Gender Differences on General Intelligence in Libya

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Gender differences on the Standard Progressive Matrices are reported for two samples of 13-18 year-olds in Libya (combined N = 1820). Males obtained higher mean scores than females but had lower variance. The later sample scored substantially higher than the earlier one.
Key Words: Intelligence; Standard Progressive Matrices; Libya; Gender differences; Variance

An early review by Court (1983) concluded that there is no gender difference on the Standard Progressive Matrices, a test of non-verbal reasoning that has been used in a large number of countries. This conclusion has been frequently reaffirmed. For instance, Mackintosh (1996, p. 564) asserts: “large scale studies of Raven’s tests have yielded all possible outcomes, male superiority, female superiority and no difference.” Jensen (1998, p. 541): “there is no consistent difference on the Raven’s Standard Progressive Matrices (for adults) or on the Coloured Progressive Matrices (for children). And Anderson (2004, p. 829): “it is an important finding of intelligence testing that there is no difference between the genders in average intellectual ability; this is true whether general ability is defined as an IQ score calculated from an omnibus test of intellectual abilities such as the various Wechsler tests, or whether it is defined as a score on a single test of general intelligence, such as Raven's Matrices."

Contrary to these assertions, a meta-analysis of gender differences on the Progressive Matrices found that although there was no gender difference among 6 to 14 year olds, from the age of 15, males obtained a slightly higher mean that increased with age reaching an advantage of 5 IQ points among adults (Lynn & Irwing, 2004). Despite these results, some scholars have continued to assert that "gender differences are absent on Raven Progressive Matrices" (Dolan, et al. 2006, p. 194). As this issue is still disputed, we report further data on it in this paper.

Method

The study used the Standard Progressive Matrices (SPM) test (Raven, Raven & Court, 2000) for the assessment of intelligence. The test was originally administered in January and February 2008 to a sample of 90 boys and 90 girls from each of the five age groups 13 through 17 years, in addition to 100 boys and 100 girls from age 18 years who were randomly selected from cities and villages in the east of Libya (Al Shahomee, 2010). The SPM was administered again in January and February 2017 to a representative sample of 60 boys and 60 girls from each of the same six ages 13 through 18 years who were randomly selected from the same cities and villages. The sampling procedure comprised a multi-stage random sampling method (cluster sampling). In cluster sampling, intact groups, not individuals, are randomly selected. All members of selected groups had similar characteristics. Cluster sampling is more convenient when the population is large or spread out over a wide geographical area and involves selecting samples from samples, each sample being drawn from within the previously selected sample.

The procedure for conducting the multi-stage stratified sampling method involved sampling from all higher-level units called the preparatory sampling units (eastern Libyan regions) and then sampling of secondary sampling units from within these higher-level units (cities and villages). This was followed by classifying the cities into two homogeneous urban area clusters using the criterion of administrative boundaries as the third sampling level, i.e. main and secondary cities. One city was selected from each category. Villages were classified into three different categories (third clustering sampling level): coastal, desert and mountain. Three villages were selected from each category with different weights or ratios as the fourth sampling level.

The Raven's Standard Progressive Matrices (SPM) test was modified to make it suitable for the Libyan sample in these respects: (1) Instructions were given in the colloquial Libyan Arabic language; (2) English letters (A, B, C, D and E) in the five sets were changed into Arabic letters; (3) the page order of the test booklet was changed from left to right, to suit the Arabic way of writing and reading; (4) a new answer sheet was designed with Arabic letters, and right to left direction for answering and writing.

The schools were contacted by a letter from the branch of education explaining the purpose of the study and the procedure to be followed in selecting and testing the students. A place for testing the students was made available at each school. The testing was carried out in most cases in either the school theatre or library where each student had his or her own table and chair. All participants were given an information sheet and were asked to sign a consent form before participation in the study. None of the participants declined to sign the consent form. The test was administered, untimed, in group settings.

