

## A Study of the Colored Progressive Matrices with Children from South Sudan

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This study assesses non-verbal cognitive ability of South Sudanese refugee children, using the Colored Progressive Matrices (CPM) test. The sample consisted of 1856 South Sudanese children living in Khartoum State ranging from 6 to 12 years of age. Mean scores were very low when scaled to the IQ metric according to British 2007 norms. Importantly, group administration produced far lower scores than individual administration of the test.

**Key Words:** South Sudan, Coloured Progressive Matrices, Group administration

The southern part of Sudan seceded to become the independent nation of South Sudan on July 9, 2011. The main reason that the people of the southern part of Sudan opted to secede was that they are ethnically and culturally different from the people of Central and North Sudan. The South Sudanese are principally a Nilotic people, as is shown in a genetic analysis by Cavalli-Sforza, Menozzi and

OSMAN, H.A., *et al.* A STUDY OF CPMs WITH CHILDREN FROM SOUTH SUDAN Piazza (1994, p. 181). Nilotic people are one of the four sub-races of Negroids according to Baker (1974, p. 329). The people of northern Sudan are a mixed-race population consisting of North African Caucasoids admixed with sub-Saharan Negroid peoples from the South and West and of mixed-race Afro-Asiatic and Negroid peoples from Eritrea and Ethiopia in the East. As explained in the Encyclopedia Britannica, “the northern provinces are Moslem and Arabic speaking. Though commonly called Arabs, the people are of mixed origin — Arab and Hamite, Hamite and Negro and, above all, Arab and Negro... the contrast is complete between the sophisticated Arabs and Arabicized Negroes of the north and the naked black-skinned peoples of the southern provinces” (sic) (K.C.B., 1960, p. 512-3). Detailed descriptions of the “segmental” social organization of the traditional indigenous societies in South Sudan can be found in the classical works of E. E. Evans-Pritchard (1940).

There have been three studies on the construct of intelligence in South Sudan. The first was a study of the intelligence of Nilotic people in South Sudan carried out in 1954 by Fahmy (1964). He administered four tests to a sample of 291 school students (7–16 years) inhabiting the west bank of the White Nile. The children belonged to the Shilluk, described as “one of the primitive Nilotic Negro tribes” (p. 164). The four tests used and the mean intelligence quotients (IQs) obtained using American norms were the Goddard Form Board (73.5), Porteus Mazes (76.5), Alexander Passalong test (94.4), and Goodenough Draw-a-Man (DAM) test (53.4). The average IQ on the four tests using American norms was found to be 74.5 and the average IQ using British norms was 72.5. These IQs do not take account of the increase in intelligence of approximately 3 IQ points a decade that took place over time in the United States (Flynn, 1984). The norms for the American tests were collected in the 1920s and 1930s. Lynn and Vanhanen (2012) have provided an adjustment for correcting the increase in intelligence that reduced the average IQ of this Sudanese sample to 69. This study was unsatisfactory for several reasons, including the difference in the IQ scores obtained from the four tests, the long duration between the establishment of the American norms and the collection of the data in Sudan, and the interval of more than sixty years since the study was carried out.

The second study was conducted with 1330 South Sudanese children aged 6-16 years residing in Khartoum State before the secession of South Sudan. The children were tested using the Standard Progressive Matrices and a mean IQ of 70.4 was found using British norms (Ahmed, 2012).

The third study (Osman *et al.*, 2017) tested 2990 South Sudanese refugee children in Sudan, aged 7-18 years, with the Standard Progressive Matrices (SPM). Scores were below the lower limit of the British norm tables, with IQs

estimated close to 55. In this paper, we report a more recent study of South Sudanese children living in Sudan.

## **Method**

The sample consisted of 1856 Shilluk children (992 boys and 864 girls) from South Sudan aged 6–12 years. The children lived in refugee camps established in Khartoum State for those displaced by the wars in South Sudan. The camps and schools were funded by the office of the United Nations High Commissioner of Refugees (UNHCR), World Food Program (WFP), and the United Nations Children's Fund (UNICEF) and were well maintained and orderly. The schools were well managed under the supervision of the Sudanese Red Crescent Society, with sizes of approximately 30 children per class.

The children were tested with the Colored Progressive Matrices (CPM), a test of visual comprehension and non-verbal reasoning that has been used in numerous studies for the assessment of intelligence throughout the world (Lynn & Vanhanen, 2012). It was first constructed in 1947 for use with children up to about 12 years (Raven et al., 1956), and standardized on the British population in 1982 and most recently in 2007 (Raven, 2008). The British norms established in 2007 are based on the administration of the test individually.

