vol. 1. Cambridge, MA: Harvard University Press.
- Jensen, A.R. (1968). Patterns of mental ability and socioeconomic status. *Proceedings of the National Academy of Sciences*, 60, 1330–1337.
- Jensen, A.R. (1969a). How much can we boost IQ and scholastic achievement? *Harvard Educational Review*, 39, 1–123.
- Jensen, A.R. (1969b). Reducing the heredity–environment uncertainty. *Harvard Educational Review*, 39, 449–483.
- Jensen, A.R. (1973). *Educability and group differences*. London: Methuen.
- Jensen, A.R. (1979). *g*: Outmoded theory or unconquered frontier? *Creative Science and Technology*, 2, 16–29.
- Jensen, A.R. (1980). *Bias in mental testing*. New York: Free Press.
- Jensen, A.R. (1984). Sociobiology and differential psychology: The arduous climb from plausibility to proof. In J.R. Royce & L.P. Mos (Eds.), *Annals of theoretical psychology*, Vol. 2 (pp. 49–58). New York: Plenum.
- Jensen, A.R. (1985). The nature of the black–white difference on various psychometric tests: Spearman's hypothesis. *Behavioral and Brain Sciences*, 8, 193–263.
- Jensen, A.R. (1987). Further evidence for Spearman's hypothesis concerning the black–white differences on psychometric tests. *Behavioral and Brain Sciences*, 10, 512–519.
- Jensen, A.R. (1997). *Spearman's hypothesis*. Presented at the Spearman Seminar held at the University of Plymouth, Devon, England, July 14–16, 1997.
- Jensen, A.R. (1998). *The g factor*. Westport, CT: Praeger.
- Lynn, R. (1978). Ethnic and racial differences in intelligence: International comparisons. In R.T. Osborne, C.E. Noble, & N. Weyl (Eds.), *Human variation: The biopsychology of age, race, and sex* (pp. 261–286). New York, Academic.
- Lynn, R. (1982). IQ in Japan and the United States shows a growing disparity. *Nature*, 297, 222–223.
- Lynn, R. (1997). Geographical variation in intelligence. In H. Nyborg (Ed.), *The scientific study of human nature: Tribute to Hans J. Eysenck at eighty*. London: Elsevier Science Ltd.
- Neisser, U. (1997). Never a dull moment. *American Psychologist*, 52, 79–81.
- Neisser, U., Boodoo, G., Bouchard, T.J. Jr., Boykin, A.W., Brody, N., Ceci, S.J., Halpern, D., Loehlin, J.C., Perloff, R., Sternberg, R.J., & Urbina, S. (1996). Intelligence: Knowns and unknowns. *American Psychologist*, 51, 77–101.



- Osborne, R.T. (1980). The Spearman–Jensen hypothesis. *Behavioral and Brain Sciences*, 3, 351.
- Rushton, J.P. (1980). *Altruism, socialization, and society*. Englewood Cliffs, NJ: Prentice–Hall.
- Rushton, J.P. (1984a). Sociobiology: Toward a theory of individual and group differences in personality and social behavior. In J.R. Royce & L.P. Mos (Eds.), *Annals of theoretical psychology*, Vol. 2 (pp. 1–48). New York: Plenum.
- Rushton, J.P. (1984b). Group differences, genetic similarity theory, and the importance of personality traits: Reply to commentators. In J.R. Royce & L.P. Mos (Eds.), *Annals of theoretical psychology*, Vol. 2 (pp. 73–81). New York: Plenum Press.
- Rushton, J.P. (1988). Race differences in behaviour: A review and evolutionary analysis. *Personality and Individual Differences*, 9, 1009–1024.
- Rushton, J.P. (1989). Japanese inbreeding depression scores: Predictors of cognitive differences between blacks and whites. *Intelligence*, 13, 43–51.
- Rushton, J.P. (1992). Cranial capacity related to sex, rank and race in a stratified random sample of 6,325 U.S. military personnel. *Intelligence*, 16, 401–413.
- Rushton, J.P. (1994). Sex and race differences in cranial capacity from International Labour Office data. *Intelligence*, 19, 281–294.
- Rushton, J.P. (1995). *Race, evolution, and behavior: A life history perspective*. New Brunswick, NJ: Transaction.
- Rushton, J.P. (1997). Brain size and cognitive ability in Asian Americans from birth to age seven. *Intelligence*, 25, 7–20.
- Rushton, J.P. & Ankney, C.D. (1996). Brain size and cognitive ability: Correlations with age, sex, social class, and race. *Psychonomic Bulletin and Review*, 3, 21–36.
- Spearman, C. (1927). *The abilities of man: Their nature and measurement*. New York: Macmillan.
- Van Valen, L. (1974). Brain size and intelligence in man. *American Journal of Physical Anthropology*, 40, 417–424.
- Vernon, P.A., & Jensen, A.R. (1984). Individual and group differences in intelligence and speed of information processing. *Personality and Individual Differences*, 10, 573–576.
- Vernon, P.E. (1982). *The abilities and achievements of Orientals in North America*. New York: Academic.