Results

The data were first examined for normality using the Kolmogorov–Smirnov and Shapiro–Wilk tests. The p values were 0.320 and 0.234, respectively. Both values were above 0.05, indicating that the SPM data were normally distributed. This allowed the use of parametric tests to investigate and evaluate the presence of statistically significant differences in the data. The reliability of the SPM test scores was investigated and showed that alpha reliabilities (KR-20) for the SPM ranged from 0.87 (males aged 15) to 0.94 (males aged 17). The Pearson product-moment correlation coefficient was used to calculate the construct validity assessed as the internal consistency given by the correlation coefficients between SPM test total score and the five SPM test sets (Anastasi & Urbina, 1997). The results showed that there were strong and statistically significant positive correlations between the five sets (A, B, C, D and E) and total scores ranging from 0.53 to 0.84 ($p<0.01$) for males and 0.71 to 0.85 ($p<0.01$) for females.

The results are given in Table 1 showing the 2008 and 2017 SPM means and standard deviations for males and females, the t values for the significance of the differences between the scores of the males and females, VR values (the variance of the males divided by the variance of the females) and the Cohen's *d* values, which is equal to the difference between the means of the males and females divided by the within group standard deviation (Cohen, 1988). Figure 1 shows a fitted graph with the male and female distributions. It shows that although average scores were higher in the second than the first administration, sex differences remained essentially the same.

Table 1. *Scores of males and females on the Standard Progressive Matrices in Libya in 2008 and 2017.*

Age	Gender	2008 Mean ± SD	*t*	*d*	VR	2017 Mean ± SD	*t*	*d*	VR
13	M F	32.4 ± 8.3 31.8 ± 8.7	0.48	0.07	0.90	38.7 ± 4.8 37.1 ± 4.9	1.75	0.32	0.95
14	M F	33.5 ± 8.0 33.3 ± 8.5	1.69	0.03	0.89	39.8 ± 4.6 39.3 ± 3.1	0.85	0.15	2.20
15	M F	35.9 ± 7.5 33.3 ± 8.5	2.15*	0.32	0.79	40.5 ± 4.6 40.0 ± 3.9	0.66	0.12	1.39
16	M F	37.4 ± 9.1 34.7 ± 8.6	2.12*	0.31	1.12	40.2 ± 4.6 40.0 ± 4.7	0.14	0.02	0.94
17	M F	40.0 ± 8.2 37.3 ± 8.7	2.11*	0.31	0.87	40.8 ± 3.1 40.3 ± 7.5	1.71	0.31	0.16
18	M F	39.9 ± 8.6 38.8 ± 9.8	0.85	0.12	0.78	43.0 ± 5.5 41.8 ± 5.8	1.24	0.23	0.79
Total	M F All	36.51 ± 8.8 34.86 ± 9.1 35.69 ± 8.1	3.05**	0.20	0.94	40.50 ± 4.7 39.75 ± 5.7 40.11 ± 5.1	2.59**	0.15	0.68

M = Male, F = Female. Statistical significance: * *p*<.05; ** *p*<.01.

