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Black–White differences on the *g*-factor in South Africa: a "Jensen Effect" on the Wechsler Intelligence Scale for Children — revised

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Abstract

A test is made to determine whether South African Black–White differences on various tests of cognitive performance are like the Black–White differences in the United States in being positively associated with a test's *g* loadings, where *g* is the general factor of intelligence. Data are analyzed from Skuy, Schutte, Fridjhon and O'Carroll [Skuy, M., Schutte, E., Fridjhon, P., & O'Carroll, S. (2001). Suitability of published neuropsychological test norms for urban African secondary school strudents in South Africa. *Personality and Individual Differences*, *30*, 1413–1425) of 154 13- to 15-year-old secondary school students in Soweto, Johannesburg, on the Wechsler Intelligence Scale for Children–Revised (WISC-R). The more highly correlated a sub-test was with *g*, the more it predicted the African–White difference ($r = 0.77$, $p = 0.05$). The effect remained even when the Vocabulary sub-test was excluded or when *g* was extracted from the Black rather than from the White standardization sample ($r = 0.60$, $P < 0.05$), as it did as well if Spearman's rho was used instead of Pearson's *r* (*g* from Whites = 0.74, *g* from Blacks = 0.74, $P < 0.005$). Understanding observed Black–White differences around the world requires new research on the nature and nurture of *g*.

For nearly 100 years the average mean score on intelligence tests in the US has been about 18 points [1.2 standard deviations (S.D.s)] lower for Blacks than for Whites (Herrnstein & Murray, 1994; Jensen, 1998; Levin, 1997; Rushton, 2000). The Black–White IQ difference turns out to be higher on tests of high-*g* than it is on tests of low-*g* (*g* is the general factor of intelligence). Jensen (1980, p. 535) formally designated this as "Spearman's hypothesis," because Spearman (1927, p. 379) was the first to suggest it. Subsequently, Osborne (1980) dubbed it the "Spearman-Jensen

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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. More recently, Rushton (1998) proposed that when a significant correlation occurs between *g*-factor loadings and variable X, the result be termed a "Jensen Effect," because otherwise there is no name for it, only a long explanation of how the effect was achieved.

The Black–White difference on the *g*-factor is the best known of all the Jensen Effects. In his latest book, *The g Factor*, Jensen (1998, Chapter 11) summarizes the results from 16 independent data sets on a total of nearly 45,000 Blacks and 245,000 Whites derived from 149 psychometric tests in which *g* loadings consistently predict the magnitude of the Black–White difference ($r = +0.62$). This is borne out even among 3-year-olds administered eight sub-tests of the Stanford-Binet. The rank correlation between *g* loadings and the Black–White differences is $+0.71$ ($P < 0.05$). Even when the *g* loading is calculated from performance on elementary cognitive (reaction-time) tasks which correlate with IQ (such as moving the hand to press a button to turn off a light, which all children can do in less than 1 second), the correlations between the *g* loadings of these tasks and the Black–White differences range from $+0.70$ to $+0.81$.

Since the studies on which Jensen (1998) based his analysis were almost all carried out in the United States, this might be a phenomenon of limited interest with its explanation sought in local conditions. Lynn and Owen (1994), however, carried out a study in South Africa of over 1000 secondary school students using the Junior Aptitude Test, a group-administered paper-and-pencil test consisting of 10 sub-tests (four verbal, six nonverbal). They found the African Black–White differences of two S.D.s correlated $+0.62$ ($P < 0.05$) with the *g*-factor extracted from the Black sample (although only $+0.23$ with *g* extracted from the White sample).

It is perhaps surprising that more studies of the *g* factor have not been carried out among Blacks in Africa because African Blacks turn out to have average IQ scores substantially below even those of African Americans. The question of African test performance came to attention in the US when *The bell curve* (Herrnstein & Murray, 1994, pp. 288–289) examined an often stated hypothesis: "The test scores of American blacks have been depressed by the experience of slavery and African blacks will be found to do better (Herrnstein & Murray, 1996, p. 565)." However, black Africans turned out to average substantially below black Americans in intelligence test scores.

The bell curve cited Lynn's (1991) review of 11 studies from East, West, and Southern Africa reporting an average IQ of 70 (median = 75), 15 points (one S.D.) lower than the mean of 85 typically found for African Americans and 30 points (two S.D.s) lower than the mean of 100 typically found for Whites. The tests used included the Standard Progressive Matrices (SPM), the Colored Progressive Matrices (CPM, a simpler version of the SPM), the Army Beta, the Junior Aptitude, and the Culture Fair.

