IQ and Head Size in a Sample in Sudan

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We report a study of the relationship between head circumference and intelligence measured by the Standard Progressive Matrices (SPM) in a sample of 240 adults in Sudan. The correlation is 0.21 and is the same as that obtained in numerous European samples. Men had a higher average head circumference and a higher mean score on the SPM than women. Men had lower variability of intelligence than women, contrary to numerous claims to the contrary.

Key Words: Intelligence; Progressive Matrices; Sudan; Brain size; sex differences; Variability

It has long been known that head size is positively related to intelligence or to some proxy for intelligence. This was demonstrated in the nineteenth century by the French physician and neurologist Paul Broca (1873) who measured external and internal skull dimensions and weighed wet brains at autopsy and observed that skilled workers had a larger average brain size than the unskilled, and eminent individuals averaged a larger brain than the less eminent. Since this time numerous studies have confirmed this relationship. The research on this issue has recently been reviewed by Rushton & Ankney (2009). They summarize the results of 59 studies that have reported the relation between external head measures and IQ (total n = 63,405), for which the average correlation is 0.20. They also summarize the results of 28 studies that have reported the relation between brain size measured by brain imaging and IQ (total n = 1,389), for which the average correlation is 0.40. The reason that the correlation is higher when brain imaging is used to measure brain size is that it is much more accurate than external head measures. Despite, this

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large number of studies, no data on the relation between external head measures and IQ has ever been reported for people in Africa. We report here the first investigation of whether the relation holds for an African sample.

Method and Results

The sample consisted of adults, n =115 males and 125 females. All the sample were resident in the three cities that constitute the State of Khartoum: Khartoum, Omdurman and Bahri which together comprise the State of Khartoum, and were ethnically Sudanese Caucasoid. The sample was obtained mainly from universities and some of the sample was collected from participants at their homes. The sample was collected by five psychology students originally from Southern Sudan who were studying at the University of Khartoum as part of their graduation project from the university. A tape was used for measuring the head circumference at its maximum, just above the ears. Head circumference has been used as a measure of head size, which is itself an approximate estimate of brain size, in numerous studies reviewed by Rushton & Ankney (2009). The Standard Progressive Matrices (SPM) (Raven, Raven, & Court, 2000) was administered as a measure of intelligence.

The five researchers were trained by their supervisor (Omar Khaleefa) at the department of psychology on how to measure the head circumference and on how to administer the Standard Progressive Matrices. The data were collected in the year 2010.

The men had an average head circumference of 56.5 cm, and a mean score on the SPM of 29.0 (Sd = 11.6) and the women had an average head circumference of 55.3 cm, and a mean score on the SPM of 27.6 (Sd = 12.2). Thus, men had a larger average head circumference than women and men a higher average SPM score than women. The correlation between SPM scores and head circumference for men = 0.42 and is statistically significant at $p < .01$. For women the correlation between SPM scores and head circumference = 0.00 and is not statistically significant.

Discussion

The results show three interesting features. First, the existence of a positive correlation between head size and

intelligence is confirmed in this sample. The correlation for the total sample is 0.21 and is virtually identical to the correlation of 0.20 obtained by Rushton & Ankney (2009) as the average in their review of 59 studies. The correlations differ for men and women, but neither of these is significantly different from the 0.21 of the total sample, so it can be concluded that these are chance deviations from the true value.

Second, the men obtained a higher SPM score than women by 1.4 raw score points. Dividing this by the Sd (11.6) = 0.12d = 1.8 IQ. This confirms numerous other studies that have found that, among adults, men obtain higher SPM scores than women, although the difference is smaller than the 5 IQ point male advantage calculated in the meta-analysis reported by Lynn & Irwing (2004). The likely explanation for this is that the present sample is not necessarily representative of men and women.

Third, the variability of the SPM is lower in men (Sd =11.6) than in women (Sd =12.2). This is contrary to the frequent assertion that males have greater variability than females. This contention has been advanced since the early years of the twentieth century, e.g. by Ellis (1904), Thorndike (1910), and Terman (1916), and reaffirmed by Eysenck (1981, p. 42) and recently by Deary, Irwing, Der, & Bates (2007). However, not all studies have found this including a meta-analysis of the performance of college students on the Progressive Matrices by Irwing & Lynn (2005). There have also been a number of recently published studies that have not found greater male variability greater male variability in several countries in the middle east and north Africa, including Pakistan (Ahmad, Khanum, Riaz & Lynn, 2008), Sudan (Khaleefa, Khatib, Mutwakkil & Lynn, 2008), the United Arab Emirates (Khaleefa & Lynn, 2008), Saudi Arabia (Abdel-Khalek & Lynn, 2009), Libya Lynn, El-Ghmary Abdalla & Al-Shahomee, 2009). The present results conform that greater male variability is not a universal phenomenon.

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