

The intelligence of the Copts of Sudan: A test of norms validation

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Abstract: This study validated the Standard Progressive Matrices (SPM+) norms in the Sudanese context. A sample of Coptic Sudanese ($n = 385$, girls = 34.5%) and other Sudanese children ($n = 1656$, girls = 51.5%) aged between 7 and 10 took the SPM+. Reliability was acceptable (Cronbach's $\alpha = 0.755$ for the Copts). British Intelligence Quotient (IQ) norms scores from the SPM+ for the Copts were compared to those of the (North) Sudanese, controlling for age. The mean IQ of the Sudanese Copts was 88.92, while that of the other (North) Sudanese was 78.26. This difference is consistent with the higher socioeconomic gradient of the Copts both in Sudan and in various Arab countries, such as Egypt. The 10-point difference is approximately two-thirds of a standard deviation (10/15), and is not, therefore, clinically significant. These findings suggest a need for caution when using the SPM+ with Sudanese school children, and particularly non-Coptic (North) Sudanese.

Keywords: Copts; intelligence; Sudan; Egypt

Introduction

Many countries contain ethnic minorities that are relatively socioeconomically elite (Rindermann, 2018). This may be due to differences in average intelligence, modal personality, or other factors. For example, the Ashkenazi Jews constitute an elite ethnic minority in many countries and score on average a standard deviation above the mean on Intelligence Quotient (IQ) test measures (Lynn, 2012). Their General Factor of Personality (a personality g -factor which is marked by being highly socially effective) is particularly high (Dunkel et al., 2015). These higher social gradient IQ scores have been reported in European and South Asian minorities in Sub-Saharan Africa (Lynn, 2006).

The Standard Progressive Matrices (SMP+; Raven, 2008) is a widely used IQ measure in the Sudanese context (Najat, 2016). The validity and reliability study results showed that the vast majority of items in each subtest had strong internal consistency with their respective total subtest scores and the overall test score.

The Sudanese Copts. An elite ethnic minority for whom this hypothesis is yet to be tested is the Sudanese Copts. The Republic of Sudan is the third-largest African country after Algeria and the Democratic Republic of Congo. It is also extremely diverse in terms of its levels of socioeconomic development and in terms of its ethnic composition, including highly distinct groups such as the Sudanese Arabs and the Nilotic Fur in Darfur. Previous IQ test

scores studies from that country include those by Irwing et al. (2008), Khaleefa (2011), and Batterjee and Ashria (2015). Estimated IQ scores based on British norms vary from between 65.90 and 84.03, with an unweighted mean of 75.73 ($SD = 5.46$) or 76.75 if weighted for sample size according to Lynn & Becker (2019). This mean score is congruous with the country's geographical location between North Africa (Libya with an IQ of around 81, Egypt with an IQ of around 76) and Sub-Saharan Africa (Eritrea with an IQ of around 69, Ethiopia with an IQ of around 68 (Lynn & Becker, 2019)). It is also consistent with socioeconomic differences in IQ within the country, where the IQ of children of those in elite professions, such as medicine, has been found to be around 90 or 100 (see Rushton, 1995).

The Sudanese Copts are practitioners of a form of Orthodox Christianity which broke away from the Roman Catholic Church after the Council of Chalcedon in 451, arguing that Christ is “one nature of full humanity and divinity,” with the Catholics arguing that He has “two natures” that are both fully divine and fully human. Since then, the Copts have had their own pope whose seat is in Alexandria (see Meinardus, 2002). The Sudanese Copts are highly genetically distinct from most Northern Sudanese and are extremely genetically similar to Egyptians, having intermarried very little with the Sudanese.