Many subsequent studies have corroborated the low mean test scores of Africans (reviewed in Lynn, 1997, in press). For example, in South Africa, Owen (1992) gave Raven's Standard Progressive Matrices (SPM) without time limits to 1056 White and 1093 African 14-year-olds. Lynn (1997) estimated that these data yield a mean African IQ of 72 using the percentile equivalents from the SPM standardization data of British Whites. Another study, by Zindi (1994), a Zimbabwean, matched 204 black Zimbabwean and 202 white English pupils from London inner-city schools for age (12–14 years old), sex, and educational level, both samples being characterized as "working class." Despite the fact that the White sample was below average for the Whites, with a mean IQ measured by the WISC-R of 95, the African–White difference was 1.07 S.D.s on the

SPM and 2.36 S.D.s on the WISC-R. Zindi expressed the Zimbabwean sample's results as IQ scores of 72 for the SPM and 67 for the WISC-R. The WISC-R score was depressed by language considerations, but not by much since the (nonverbal) performance IQ score of the Zimbabwean sample was 70.

A study by Rushton and Skuy (2000) gave untimed Raven's Standard Progressive Matrices to 173 17- to 23-year-old Black African university students in Johannesburg. Using the standards of the 1993 US normative sample, the African university students scored at the 14th percentile, which yields an IQ equivalent of 84. Detailed analyses showed that those items that correlated most highly with the test as a whole (an excellent measure of *g*; Jensen, 1998, p. 38) predicted the magnitude of the African–White differences in percentage passing each item. Thus African–White differences in these university students were on the *g*-factor and so demonstrate a "Jensen Effect."

1. Data

In a recent study, Skuy, Schutte, Fridjhon, and O'Carroll (2001) found scores 1 to 2 S.D.s below American norms in 154 African secondary school students from Soweto, Johannesburg, on a variety of tests including the Wechsler Intelligence Scale for Children-Revised (WISC-R), the Rey Auditory Verbal Learning Test, the Stroop Color Word Test, the Wisconsin Card Sorting Test, the Bender Gestalt Visual Motor Integration Test, the Rey Osterreith Complex Figure Test, the Trail Making Test, the Spatial Memory Task, and various Drawing Tasks. On the WISC-R, the African students were −1.81 S.D.s below American norms (−1.58 S.D.s with the vocabulary sub-test excluded).

Skuy et al.'s (2001) data on African means and standard deviations for the various sub-tests of the WISC-R are shown in Table 1. All students were tested individually and care taken to form a well functioning and representative sample. Any students who had suffered head injuries, epilepsy, or

Table 1
Means and standard deviations of Black secondary school students aged 13 to 15 years on subtests of the WISC-R (after Skuy et al., 2001), and U.S.–African differences[a]

WISC-R scale	Mean	Standard deviation	US–African difference	*z*-Score difference	*g* for US	*g* for Africa	Reliability
Information	4.66	2.33	5.34	2.29	0.67	0.65	0.85
Picture completion	7.06	2.28	2.94	1.29	0.51	0.57	0.77
Similarities	4.89	2.32	5.11	2.20	0.67	0.62	0.81
Picture arrangement	6.42	2.68	3.58	1.34	0.49	0.49	0.73
Arithmetic	6.01	2.20	3.99	1.81	0.57	0.60	0.77
Blocks	6.58	2.49	3.42	1.37	0.65	0.61	0.85
Vocabulary	2.85	1.64	7.15	4.36	0.72	0.71	0.86
Object assembly	6.29	2.81	3.71	1.32	0.50	0.53	0.70
Comprehension	4.79	2.46	5.21	2.12	0.60	0.61	0.77
Coding	6.18	2.25	3.82	1.70	0.37	0.36	0.72
Digits	6.93	2.64	3.07	1.16	0.44	0.59	0.78
Mazes	7.60	2.90	2.40	0.83	0.37	0.45	0.72

[a] US standardization sample mean = 10, S.D. = 3.

hospitalization were excluded. Although a third of the parents were unemployed, most were not, with 40% in unskilled jobs, 25% in semi-skilled jobs or conducting small businesses, and 2% professionals. To optimize standardization, testing was carried out at a quiet and comfortable locale away from the school with no distractions.

