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Sex Differences in High School Students on Raven's Advanced Progressive Matrices in Yemen

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The Advanced Progressive Matrices (APM), combined sets 1 and 2, was administered to a sample of 503 male and 524 female high school students aged 16 to 18 years in Yemen. The male students obtained a higher IQ score than the female students by 0.9 IQ points, not statistically significant. The mean score of the sample was 21.6 and is equivalent to a British IQ of 93.

Key Words: Yemen, Advanced Progressive Matrices, Sex Differences, Intelligence

The Progressive Matrices was constructed in Britain in the late 1930s by Raven (1939) as a measure of non-verbal reasoning ability and Spearman's *g* and has been extensively used in numerous studies throughout the world. It was shown by Jensen (1998) that the test is a good measure of Spearman's *g*, as was intended. There are four versions of the test. These are the Coloured Progressive Matrices (CPM) designed for children aged 4 to 11 years, the Standard Progressive Matrices (SPM) designed for those aged 6 years and older, the more difficult Standard Progressive Matrices Plus (SPM+), and the Advanced Progressive Matrices (APM), the most difficult version of the test.

It was proposed by Lynn (1994) that at the age of 16 years males show a slightly higher IQ than females and this increases to an advantage of 4 to 5 IQ points among adults. This theory was rejected by Mackintosh (1996), who asserted that there is no sex difference on the Progressive Matrices and therefore that there is no sex difference in non-verbal reasoning ability and Spearman's *g*. This contention was answered and refuted by Lynn (1998) and disconfirmed by Colom and Garcia-Lopez (2002) in a study that reported that among a sample of 600 Spanish high school graduates males had a 4.2 IQ points higher average score on the Progressive Matrices. Mackintosh's contention of no sex difference on the Progressive Matrices was examined further in a meta-analysis of sex differences on the Progressive Matrices among general population samples that found virtually no difference between boys and girls up to the age of 15 years but from the age of 16 years a male advantage appeared reaching 5 IQ points among adults (Lynn & Irwing, 2004), consistent with Lynn's (1994) theory. A second meta-analysis of sex differences on the Progressive Matrices among university students concluded that males have an advantage of 4.6 IQ points (Irwing & Lynn, 2005). Despite these two meta-analyses, Dolan et al. (2006, p. 194) asserted that "sex differences are absent on Raven Progressive Matrices." We present here new data about sex differences on Raven's Advanced Progressive Matrices for a sample of high school students in Yemen.

Method and Results

This study consisted of an administration in 2010 of the Advanced Progressive Matrices (APM), sets 1 and 2 combined (Raven, Raven & Court, 2000), to a sample of 503 male and 524 female high school students in Sana'a, the capital city of Yemen. The results are reported in Arabic in an MA thesis by Abdo Mohammed Ali Sabaie (2012). The students were aged between 16 and 18 years with an average of 17 years and were drawn from four socially representative schools in the city. A general studies curriculum was taken by 580 of the students, science was taken by 230, and arts subjects by 217.

The male students obtained an APM score of 21.77 (SD 6.38) and the female students obtained an APM score of 21.39 (SD 6.21). This is a difference of .06*d* (standard deviation units calculated as the difference between the means divided by the standard deviation) and is equivalent to .9 IQ points. The difference is not statistically significant ($t = 0.958$).

Discussion

There are three points of interest in the results. First, the higher IQ obtained by the male students confirms the conclusions of the two meta-analyses of sex

differences on the Progressive Matrices among general population samples and among university student samples that from the age of 16 years a male advantage is present on the test (Lynn & Irwing, 2004; Irwing & Lynn, 2005). The male advantage is small at .9 IQ points, but Lynn's (1994) theory states that there is only a small advantage at 16 to 17 years that increases progressively up to 4 or 5 IQ points among adults, so the small male advantage in the present study is consistent with the theory and previous results. The male advantage of .9 IQ points in the present sample is comparable to that of 1.05 IQ points of 17-year-olds on the Progressive Matrices in Estonia reported by Lynn *et al.* (2002).

The high school students in the present study are not a representative sample of the country because secondary school enrolment in Yemen is far from complete. In 2010, when this study was performed, total secondary school exposure in the 15-19 years age group was 36.8% for females and 36.6% for males according to the Barro-Lee dataset (www.barrolee.com). Thus the male and female participants in this study were not only matched for educational exposure, but the selectivity of the samples was virtually the same if we assume that males and females were selected into secondary education based on the same cognitive attributes.

Second, it has been contended by Mackintosh (2011) that men did have a higher average IQ than women in the past when more men experienced higher education but in recent years the IQ of women has increased as more women have experienced higher education and the IQ of women is now equal to that of men. The present result is more consistent with the theory that males have a higher average IQ than females when they both have the same education.

Third, the mean score of the present sample is 21.6. According to Table APM35 in Raven, Raven & Court (1998), this is equivalent to a score of 14 on APM set 2 alone. This is approximately at the 32nd percentile of British 1979 and 1992 norms (Table APM14 in Raven, Raven & Court, 1998), and equivalent to an IQ of 93. The British IQ of this age group on the Raven tests does not appear to have increased from 1979 to 2008 (Lynn, 2009), so this IQ for the present sample is still valid.

This IQ is higher than those obtained in previous studies of the intelligence of representative samples of younger children in Yemen of 81 and 85 reported by Lynn and Vanhanen (2012, p. 419) and the more recent study of the Standard Progressive Matrices-Plus administered to a sample of 2012 6-13 year olds who obtained a British IQ of 68.5 (Bakhjet, Al-Khadher & Lynn, 2015). The explanation for the higher IQ of the present sample is that most children in Yemen leave school before the age of 16, so the present sample of 16-18 year olds should not be considered representative for all 16-18 year olds in the country. Their higher

performance nevertheless shows that there are many intelligent young people in Yemen among those who received adequate schooling in an urban environment, despite the apparently depressed IQ of the majority.

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