Norms for the Standard Progressive Matrices for 9-18 year olds for Darfur

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Results are reported for a standardization of the Standard Progressive Matrices in Darfur. The sample consisted of 1006 school students aged 9 to 18 years. The younger children performed better than older children, in relation to British norms. This may be because schools in Darfur do not give so much attention to teaching the problem solving skills tested in the Progressive Matrices, or perhaps due to the underdevelopment of Darfur region compared to other regions of Sudan.

Key Words: Intelligence; Progressive Matrices; Darfur; Sudan.

There have been several studies of intelligence in Sudan based on samples from Khartoum state, i.e. the city of Khartoum and the surrounding rural region. In these studies intelligence has been assessed by the Draw-a-Man test (Khaleefa, Abdelwahid, Abdulradi & Lynn, 2008; the Progressive Matrices (Ahmed, 1989; Khatib et al., 2006; Khaleefa, Khatib, Mutwakkil & Lynn, 2008; Irwing et al., 2008); the Wechsler Adult Intelligence Test (Khaleefa, Sulman, & Lynn, 2009; and the Expanded Trail Making Test (a non-verbal test with a visuospatial component) (Stanczak et al., 2001).

Sudan is a large country comprising approximately 2.5 million square km. This is approximately five times as large as Spain and eight times as large as the United Kingdom.

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The ethnographic character of the population differs in different regions. According to the Encyclopedia Britannica (1960, 21, p. 511-2) "the northern provinces are predominantly Moslem and Arabic speaking. The people are of very mixed origin - Arab and Hamite, Hamite and Negro, and, above all, Arab and Negro. There is a complete contrast between the sophisticated Arabs and Arabicized Negroids of the north and the black skinned peoples of the southern provinces". The peoples of the southern region of Darfur are described as "Negroid" in the Encyclopedia Britannica (1960, 7, p.57). Because of this ethnographic diversity, the intelligence results obtained from samples from Khartoum state are not necessarily representative of all regions of the country. To examine whether this is the case, we present Standard Progressive Matrices data for a sample of 9-18 year old school students in Darfur.

The Darfur region lies about 1,000 km south west of Khartoum. North Darfur had an estimated population 1,763,000 in 2006 and comprised 4.9% of the population of Sudan. The capital city of is Al-Fashir**.** Its population in 2006 was estimated as 264,734 residents. It is the agricultural and commercial marketing center for cereals and fruits grown in the region. North Darfur is semi-desert and most inhabitants are nomads who spend the summer season around wells and valleys in the region while in the autumn and winter some of the tribes migrate to the south and others migrate to the north. South Darfur had an estimated population of 3,634,000 in 2006 and comprised 9.5% of the population of Sudan. Its capital is the city of Niyala with a population estimated in 2007 of 565,734. As in North Darfur, the majority of the population work as agriculturalists tending and raising animals.

Method and Results

The Standard Progressive Matrices (SPM) was administered in 2008 to a sample of 1006 school students aged 9 to 18 years at schools in the cities of Niyala and El-Fasher in Darfur. There were approximately equal numbers from both cities and of males and females.

The results (numbers, means and sds) for each age group are given in Table 1. Age 9 consists of those aged 9.0 to 9.11 months, average age 9.5 years, and similarly for the

other age groups. The right hand column gives the British percentile equivalents of the Darfur scores. For the 9 to 15 year olds, the British percentile equivalents are from the British 1979 standardization sample given by Raven (1981). There are no British norms for 16-18 year olds, but there are detailed American 1993 norms for this age group given by Raven, Raven & Court (1998, p. 77), so these are given. For the 16-18 year olds the scores of the Darfur sample are well below the first percentile of the American 1993 norms, so they have been assigned the American zero percentile.

Table 1. Standard Progressive Matrices scores of 9 to 18 year olds in Darfur

Age	N	Mean	SD	British Percentile
9	135	21.39	10.25	14
10	224	22.18	11.14	4
11	269	25.00	11.59	6
12	138	25.07	11.36	5
13	90	21.62	9.79	3
14	101	20.87	12.57	0
15	17	23.18	8.71	1
16	7	25.00	11.11	0
17	11	29.36	12.13	0
18	5	25.00	7.83	0

Discussion

The results show three interesting features.

First, the average of the British percentiles of the 10 age groups is 3.3 and is equivalent to British IQ of 72.5. This is a little lower than the average IQ of 79 obtained in the four studies of the Progressive Matrices in samples in Khartoum city or Khartoum state cited in the introduction.