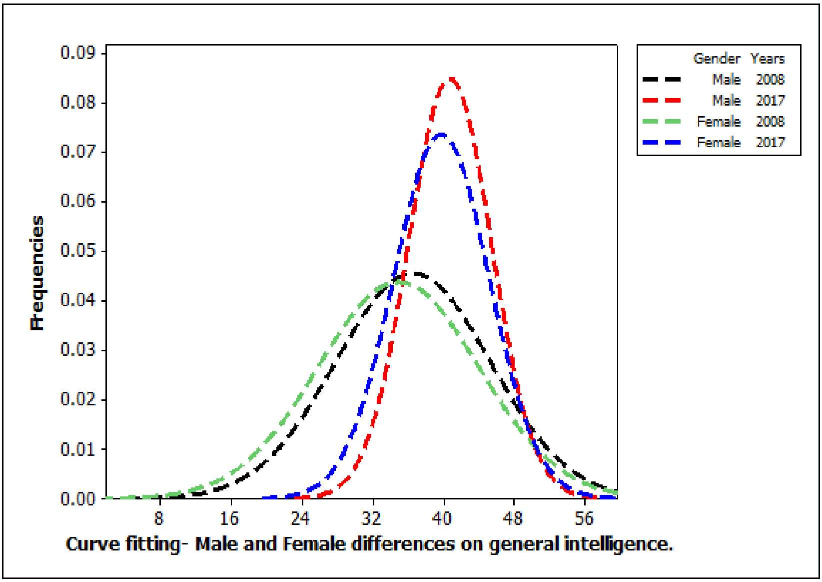

Figure 1. *Fitted curves for Raven raw scores.*

The gender differences were also examined by two-way ANOVA. For the SPM scores in 2008, there was a statistically significant main effect for gender, F (1, 1088) = 10.263, *p* = .001; the magnitude of the effect size was small (partial eta squared = 0.089). For the SPM scores in 2017, there was a statistically significant main effect for gender, F (1, 708) = 7.143, *p* = .008; the magnitude of the effect size was small (partial eta squared = 0.072). Post-hoc comparisons using the Tukey HSD test showed that there were statistically significant differences between the ages for SPM scores in both test administrations. On both occasions there was a highly significant main effect for age, F (5, 1088) = 20.741, *p* = .000 in 2008, and F (5, 708) = 11.361, *p* = .000 in 2017. The interaction effect between age and gender was not statistically significant in both samples, and the Levene's equality test for both samples was not significant indicating that the group variance was equal.

Discussion

There are two points of interest in the results. First, in all six 2008 age groups and in all six 2017 age groups, the males obtained higher average scores than the females. These results do not confirm the assertion that there is no gender difference on the Progressive Matrices. They provide some confirmation of the meta-analysis of gender differences on the Progressive Matrices that found a male advantage at the age of 15 and older (Lynn & Irwing, 2004) in so far as in the 2008 sample there were no significant gender differences at the ages of 13 and 14, while at the ages of 15, 16 and 17 the male advantage was statistically significant and at age 18 male advantage was present although not statistically significant. In the 2017 sample, like the earlier one, all sex differences were at least marginally in favor of males. However, this failed to reach statistical significance at any age.

Second, in 2008 the females had greater standard deviations and therefore greater variance in five of the six age groups and in the 2017 sample the females had greater variance in four of the six age groups and the males had greater variance in the other two. These results do not support the frequent assertion that males have greater variability of intelligence than females, for example, "The consistent story has been that men and women have nearly identical IQs but that men have a broader distribution…the larger variation among men means that there are more men than women at either extreme of the IQ distribution." (Penrose, 1963, p. 186); "While men and women average pretty much the same IQ score, men have always shown more variability in intelligence." (Eysenck, 1981, p. 42): "All sides in the gender wars agree that there is greater variability in male distributions of many abilities." (Ceci & Williams 2007, p. 223). The present results showing greater female variability in nine of the twelve samples show that this contention is not invariably valid.

References

Al-Shahomee, A.A. & Lynn, R. (2010). Norms and sex differences for the Standard Progressive Matrices in Libya. *Mankind Quarterly* 51: 97-107.

Anastasi, A. & Urbina, S. (1997). *Psychological Testing*. Prentice Hall/Pearson Education.

Anderson, M. (2004). Gender differences in general intelligence. In: R.L. Gregory (ed.), *The Oxford Companion to the Mind*. Oxford, UK: Oxford University Press.

Ceci, S.J. & Williams, W.M. (2007). *Why Aren't More Women in Science?* Washington DC: American Psychological Association.

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*, 2nd ed. Mahwah, NJ: Erlbaum.

Court, J.H. (1983). Gender differences in performance on Raven's Progressive Matrices: A review. *Alberta Journal of Educational Research* 29: 54-74.

Dolan, C.V., Colom, R., Abad, F.J., Wicherts, J., Hessen, D.J. & van de Sluis, S. (2006). Multi-group covariance and mean structure modelling of the relationship between the WAIS-III common factors and gender and educational attainment in Spain. *Intelligence* 34: 193-210.

Eysenck, H.J. (1981). *Intelligence: The Battle for the Mind*. London: Pan.

Jensen, A.R. (1998). *The g Factor*. Westport, CT: Praeger.

Lynn, R. & Irwing, P. (2004). Gender differences on the Progressive Matrices: A meta-analysis. *Intelligence* 32: 481-498.

Mackintosh, N.J. (1996). Gender differences and IQ. *Journal of Biosocial Science* 28: 559-572.

Penrose, L.S. (1963). *The Biology of Mental Defect*. New York: Grune & Stratton.

Raven, J., Raven, J.C. & Court, J.H. (2000). *Standard Progressive Matrices*. Oxford: Oxford Psychologists Press.