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Sex Differences in Intelligence, Emotional Intelligence and Educational Attainment in Libya

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Data for a sample of 18-year-old Applied Science and Social Science students in Libya are reported for intelligence (IQ), emotional intelligence (EI) and educational achievement. Means were significantly higher for Applied Science students than for Social Science students both for IQ and EI. Although males obtained higher means than females on intelligence assessed by the Standard Progressive Matrices, and females obtained higher means than males on emotional intelligence assessed by the Goleman test, the sex differences were very small and did not reach statistical significance. IQ, EI and educational achievement were significantly intercorrelated.
Key words: Progressive Matrices; emotional intelligence; educational attainment; Libya; gender; academic subjects

There is a very large literature on sex differences in intelligence, emotional intelligence and educational attainment in economically developed Western countries, but much less in economically developing countries. In this paper we address these issues by presenting data for a sample from Libya.

There has been a general consensus that there is no sex difference in intelligence as stated by Halpern (2012, p. 233): “Females and males score identically on IQ tests.” This position has recently been reaffirmed by Cooper (2015), Ritchie (2015), and Pietschnig et al. (2015): "careful analyses of datasets not limited by range restriction clearly indicate the absence of sex differences in IQ." This consensus has been disputed by Lynn (1994), who has maintained that while males and females have approximately the same average intelligence up to the age of 16 years, from this age males develop a higher average IQ than females reaching an advantage among adults of approximately 4 IQ points. This position was supported in a meta-analysis of sex differences on the Progressive Matrices by Lynn and Irwing (2004).

The general consensus on sex differences in emotional intelligence broadly defined as "the perception of and control over emotions" (McIntyre, 2010, p. 618) is that this is stronger in females than in males (Downey et al., 2008; McIntyre, 2010). Goleman (1995) defined emotional intelligence as “The capacity for recognizing our own feelings and those of others, for motivating ourselves, and for managing emotions well in ourselves and in our relationships.” (p. 9). The topic has attracted considerable research with many studies replicating small but significant differences in favor of women (Petrides et al., 2016).

The general consensus on sex differences in educational attainment is that this is higher in females than in males. For instance, in a study of 15 year olds in 26 nations girls obtained higher grades than boys for course work in History (Wilberg & Lynn,1999). In a study in England of performance in the GCSE (General Certificate of Secondary Education) taken by 74,403 15-16 year olds in 2002, girls obtained significantly higher results than boys in all subjects except Physics (Deary et al., 2007).

Correlations between intelligence and educational achievement are generally high in economically developed Western countries. Longitudinal studies have shown that IQ measured as young as 10 years predicts educational achievement nearly 20 years later (Furnham & Cheng, 2012). Jencks (1979) estimated the correlation from eight American studies at between .40 and .63, and this estimate has been confirmed in a number of other studies and reviews given by Deary et al. (2007).

Correlations between emotional intelligence and educational attainment are generally positive but low (*r* around .2) in economically developed Western countries (e.g. Downey et al., 2008; Mayer, Roberts & Barsade, 2008). Petrides et al. (2011) showed how emotional intelligence affects educational attainment primarily through being less disruptive in school and calling on the help of others.

Method

This study was carried out in the east of Libya during September and November 2015. A total of 1,329 students (550 male and 779 female) with a mean age of 18 years were enrolled in secondary school attending 12th grade in the city of Al-Marj. The sample consisted of 170 male and 170 female school students. Half the students were studying Social Sciences and half were studying Applied Sciences. Social Sciences consist of Religion, Arabic, English, Geography, History, Philosophy, Developmental Psychology, Demography and Political Science. Applied Sciences consist of Mathematics, Biology, Chemistry, Physics, Materials Science and Statistics. The sample was selected by stratified random sampling. All participants were given an information sheet and were required to sign a consent form before participation in the study.

Intelligence (IQ) was assessed by the Standard Progressive Matrices (Raven, Raven & Court, 2000), a non-verbal reasoning test that has been used widely in cross-cultural research and that is considered a good measure of the general cognitive ability factor *g*. Emotional Intelligence (EI) was assessed by the Goleman test (1995) translated into Arabic by Dardeer (2004). The EI test is based on self-report. It measures emotional intelligence, defining the construct as a set of personality traits. The EI test consists of 88 items scored fully applicable, frequently applicable, sometimes applicable, a little applicable and not applicable. The maximum possible score is 440. Academic performance (AP) was assessed by the marks in the General Secondary School Certificate (GSSC), a national examination taken by grade 12 students in the final year of secondary school.

Results

The data were first examined for normality using the Kolmogorov–Smirnov and Shapiro–Wilk tests. The p values were .20 and .31, respectively. Both values were above .05, indicating that the data were normally distributed. This allowed the use of parametric tests to investigate and evaluate the presence of statistically significant differences in the data. Table 1 gives the gender differences in mean scores, standard deviations and variability on IQ and EI. A one-way between-groups multivariate analysis of variance was performed to investigate gender differences in IQ and EI. Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices, and multicollinearity, with no serious violations noted. There was no significant difference in mean scores between males and females on the combined dependent variable, F (2, 337) = 0.666, p = 0.514; Wilks' Lambda = 0.99). The effect size was very small (partial eta squared = 0.004). When the results for the dependent variables were considered separately, there

were no statistically significant differences although males obtained a slightly higher mean than females on IQ while females obtained a slightly higher mean on EI.

