A standardisation of the Standard Progressive Matrices for adults in Libya

Alsedig Abdalgadr Al-Shahomee [*]

Department of Psychology and Special Education, University of Omar Al-Mukhtar, P.O. BOX 919, El-Beida, Libya

A R T I C L E   I N F O

A B S T R A C T

Twenty-one studies of intelligence in North Africa are summarised showing a median British IQ of 84. Data are reported for a standardisation of the Standard Progressive Matrices on a sample of 600 adults in Libya giving a median British IQ of 81. Results are reported for the urban–rural, gender and education levels in means and variance. Confirmatory factor analysis provided evidence of four first-order factors and one general factor accounting for 58.7% of the reliable variance.

© 2012 Elsevier Ltd. All rights reserved.

1. Introduction

Lynn (2006) and Lynn and Vanhanen (2006) have summarised the results of intelligence tests worldwide and estimated the mean IQ in North Africa at approximately 81, in relation to a British IQ of 100 (SD = 15). Subsequently, a number of further studies have been published. This paper begins with a summary of all the studies and presents new data for a standardisation of the Standard Progressive Matrices for adults in Libya.

The first study of intelligence in North Africa was published in the 1960s by Badri (1965a, 1965b) who administered the Draw-a-Man test to a sample of 293 nine year olds in Sudan. In the subsequent years a further 20 studies have been published and data are now available for all the North African countries except for Algeria. The results of these studies are summarised in Table 1. The IQs in these studies are expressed in relation to a British IQ of 100 (SD-15). It will be seen that they lie in the range between 75 (Ahmed, 1989) and 86 (Badri, 1965a; Lynn, Abdalla, & Al-Shahomee, 2008). Considering that these studies have been conducted over more than 40 years and have used six different tests, the results are remarkably consistent. The median IQ of the studies is 84. These IQs have been validated by Lynn and Mikk (2009) who have reported that 15 year olds in Tunisia tested on mathematical ability have a "Mathematical Quotient" of 81 in relation to the British Quotient of 100 (SD-15).

2. Method

2.1. Sample

The Standard Progressive Matrices test (SPM, Raven, Raven, & Court, 2000) was standardised in Libya during November and December 2010 on a representative sample of 600 adults (300 men and 300 women) aged between 23 and 37 years. All of them were Libyan citizens and employed in the government service. The sampling procedure comprised a multi-stage random sampling method (cluster sampling), to obtain an urban sample of 300 from two cities (Al-Beida and Shahat) and a rural sample of 300 from nine villages from the existing 30. Villages were divided depending on location in coastal, mountain or desert villages (three villages from each category). Al-Beida is the main city in the eastern region of Libya. During the monarchy (1951–1969), Al-Beida was the second capital of Libya. It is considered as an educational, trade and health centre for neighbouring settlements and small cities (Kezeiri, 1995). Shahat city, previously known as Cyrene, was established by the Greeks in 631 B.C. It was the first city to be formed in Libya. The location of the city played a significant role in its growth and prosperity as did the availability of water from the Apollo springs and the abundance of rain. Its proximity to the port of Apollonia provided easy contact with all Mediterranean ports. The city is considered as an important political, religious, agricultural and industrial centre (Kezeiri, 1995).

In cluster sampling, intact groups, not individuals are randomly selected. All members of selected groups had similar characteristics. Cluster sampling is more convenient when the population is large or spread out over a wide geographic area. Cluster sampling can be carried out in stages, involving selection of clusters within clusters. This process is called multistage sampling (Gay, Geoffrey, & Peter, 2006). When Raven (1981) standardised the Irish and British Standard Progressive Matrices test, he used this sampling method, which was defined by Denscombe (1998) as a sampling method that involves selecting samples from samples, each sample being drawn from within the previously selected sample. The procedure for conducting the multi-stage stratified sampling method involved sampling from one higher level unit called the preparatory sampling unit (Eastern Libyan Region) and then sampling of

* Tel.: +218917194490.
   E-mail address: Shahomee@yahoo.com

Table 1
Studies of the IQ in North Africa.

