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Gender Differences on the Standard Progressive Matrices of South Sudanese Living in Khartoum

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Data are reported for non-verbal ability tested with Raven's Standard Progressive Matrices for a sample of 755 male and 622 female school children, 6 to 18 year old, from South Sudan. These were the children of refugees who were settled with their families in the area of Khartoum. There was no gender difference among 6 through 15 year olds, but among the 16-18 year olds males obtained a significantly higher mean score of .31*d* or 4.65 IQ points. The variance was greater among the males than among the females. At all ages, average IQs were below 60 according to British 2007 norms.

Key words: South Sudan, Standard Progressive Matrices, Intelligence, Sex differences, Refugees

There are two positions on gender differences in the Standard Progressive Matrices, a test of non-verbal reasoning ability. The first advanced by Court (1983), Mackintosh (1996) and Anderson (2004) is that there is no gender difference. The second advanced by Lynn and Irwing (2004) is that there is no gender difference up to the age of 15 years but that from the age of 16 years males obtain higher average scores reaching 5 IQ points among adults. While these conclusions are based on results from advanced industrial societies, very little is known about sex differences in less developed countries, especially those in which gender roles are very different from those in modern Western societies. The present paper reports a test of these two positions in a sample of children and adolescents from South Sudan who are currently living in or near Khartoum.

Subjects and Method

The subjects of this study are members of refugee families who live dispersed in the towns and suburbs of the Khartoum area in Central Sudan. They generally live in poor districts and under strained economic and social conditions. The schools that these children attend are part of the public school system, and they teach the standard Sudanese curriculum. They are funded by the government, but one school receives financial assistance from churches and international NGOs.

Figure 1. *Children taking the Raven test in their classroom.*

The sample consisted of 1439 pupils (755 boys and 622 girls) from the five public schools for South Sudanese in the Haj Youssef region of Khartoum State.

The schools were Kassala, Episcopal (A), Episcopal (B), Alshiglah 1 and Alshiglah 2. The sample came from the Dinka, Shilluk, Nuer, Murle and Pellndah tribes. The sample was tested in the academic year 2009–2010 with Raven's Standard Progressive Matrices (SPM). This nonverbal test requires visual matching for the easier items and abstract analytical thinking for the more difficult items. The test was administered to the children in their classrooms (Figure 1). To estimate the average IQ, the raw scores were converted to the equivalent SPM+ scores according to the conversion table (Table SPM3) in Raven, Raven & Court (1998). The IQ was then estimated from these scores according to the SPM+ norm table in Raven (2008).

Results

The results are given in Table 1 showing for males and females the age, numbers, mean raw scores and standard deviations, the *d*s (difference between male and female scores divided by the averaged standard deviation), and the variance ratios (VR) calculated as the standard deviation of the males divided by the standard deviation of the females. None of the differences between the scores of the males and females is statistically significant. However, females have marginally higher scores than males up to the age of 10 years, while males obtain higher scores in the older age groups. When the ages of 16-18 years are combined, males have significantly higher scores than females (d = .31, t = 2.05, p<.05).

Table 1. *Mean and standard deviation (SD) of SPM scores by sex by age among South Sudanese in Khartoum Province.*

Age	Male			Female			*d*	VR	*t*
	N	Mean	SD	N	Mean	SD			
6	14	5.86	5.23	36	7.69	4.41	-.38	1.19	-1.16
7	33	9.36	4.93	45	9.60	6.13	-.04	0.82	-0.19
8	51	9.76	5.10	46	10.02	3.45	-.06	1.48	-0.30
9	67	9.82	5.86	64	9.94	4.61	-.02	1.27	-0.13
10	78	11.77	6.57	88	12.30	6.27	-.08	1.05	-0.53
11	47	14.45	7.43	48	12.77	6.73	.24	1.10	1.15
12	90	15.93	9.15	64	15.11	8.49	.09	1.08	0.57
13	96	19.83	9.26	64	17.47	9.62	.25	0.96	1.54
14	86	21.38	10.36	62	19.47	8.74	.20	1.19	1.21
15	65	20.68	8.94	42	22.81	9.90	-.23	0.90	-1.13
16	51	22.57	10.44	26	19.62	8.42	.31	1.24	1.34
17	40	22.38	10.31	28	19.82	8.39	.27	1.23	1.13
18	37	21.27	6.95	9	17.56	7.16	.53	0.97	1.40

Discussion

There are three points of interest in the results. First, the gender differences are small and inconsistent at the ages of 6 through 15 years, with females obtaining non-significantly higher scores at ages 6 through 10 years and at age 15, and males obtaining non-significantly higher scores at ages 11 through 14 years. In the 16-18 year age group males obtained a significantly higher average score than females by .31*d.* This is equivalent to 4.65 IQ points and is therefore consistent with the position advanced by Lynn and Irwing (2004) that on the Raven test, males obtain higher average scores than females among this age group.