Second, the Darfur IQ obtained in this study may be a little lower than that of the population of the region. The percentage of children enrolled in basic education in 2006 in North Darfur was 63.8% and South Darfur was 60%, compared with 88.6% in Khartoum, and 68.7%, in Sudan as

a whole. It is compulsory for children to go to school in Sudan between 6-14 years, but in reality many do not attend school.

The total percentage of enrolment in secondary education in 2006 in North Darfur was 25.3% and in South Darfur was 21.4%, compared with 54.9% in Khartoum, and 28% in Sudan as a whole (Sudan Ministry of General Education, 2008). Children in school typically have higher IQs than those not in school in the same country. For example, Heady (2003) found in samples of 12-18 year olds in Ghana that those in school had an IQ 2 points higher than those not in school. It has been reported that in Senegal each 1 year of schooling among 14-17 year olds increases cognitive ability (tested as "basic practical knowledge, e.g. of nutrition, HIV/AIDS, government institutions and related topics") by 1.9 IQ points (Glick & Sahn, 2009). Thus 17 year olds in school had a 5.7 IQ advantage over those who had not been in school during the preceding three years.

There are two likely reasons why the IQs of children in school are typically higher than the IQs of those not in school. First, schooling has some effect in increasing IQs because children are taught the cognitive skills tested in IQ tests. The Progressive Matrices tests the skills of categorization by abstract rules concerning number, form, location and logical progression. These abstract categorizations are to some degree taught in school, in the arithmetical skills of addition, subtraction, multiplication and division. Second, parents who send their children to school typically have higher socio-economic status and likely have higher IQs. In Sudan parents have to pay a small amount for their children's schooling. Although this is only around US $ 10 a year it may deter poorer parents from sending their children to school. The children of these poorer parents may tend to have lower IQs.

A third point of interest in the results is that the British percentile equivalents are highest for the 9 year olds (the 14th percentile), lower for the 10-13 year olds (average 4.5th percentile), and lowest for the 14-18 year olds (average 0.2th percentile). Thus, over the age range 9 through 18 years, the cognitive ability of the Darfur children appears to decline

relative to that of British children. This result that younger Darfur children perform better, relative to British children, than do older Darfur children, replicates the results reported for Syria and the United Arab Emirates by Khaleefa & Lynn (2008a and 2008b). There are two probable explanations for this. First, it has been shown by Lynn, Allik and Irwing (2004) that the initial items in the SPM are measures of visualization ability, while the later items are measures of abstract and arithmetical reasoning ability. The 9 year olds are scored mainly on the initial visualization items because the abstract and arithmetical reasoning ability items are too difficult for them. The older children aged 10-13 are scored partly on visualization items and also on the abstract and arithmetical reasoning ability items. Those aged 14-18 are scored mainly on the abstract and arithmetical reasoning ability items because the visualization are so easy that they mostly get them all right, so the visualization items are largely a constant that is added to their scores on the abstract reasoning ability items. Thus, it appears that Darfur children find visualization items easier than abstract and arithmetical reasoning ability items.

It should be noted that in the present study, the numbers of 9-14 year olds are greater than the numbers of 15 to 18 year olds. This is because the 9-14 year olds were those in compulsory primary education, while the numbers of 15 to 18 year olds are smaller because most young adolescents leave before they are 15. The 9-14 year olds can be regarded as reasonably representative of urban children in Darfur. The average British percentile of the six age groups is 5.3, equivalent to an IQ of 76. The 15 to 18 year olds are probably less representative but the reasons they are in school are uncertain. Some may be repeating classes, or enrolled late, while others may have relatively affluent parents who aspire to their children entering universities and higher socio-economic status occupations.

Possibly the explanation for the low scores obtained by the Darfur children is that schools in Darfur do not teach abstract reasoning skills and arithmetical problem solving abilities so well as do schools in Britain, teachers are not so well trained, and children in Darfur do not have so much experience of test taking, as suggested as a factor responsible

for the lower scores obtained on intelligence tests by children in the Middle East by Stanczak, Stanczak & Awadalla (2001). It may be that the solution to this problem would be for teachers in Darfur to be trained to devote more attention to teaching reasoning and arithmetical problem solving skills, and also to increasing the level of education and improving the economic development in the region.

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