Negligible Sex Differences in General Intelligence

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The general factor, *g*, can be extracted from a correlation matrix of a battery of mental ability tests. *g* is common to all mental abilities. A key question in the research on cognitive sex differences is whether, on average, females and males differ in *g*. This question is technically the most difficult to answer and has been the least investigated. Cognitive batteries were applied in the present study to independent samples totaling 10,475 adult subjects (4,256 females and 6,219 males). The scores were factor-analyzed by sex to obtain separate *g* factors. The congruence coefficients (r_c) suggested a near identity of these factors. Then, three methods were used to know if the standardized sex differences (*ds*) are explained by *g*: (1) the method of correlated vectors; (2) the sex loading in *g* was computed including the point-biserial correlation between sex and each of the subtests in the full matrix of subtest intercorrelations for factor analysis; and (3) the correlation between sex and *g* factor scores. The results suggest a negligible sex difference in *g*. The present study includes the largest sample on which a sex difference in *g* has ever been tested. The findings are consistent with those using quite different test batteries and subject samples.

Introduction

Some issues on sex differences in IQ as an estimate of general intelligence have been prompted by the finding of a significant sex difference in brain size (Ankey, 1992, 1995; DeLacoste, Adesanya, & Woodward, 1990; Lynn, 1994; Willerman, Schultz, Rutledge, & Bigler, 1991). A "paradox" concerning sex differences in intelligence and brain size has been noted by Ankey (1992): males have, on average, larger brains than females and brain size is positively correlated with IQ. It would be expected that males would have a higher average level of IQ than females. Yet it is generally stated than there are no overall differences in the scores obtained by males and females on IQ (Brody, 1992; Colom, 1998; Halpern, 1992; Juan-Espinosa, 1997). There seems to be a logical inconsistency among the findings of larger male brain, the association of brain size with IQ, and the absence of a sex difference in overall IQ that calls for a resolution (Lynn, 1994).

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Ankey (1992) accepts the view that there is no sex difference in IQ and that females obtain higher means on verbal abilities, while males obtain higher means on spatial abilities (Hyde & Linn, 1988; Linn & Petersen, 1985; Voyer, Voyer, & Bryden, 1995). The solution to the "paradox" is that spatial ability may require more brain tissue than verbal ability. McGlone (1980) has proposed that females have verbal abilities located in their right as well as in their left hemispheres. If this is correct, females must have about the same amount of brain tissue devoted to verbal abilities as males that explains the fact that female verbal abilities are about the same as those of males. Female spatial abilities will be rather substantially weaker than those of males, because the female right hemisphere is smaller than that of a male (and some of it has been given over to verbal abilities).

Rushton (1992) has proposed another solution to the "paradox": males and females do not have the same mean IQ. This is the solution favored by Lynn (1994) who has argued that a difference of 4 IQ points favoring males would be consistent with the prediction from the calculated sex differences in brain size. In a review of the literature, he has found an overall sex difference of precisely 4 IQ points. Males have a brain size advantage of 0.78 *SD* units. The correlation between brain size measured by magnetic resonance imaging and intelligence has been calculated by Willerman et al. (1991) at 0.35 (see Rushton & Ankey, 1996, for a review). The male advantage for intelligence accruing from greater brain size is therefore $0.78 \times 0.35 = 0.27$ *SD* units = 4 IQ points.

However, as Jensen (1998) has stated, any overall difference on a collection of tests, even if significant, like the one reported by Lynn (1994), has questionable generality across batteries and cannot answer the question concerning a sex difference in general ability defined as *g*.

The empirical fact that all mental abilities are positively correlated calls for an analytic taxonomy of mental abilities based on some form of correlation analysis. The dimensions found in the factor analysis of the correlations among a large variety of mental ability measurements can be arranged hierarchically according to their generality (Carroll, 1993, 1997). The *g* factor is the most general of all and is common to all mental abilities. *g* may be thought of as a distillate of the common source of individual differences in all mental tests. *g* can be roughly likened to a computer's central processing unit. The knowledge and skills tapped by mental test performance merely provide a *vehicle* for the measurement of *g* (Jensen, 1992). *g* is best regarded as a source of variance in performance associated with individual differences in the speed or efficiency of the neural processes that affect the kinds of behavior called mental abilities (Jensen, 1998).

Concerning sex differences in general intelligence defined as *g*, the statement of McArdle (1996) that equality of factor loadings should be established before other group comparisons (e.g., mean differences) were considered is worth noting. If not, the psychological constructs being measured may be qualitatively different for the groups being compared.

Several studies of factorial similarity have been conducted for cognitive ability (Carreta & Ree, 1995; DeFries et al., 1974; Humphreys & Taber, 1973; Loehlin, Lindzey, & Spuhler, 1975; Michael, 1949; Ree & Carretta, 1995). These studies found no difference in factor structure across groups. Carretta and Ree (1995) found that the correlation of the *g* loadings for males and females for the hierarchical *g* factor was +0.97. Carretta and Ree (1997) found that the correlation between the male and female factor loadings on *g* was