In the current study, the test was administered individually to the youngest participants only. Permission to test the participants was obtained from the principals of the schools and from administrators of the camps. We did not take parents'/guardians' consent. This was deemed unnecessary for our study in the Sudanese cultural and legal context because the children are not adversely affected by responding to the test, and the test is administered in schools as a scheduled school activity under the supervision of principals, teachers and administrators of the camps.

## **Results**

The results shown in Table 1 include the ages, sample sizes, mean scores, standard deviations, and IQs using the 2007 British norms (Raven, 2008). These British norms, for ages from 4 to 11 years, were established using individually administered tests. There are no British norms for the test administered to groups. Table 1 shows that when the test was administered in groups to 8–10 year old students, their scores were much lower than those of 6- and 7-year-old students who were administered the test individually. This finding is in line with the results of a study in Palestine in which children who took the CPM as a group test obtained an IQ 12.5 points lower than those who were administered the test individually (Bakhiet & Lynn, 2014, p. 10-11). To obtain a crude estimate of the

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 IQs of the 8 to 12 year old students, we added 12.5 to their IQs based on the earlier Palestine results. However, the raw scores obtained with the group-administered test in this age range were well below the limits of the British norms, resulting in average IQ estimates substantially lower than 60. Even when 12.5 points were added to these estimates, all we can say is that average IQs were well below 70 for the 8-11 years old students.

**Table 1.** *Colored Progressive Matrices scores for South Sudanese students.*

Age	Number	Administration	Score $\pm$ SD	British IQ
6	240	Individual	13.73 $\pm$ 9.45	78
7	227	Individual	13.84 $\pm$ 9.95	68
8	218	Group	10.46 $\pm$ 6.92	<70
9	227	Group	10.80 $\pm$ 6.91	<70
10	311	Group	11.74 $\pm$ 7.57	<70
11	272	Group	13.70 $\pm$ 7.95	<70
12	361	Group	16.32 $\pm$ 9.02	

## Discussion

There are three points of interest in the results. First, the average British-scaled IQ of the 6- and 7-year-olds who took the test individually is 73 and the estimated IQ of the 8 to 12 year olds who took the test in groups is well below 70. This estimate is compatible with the IQ estimates of 69 given by Lynn and Vanhanen (2012) for the Fahmy (1964) study and of 70.4 for the study by Ahmed (2012). It is also compatible with the very low scores, with estimated IQs of about 55, in the Osman *et al.* (2017) study. These results are in line with the average IQ of 71 given from 143 studies of the IQ in sub-Saharan Africa given by Lynn (2015, p. 59).

Averaging the results of the three earlier studies with those of the present one in order to estimate an average IQ for South Sudanese children is problematic because of massive floor effects. To put the results of the present study in perspective, the test has 36 items each with 6 answer choices. Therefore random guessing would produce a raw score of 6. In the British standardization of 2007, a score of 21 at age 11 (the oldest age for which British norms were established) is assigned an IQ of 60. The mean raw score of 13.7 that 11-year-olds obtained with the group-administered test in the present study is far lower than this. The raw scores in Table 1 imply that many children could not even answer the easiest questions. The combined evidence of all four studies indicates an average IQ of South Sudanese children that is almost certainly less than 70

according to current British norms. We also note that the Fahmy (1964) study is hardly comparable with the later ones because it was done more than half a century earlier, different tests were used, and these were scaled using obsolete norms.

Second, this is the second study, after the one reported by Bakhiet and Lynn (2014) in Gaza, finding that scores are much lower when the CPM test is administered in groups instead of individually. This shows that extreme caution needs to be exercised in the interpretation of results whenever the test is group-administered to children in developing countries and/or to children from poor educational backgrounds. Many of these children appear to have difficulty understanding what they are expected to do with the test, and they require individually tailored explanations from the examiner. The recommendation is that the test should generally be administered individually in these contexts, especially to younger children and those from poor educational and cultural backgrounds.

Third, the generalizability of the three later studies is uncertain because they were conducted with refugee children living in Khartoum State, not with South Sudanese in their own country. Although these children were growing up under deprived socio-economic conditions, they attended schools that conformed to minimum standards in Khartoum State, they attended school more-or-less regularly, and they were not overtly malnourished. It is not clear to what extent results from these groups are comparable with those that would be obtained by children in South Sudan. While it is plausible that refugee children suffer disadvantages as a result of their displacement, it is equally possible and even likely that living standards and quality of schooling are higher for the refugee children than for children left behind in war-torn South Sudan. The country is economically undeveloped and politically unstable. The educational system is weak, and inadequate teacher qualifications are a main impediment for the efficiency of South Sudanese schools (Joseph & Kennedy, 2017). This raises the possibility that our results, low as they are, would be an overestimate of the cognitive skills attained by children in South Sudan.

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