Many of the Sudanese Copts migrated from Egypt to Sudan around two hundred years ago, during the period of

Anglo-Egyptian colonial rule. They compose about 1% of the Sudanese population, mainly living in Khartoum and other large cities. They are a mixture, genetically, between Egyptians and broader Arab populations and have about the same European admixture as do Egyptians (Hollfelder et al., 2017). Some Copts are descended from a group that migrated to Sudan when Coptic Christians began to be persecuted in Egypt after it became Islamic in the eighth century (Saleh, 2018). On many measures, the Sudanese Copts are of higher socioeconomic status than the surrounding Sudanese. They tend to be merchants, bankers, and bureaucrats and are regarded as a “privileged minority” (Kramer et al., 2013, p.117). The Copts in Egypt are also very strongly over-represented in elite professions such as medicine and government administration (Rugh, 2016; Pennington, 1982). They also have a historical tax system known as the *jizya*, experienced between 641 and the beginning of British rule in 1856, which may have encouraged their entrepreneurship and forced the less economically successful to convert to Islam.

Validity and reliability

The Standard Progressive Matrices (SPM) test was standardized in Sudan on a large sample of individuals aged 7 to 18 years, specifically in Khartoum (Najat, 2016). That study employed factor analysis, showing that the vast majority of items in each subtest had strong internal consistency with their respective total subtest scores and the overall test score. The study also showed that all five sets exhibited internal consistency with one another and with the total test score, indicating that the five test sets measure a single factor, with factor loadings of the five sets ranging between 0.483 and 0.880.

Najat (2016) further estimated statistically significant differences between each set and the subsequent one, reflecting a gradual increase in difficulty across the test sets. The reliability coefficients for the total test score ranged between 0.343 and 0.785. The study recommended using the test for scientific research, educational diagnostics, and counselling within the study population.

Goal of the Study

This study compared the Sudanese Copts and other Sudanese IQ SPM+ scores based on British norms from Raven (2008). We addressed the following question: Do Sudanese Copts and other Sudanese IQ SPM+ scores differ reliably?

Method

Samples

The study of the Sudanese Copts was conducted in 2017 and was applied in all Coptic schools in the capital, Khartoum, and in Omdurman. These were Comboni (in Khartoum), Alsalam (in Khartoum North), and the Coptic school; Pastor Comboni, and the Nuns School (in Omdurman). These were representative as 70% of the students participated. The results of the North Sudanese are from Husain et al. (2019), from an administration to a representative sample of Sudanese school children, which took place in 2016. Thus, in both cases, these were representative samples.

Procedure

Ethical approval for the study was obtained from the Mashreq University Research Board Committee on Research Ethics, ensuring that all procedures complied with established ethical standards for research involving human participants. Prior to data collection, informed consent was obtained from the parents of all participating children, who were provided with detailed information about the purpose, procedures, potential risks, and benefits of the study. Additionally, age-appropriate assent was obtained from the children themselves, ensuring that participation was voluntary and that the children understood their right to withdraw at any time without any negative consequences. All data were treated with strict confidentiality and used solely for research purposes.

Administration

In both cases, the SPM+ was administered. This test was developed by Raven et al. (1998) and its British norms were published by Raven (2008). It has been administered to individuals aged 6 to 80 years and is an advanced version of the Standard Progressive Matrices test initially developed by Raven in 1938 and revised in 1956. The test consists of 60 items distributed across five sets (A, B, C, D, and E), with each set containing 12 individual matrices. Each matrix consists of geometric figures or patterns, and the difficulty of the items increases progressively within each set until the end of the test. The version to be adapted into Arabic, i.e., explained to subjects via Arabic, retains the same group names (A, B, C, D, and E) and is suitable for individuals aged 6 to 80 years.

Each test item consists of a rectangle containing drawings or patterns with a missing part. The examinee is required to identify the missing part from six or eight options displayed at the bottom of the rectangle. In sets A and B, there are six options per item, whereas in the remaining sets, there are eight options per item. Set A begins with easy items, requiring simple completion skills, either through basic comparison or straightforward logical reasoning. Similarly, set B progresses in difficulty from easier to harder items, and overall, it is more difficult than set A. The primary focus of measurement in this set is the examinee's ability to recognize symmetry among shapes.