2. Results, analysis, and reanalysis

Mean African–White differences (with Whites set at the US standardization mean of 10, although these data also included US Blacks, thereby reducing the African–White difference) were calculated from Skuy et al.'s (2001) data in Table 1. The African–White differences are also expressed in S.D. units (using the African S.D.s). To examine whether the African–White differences in these data are more pronounced on the more *g*-loaded sub-tests, Jensen's (1998, pp. 589–591, Appendix B) procedure was followed to extract *g* loadings from the WISC-R national standardization data (using a Schmid–Leiman hierarchical factor analysis, corrected for attenuation using the reliabilities given in the Manual). The column vector of the sub-tests' *g* loadings was correlated with the column vector of the African–White differences in the sub-tests. The Pearson *r* was 0.77 ($P=0.01$).

The largest African–White difference in Table 1 is on the Vocabulary sub-test, which is not surprising since English is typically not these students' first language. The *g*-factor correlations, however, are not due entirely to the Vocabulary sub-test. After excluding the vocabulary sub-test and substituting the mean of the 11 other sub-tests in its place, the correlation remained significant ($r=0.66$, $P<0.05$). Moreover the effect remained if *g* is extracted from the African rather than from the White standardization sample ($r=0.60$, $P<0.05$), as it does as well if Spearman's rho is used instead of Pearson's *r* (rhos = 0.74, 0.74, respectively, $P<0.005$).

3. Discussion

One reviewer calculated that a more accurate assessment of the African–European IQ difference for the data in the current study should be based on eliminating all the Verbal sub-tests because English is typically not the African's first language. This method would produce an overall African-European difference of only 1.1 S.D.s rather than the 1.81 S.D.s reported above. Alternatively, he calculated a difference of 1.29 S.D.s based on using the test manual's S.D. of 3 for each sub-test rather than the African S.D.s reported in Table 1. Further, he suggested that using the sub-test S.D.s of 3 might even reduce the magnitude of the *g*-factor difference.

Another reviewer, however, proposed that I had underestimated the magnitude of the African–European IQ difference. He calculated that the "true" difference would increase by an additional 2.2 IQ points if Africans were compared against only the Whites in the US normative sample, rather than against the total sample, which included US Blacks as well as Whites. He further calculated that the difference would increase yet another 6.8 points, to a total of over 2 S.D.s, if the data were adjusted for the Flynn (1999) Effect, the secular trend showing a 3.4 increase in IQ scores per decade on the WISC-R (since the Africans had been tested in the 1990s and were compared against the Wechsler norms for 1974).

The main purpose of the current study, however, was to test whether the African–European IQ differences (whatever their absolute magnitude) were mainly on the *g*-factor. The correlation between sub-test differences calculated from the African S.D.s in Table 1 and from the normative S.D.s of 3.0 from Wechsler (1974) is 0.96 so there is little, if any, change in the *g*-loadings, whichever procedure is used. Thus, the take home message is that the African–European IQ difference is on the *g*-factor.

Jensen (1998) has shown that the vector of a test's *g* loadings is the best practical predictor not just of that test's correlation with scholastic and work-place performance, but of heritability coefficients determined from twin studies, inbreeding depression scores calculated in children born from cousin-marriages, and many other variables including brain evoked potentials, brain pH levels, brain glucose metabolism, as well as nerve conduction velocity, reaction time, and other physiological factors. These correlations establish the heritable and biological, as opposed to the mere statistical, reality of *g*. Indeed, massive evidence indicates that *g* is related to the size and functioning of the brain (Wickett, Vernon, & Lee, 2000) on which there are also population differences starting at birth and continuing throughout life (Jensen, 1998; Rushton, 1997, 2000; Rushton & Ankney, 2000).

The data presented in this study, then, provides the third independent demonstration that African–White IQ differences on various sub-tests are positively associated with the *g* loadings for that sub-test (following Lynn & Owen, 1994; Rushton & Skuy, 2000). The effect seems very robust and implies that *g* is the same in South Africa as it is in the US. This is important because it tells us that the main source of African–White differences across various cognitive tests is essentially the same as that for the Black–White difference in the US, as well as for the differences between individuals within each racial group, namely, *g* (Jensen, 1998). This proposition implies that a scientific understanding of Black–White differences around the world depends on understanding the nature and nurture of *g*.

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