Second, in nine of the thirteen age groups males had greater standard deviations than females, as shown by the variance ratios of greater that one and an average of 1.14. This is consistent with the frequent finding that the variability of intelligence is greater in males than in females (e.g., Arden & Plomin, 2006).

Third, the mean scores are remarkably low. The Standard Progressive Matrices test has 60 items, each with 6 or 8 answer choices. Pure guessing alone will produce an average raw score of 8.5. In this sample, raw scores barely exceed random guessing up to the age of 9 years. Even at the older ages, scores are so low that discrimination is mainly on the easier visual matching tasks, which comprise the first 24 items of the test. Few of the subjects were able to solve the more difficult tasks, which require analytic thinking: decomposing simple drawings into their elements and analyzing them one element at a time by abstract criteria such as numerosity, periodicity and directionality. Therefore the higher male scores in the older age groups should be attributed mainly to greater male visuo-spatial ability, rather than greater abstract reasoning ability. In Western countries, children acquire the capacity for analytical thinking through formal schooling. This, apparently, has not happened in these children. Their average total scores are well below the norming range of the British SPM+ standardization of 2007. For example, in order to be assigned an IQ of 60 according to British norms (the 0.4th percentile of the British distribution, in the mildly mentally retarded range), a child would have to obtain an SPM score of 10 at age 7, 20.5 at age 10, and 25.7 at age 15. Therefore the raw scores in Table 1 translate into an average IQ well below 60.

There are many possible causes for the low performance of these children. One factor to consider is the quality of schooling. The first author noted that most of the teachers at these schools are not trained teachers at all, but either UN staff or university students. Teachers' cognitive skills are considered an important determinant of students' cognitive skills (e.g., Hanushek, Piopiunik & Wiederhold, 2014), and poorly qualified teachers are a possible cause of low performance of

children in this sample. The amount and quality of schooling have long been recognized as important for children's cognitive development (e.g., Ceci, 1991; Ritchie & Tucker-Drob, 2017). The schools in which this study was carried out lack the most basic necessities, with some classrooms entirely constructed of mats and others covered with mats, which makes the children suffer from the heat of the sun in the summer and the cold of the winter. Basic school necessities such as pencils are in short supply. We also have to take note of the poverty in which these children grow up. Most of them were born in the Khartoum area to parents who had been displaced by the decades-long war in the South. Under these conditions, the main challenge for the people is to secure basic needs, with little attention given to education. Studies in Western countries have pointed to the importance of serious deprivation for cognitive development. Michael Rutter (1985), for example, concluded: "…environmental effects on IQ are relatively modest within the normal range of environments, but…the effects of markedly disadvantageous circumstances are very substantial." The circumstances of South Sudanese children in Khartoum State qualify as "markedly disadvantageous" by Rutter's standards. Nutritional deficiencies may contribute to poor intellectual development of the children (Gorman, 1995; Grantham-McGregor, 1995). We also have to note poor cultural compatibility with the mainstream population of the province, where the displaced South Sudanese families are living among people with a different religion, different customs and different lifeways.

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References

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

Arden, R. & Plomin, R. (2006). Sex differences in variance of intelligence across childhood. *Personality and Individual Differences* 41: 39-48.

Ceci, S.J. (1991). How much does schooling influence general intelligence and its cognitive components? A reassessment of the evidence. *Developmental Psychology* 27: 703-722.

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

Gorman, K.S. (1995). Malnutrition and cognitive development: Evidence from experimental/quasi-experimental studies among the mild-to-moderately malnourished. *Journal of Nutrition* 125: 2239S-2244S.

Grantham-McGregor, S. (1995). A review of studies of the effect of severe malnutrition on mental development. *Journal of Nutrition*, 125: 2233S-2238S.

Hanushek, E.A., Piopiunik, M. & Wiederhold, S. (2014). The value of smarter teachers: International evidence on teacher cognitive skills and student performance. *NBER Working Papers*, No. 20727.

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

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

Raven (2008). *Manual for Standard Progressive Matrices Plus Version and Mill Hill Vocabulary Scale.* London: Pearson.

Raven, J., Raven, J.C. & Court, J.H. (1998). *Raven Manual: Section 3. Standard Progressive Matrices, 1998 edition. Oxford: Oxford Psychologists Press.*

Ritchie, S.J. & Tucker-Drob, E.M. (2017). How much does education improve intelligence? A meta-analysis. PsyArXiv.

Rutter, M. (1985). Family and school influences on cognitive development. *Journal of Child Psychology and Psychiatry* 26: 683-704.