The difficulty of items in set C increases further, making it more challenging than set B. This set measures the examinee's ability to recognize systematic changes in shape patterns. Set D features an even greater increase in difficulty compared to set C. The focus in this set is on the examinee's ability to reorganize or systematically and logically alter shapes.

Set E represents the most challenging level, surpassing set D in difficulty. This set assesses the examinee's ability to analyse shapes into their components and perceive the logical relationships between these elements. The total score obtained by the examinee in the test serves as an indicator of their general cognitive ability. Additionally, the sub-scores obtained in each test set contribute to assessing the internal consistency of the test. The extent of the differences can, however, be potentially better comprehended by using the ratio scale of IQ differences, based on British norms. Based on this information, we are able to produce

Table 1. Descriptive statistics of the SPM+ scores for both groups, and corresponding IQ estimates according to UK norms

Sex	Age	Sudanese copts				Northern sudanese			
		<i>N</i>	<i>M</i>	<i>SD</i> ²	<i>IQ</i>	<i>N</i>	<i>M</i>	<i>SD</i> ²	<i>IQ</i>
Male	7	70	19.41	5.98	92.74	170	12.89	6.26	76.65
	8	125	22.12	5.51	94.42	184	14.74	5.69	77.28
	9	56	25.82	4.43	93.87	192	17.52	8.17	76.77
	10	1	28	n.v. ³	92.19	257	18.98	8.48	72.02
	All	252			93.39 94.64 ¹	803			76.22 76.93 ¹
Female	7	3	14.67	7.51	81.14	186	13.98	5.55	79.41
	8	26	17.27	5.02	83.07	190	15.64	6.74	79.33
	9	81	21.67	5.51	84.86	215	17.23	7.73	76.24
	10	23	22.93	4.79	96.36	262	21.86	8.25	77.71
	All	133			84.05 84.00 ¹	853			78.64 79.52 ¹
Total		385			88.66 88.92 ¹	1656			77.43 78.26 ¹

Note. ¹Means are weighted by *N*s. ²*SD*s are pooled. ³*SD* set to 0 when weighting.

weighted mean IQ scores for each sample, to calculate the effect size and see whether it attains significance.

Data analysis

Data were analyzed using IBM SPSS Statistics version 25. Descriptive statistics, including means, standard deviations, and frequency distributions, were computed to summarize the performance of Sudanese Copts and Northern Sudanese participants on the Standard Progressive Matrices Plus (SPM+).

Results

Table 1 summarizes the raw scores on the SPM+ for each ethnic and age group. It shows that the Copts have higher numbers of correct items in every age group, for both sexes. Moreover, boys tend to have higher scores within the Coptic group, whereas girls tend to have higher scores within the Sudanese group. Table 1 also lists the estimated corresponding IQ points for each of these eight groups. These were calculated based on the British scores in Raven (2008). The conversion formulas can be found in Lynn & Becker (2019). Reliability was acceptable at Cronbach's alpha 0.755 for the Copts; for the Northern Sudanese, we refer to Husain et al. (2019).

In order to compare the two ethnic groups, we controlled for age. To this end, simple regressions were computed with score as the dependent variable and age as the predictor. Across sex and all ages, the *B* coefficient was 2.88, which we considered appropriate given that *B* was in the range 2.53–3.58 for each of the four possible sex x ethnic group combinations. Age-controlled scores were then calculated by adding 2.88 for each year below 10, that is, 8.64 for 7, 5.76 for 8, and 2.88 for 9 years of age. These values were then aggregated across age and sex and used to estimate *t* and Cohen's effect size *d* (Hedges & Olkin, 1985), using the *N*-weighted pooled standard deviation

according to Olejnik and Algina (2000) and degrees of freedom according to the Welch-Satterthwaite equation (Welch, 1947), because of the large differences in sample size. Table 2 shows the age-controlled means, their pooled *SD*, and *t* and *d* estimates for the ethnic group difference, both for each age and sex group separately, each sex aggregated across age, and for the overall difference. It can be seen that all Coptic-Northern Sudanese differences were statistically significant except for the 7 and 8-year-old females and the 10-year-old males (because there was only one Coptic participant in the 10-year group).