Table 1. *Gender differences in intelligence (IQ) and emotional intelligence (EI); Vr, variance ratio (male SD^2/female SD^2); d, mean difference in standard deviations.*

Variables	Gender	N	Mean ± SD	Vr	*d*
IQ	Male	170	40.14 ± 10.73	0.80	0.10
	Female	170	39.06 ± 11.55		
EI	Male	170	302.09 ± 40.63	1.49	-0.06
	Female	170	304.49 ± 33.22		

Participants were divided into two groups of academic disciplines, Social Sciences and Applied Sciences. Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices, and multicollinearity, with no serious violations noted. The results are given in Table 2**.** A one-way between-groups multivariate analysis of variance was performed to investigate discipline differences in IQ and EI. There was a statistically significant difference in mean scores between Social Sciences and Applied Sciences on the combined dependent variable, *F* (2, 337) = 27.874, p = .000; Wilks' Lambda = 0.858. The eta squared value was 0.14 indicating a medium effect size. When the results for the dependent variables were considered separately, the results using a Bonferroni adjusted alpha level of 0.017 were *F* (1, 338) = 26.17, p = .000. The magnitude of the effect size was medium (partial eta squared = 0.072, *d* = 0.54), the results showing that Applied Sciences students obtained a statistically significantly higher mean on IQ (*M* = 42.54, *SD* = 10.46) than Social Sciences students (*M* = 36.66, *SD* =10.70). The results also showed that Applied Sciences students obtained a statistically significantly higher mean on EI (*F* (1, 338) = 33.10, p = .000. The magnitude of the effect size was medium (partial eta squared = 0.089); *d*= 0.60.

Table 2. *Differences on IQ and EI between Social Sciences and Applied Sciences students.*

Variables	Discipline	N	Mean ± SD	*d*
IQ	Social Science	170	36.66 ± 10.70	0.54
	Applied Science	170	42.54 ± 10.46	
EI	Social Science	170	292.24 ± 37.96	0.60
	Applied Science	170	314.35 ± 32.71	

Gender differences in academic performance are given in Table 3. Neither of the differences are statistically significant (t = .318 and .390, respectively). Product-moment correlations between IQ, EI and AP (academic performance) are given in Table 4.

Table 3. *Gender differences in academic performance.*

Discipline	Gender	N	Mean ± SD	*d*
Social Science	Male	85	1.95 ± 0.754	-0.07
	Female	85	2.00 ± 0.789	
Applied Science	Male	85	2.18 ± 0.789	0.08
	Female	85	2.13 ± 0.784	

Table 4. *Product-moment correlations between IQ, EI and AP (academic performance).*

Variables	IQ	EI
EI	.136*	-
AP	.271**	.178**

Note: * and ** denote statistical significance at p<.05 and p<.01.

Discussion

There are six points of interest in the results. First, the results in Table 1 show male students obtained a slightly higher mean score of .10*d* (1.5 IQ points) on the Progressive Matrices. The sex difference is not statistically significant but the result confirms those of the meta-analysis of sex differences on the Progressive Matrices by Lynn and Irwing (2004) showing that in late adolescence males obtain slightly higher means than females on this test of non-verbal reasoning ability. The result shows that differences between Libya and Western countries in gender roles and educational systems have little or no effect on sex differences in non-verbal reasoning ability.

Second, the results in Table 2 show that Applied Sciences students obtained significantly higher scores than Social Sciences students on IQ (0.54*d*). This result is consistent with several previous studies. For instance, an 8.5 points higher average IQ of British science students than of arts students was reported on the AH5 test by Heim (1968, p. 16) and by 16.7 points on the AH6 test by Heim, Watts and Simmonds (1983). Furnham and Crump (2012) found that Arts students had lower '*g*' (measured by Raven's Progressive Matrices) and numerical ability than Science students, confirming several earlier studies summarized in the introduction. A 2 points higher IQ of Science students than of

Arts students was reported in a sample of 800 students in Libya (Al-Shahomee & Lynn, 2010); and a higher IQ of Science students than of Arts students was also reported in a sample of 1001 students at the University of Khartoum (Khaleefa, Amer & Lynn, 2014).

Third, the results in Table 2 show that Applied Sciences students obtained significantly higher scores than Social Sciences students on emotional intelligence (EI) by 0.60*d*. We are not aware of any other results on this. It remains to be seen whether this difference also exists in Western countries.

Fourth, the results in Table 3 show that there were no significant sex differences in academic performance contrary to most studies in economically developed Western countries in which females perform better than males.

Fifth, the results in Table 3 show that IQ, EI and AP (academic performance) were significantly correlated. The .271 correlation between IQ and AP is lower than that found in a number of studies in economically developed Western countries but similar to that reported by Parker et al. (2004). The low but significant correlation of .178 between EI and AP and of .136 between IQ and EI are consistent with those found in a number of studies in economically developed Western countries (e.g. Downey et al., 2008; Mayer, Roberts & Barsade, 2008). Part of the inconsistency in this area lies in the different tests used to measure both IQ and EQ (Petrides, 2011).

Sixth, females had greater variability of intelligence than males (Table 1), contrary to many reports that males typically have greater variability than females (e.g. Johnson, Carothers & Deary, 2009). A recent study showed that the excess male variability on PISA (Program for International Student Assessment) tests is less regularly seen in less developed countries than in modern industrialized countries (Meisenberg, 2016). We do not know whether the same is true for cognitive tests such as Raven's Progressive Matrices. In our study there were no clear sex differences in the variability of academic performance (Table 3), and only emotional intelligence showed greater male variability (Table 1).

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