Discussion and Conclusion

As hypothesised, the average IQ of the Sudanese Copts was marginally higher than the average IQ of the Sudanese. The Copts scored 88.92, 11 points lower than British standard norms. This falls within the 15 point standard deviation for what is traditionally understood as normal range intelligence, the cut-off point being 85. The Sudanese scored 78.26, 7 points below this cut-off point and close to 10 points, two-thirds of a standard deviation, lower than the Copts.

With regard to the observed sex differences, the female Copts exhibited a substantial advantage over the male Copts, whereas there was an opposite trend in the Northern Sudanese group. On the one hand, matrix reasoning tests like the Raven's are known to exhibit a male advantage, possibly because of their spatial format nature (Abdel-rasheed et al., 2020; Mosing et al., 2015). On the other hand, this was not the case for the Northern Sudanese, and we can only speculate on why this might be the case. It has been argued that there are significant racial differences in sexual dimorphism (Wells, 2012), including in relation to psychological differences for reasons yet to be determined.

Table 2. Inference statistics for the differences between the ethnic groups, separately for each sex and age, across ages, and across both sex and age

Sex	Age	<i>M Copts</i>	<i>M Sudan</i>	<i>SD²</i>	<i>T</i>	<i>D</i>	<i>p</i>
Male	7	19.41	12.89	6.18	7.56	1.05	<0.0001
	8	22.12	14.74	5.62	11.4	1.31	<0.0001
	9	25.82	17.52	7.50	9.93	1.11	<0.0001
	10	28.00	18.98	—	—	—	—
Female	7	14.67	13.98	5.57	0.16	0.12	>0.1
	8	17.27	15.64	6.56	1.48	0.24	<0.1
	9	21.67	17.23	7.19	5.50	0.62	<0.0001
	10	22.93	21.86	8.03	2.92	0.41	<0.005
Male ³	7–10	28.02	20.21	7.81	17.67	1.00	<0.0001
Female ³	7–10	23.86	21.36	8.43	4.47	0.30	<0.0001
All ³	7–10	25.94	20.79	8.07	15.21	0.64	<0.0001
All ^{1,3}	7–10	26.65	20.74	7.86	17.14	0.75	<0.0001

Note. ¹N-weighted. ²SDs are pooled. ³Corrected for age differences.

Limitations and future directions

It should be noted that national IQs have been heavily criticised, though when they were recalculated to take these criticisms into account, they correlated with the original IQs at 0.9. Moreover, they strongly correlate, at about 0.8, with national student achievement tests such as PISA (Lynn & Becker, 2019). They have been particularly strongly criticised in a Sudanese context due to the relative poverty of Sudan. Subjects are less likely to be familiar with geometric shapes than Westerners, for example (Dutton et al., 2018). For these reasons, many assessment tests of this kind are questionable as cross-cultural instruments (Greenfield, 1997). Future research should seek to replicate this study's findings among different Coptic and general Sudanese student populations.

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Availability of Data and Materials: Due to the nature of this research, participants of this study did not agree for their data to be shared publicly, so supporting data is not available.

Ethics Approval: Ethical approval for the study was obtained from the Mashreq University Research Board Committee on Research Ethics, ensuring that all procedures complied with established ethical standards for research involving human participants. Prior to data collection, informed consent was obtained from the parents of all participating children, who were provided with detailed information about the purpose, procedures, potential risks, and benefits of the study.

Conflicts of Interest: The authors declare no conflicts of interest to report regarding the present study.

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