Country	Age	N	Test	IQ	Reference
Egypt	6–10	206	DAM	84	Dennis (1957)
Egypt	12–15	111	CCF	81	Sadek (1972)
Egypt	6–12	129	SPM	83	Abdel-Khalek (1988)
Egypt	8–15	–	MSR	84	Rindermann (2007)
Libya	6–11	600	CPM	86	Lynn et al. (2008)
Libya	8–17	1600	SPM	78	Al-Shahomee and Lynn (2010)
Libya	6–16	870	WISC-R	85	Lynn, El-Ghmary Abdalla, and Al-Shahomee (2009)
Morocco	8–15	–	MSR	79	Rindermann (2007)
Morocco	Adults	202	SPM	84	Sellami, Infanzón, Lanzón, Díaz, and Lynn (2010)
Sudan	9	293	DAM	86	Badri (1965a, 1965b)
Sudan	8–12	148	SPM	75	Ahmed (1989)
Sudan	Adults	77	ETMT	76	Stanczak, Stanczak, and Awadalla (2001)
Sudan	6–9	1683	CPM	81	Khatib, Mutwakkil, and Hussain (2006)
Sudan	4–10	1345	DAM	83	Khaleefa, Abdelwahid, Abdulradi, and Lynn (2008)
Sudan	9–25	6202	SPM	79	Khaleefa, Khatib, Mutwakkil, and Lynn (2008)
Sudan	7–11	3185	SPM	79	Irwing, Hamza, Khaleefa, and Lynn (2008)
Sudan	50	801	WAIS-R	86	Khaleefa, Sulman, and Lynn (2009)
Sudan	50	801	WAIS-R	84	Khaleefa et al. (2009)
Tunisia	20	509	SPM	84	Abdel-Khalek and Raven (2006)
Tunisia	8–15	–	MSR	84	Rindermann (2007)
North Africa	Adults	90	SPM	84	Raveau, Elster, and Lecoutre (1976)

Note: full names of tests abbreviated in the table: DAM, Draw-a-Man test; CCF, Cattell's Culture Fair Test; CPM, Coloured Progressive Matrices; ETMT, Expanded Trail Making Test; MSR, Math, Science and Reading combined as a measure of IQ by Rindermann (2007); SPM, Standard Progressive Matrices; WAIS-R, Wechsler Adult Intelligence Scale-Revised; WISC-R, Wechsler Intelligence Scale for Children-Revised.

secondary sampling units from and within that higher level unit (cities and villages). This was followed by classifying the cities into two homogenous urban area clusters using the criterion of administrative boundaries as the third sampling level, i.e. main and secondary cities. The researcher selected one city from each category. In addition, villages were classified into three different categories (third clustering sampling level); coastal, desert and mountain villages. Three villages were selected from each category with different weights or ratios as the fourth sampling level.

2.2. Measure

The Standard Progressive Matrices (SPM) test consists of 60 items given in 60 pages, and is divided into five sets lettered A, B, C, D and E. Each set consists of 12 items. Each page of the booklet contains a matrix with one missing part. Participants are asked to select the missing part from six or eight options given below each matrix, and to indicate its number on a separate answer sheet. Items are scored either right or wrong. A participant's score is the number of right answers. The maximum possible score is 60. The Raven's Standard Progressive Matrices (SPM) test was constructed to measure the educative component of *g* as defined in Spearman's theory of cognitive ability (Raven & Court, 1989). Kaplan and Saccuzzo (2008) and Jensen (1998) consider that research shows that the Raven Standard Progressive Matrices is a measure of fluid reasoning. The Progressive Matrices (Standard, Coloured, and Advanced) are the best known and most widely used tests as measures of individual differences in cognitive ability and as culture-reduced tests (DeShon & Weissbein, 1995; Powers, Barkan, & Jones, 1986).

The following modifications were introduced to the SPM test, to make it more suitable for the Libyan sample:

1. Instructions were given in the colloquial Libyan Arabic language.
2. English letters (A, B, C, D and E) in the five sets were changed into Arabic letters.
3. Page order (direction) of the test booklet was changed from left to right, to suit the Arabic way of writing and reading.
4. A new answer sheet was designed with Arabic letters, and right to left direction for answering and writing.

2.3. Strategy of analysis

The analysis was carried out in the following manner:

- *First*: Kolmogorov–Smirnov, Shapiro–Wilk test and normal probability plots were used to determine the normality of the data.
- *Second*: to investigate the effect size of the SPM means by calculation of Cohen's *d*, which is equal to the difference between the means divided by the within group standard deviation (Cohen, 1988).
- *Third*: Two-Way Analysis of Variance was used to compute differences between SPM test means in regard to regions and gender variables or education levels and gender variables or age groups and gender variables.
- *Fourth*: to evaluate the gender differences in variability (variance ratios).
- *Fifth*: reliability of SPM test scores was investigated using Alpha (KR-20) and split-half methods.
- *Sixth*: the construct validity of SPM test scores was investigated using exploratory and confirmatory factor analysis.

3. Results

The data were first examined for normality using the Kolmogorov–Smirnov and Shapiro–Wilk tests. The *P* values were 0.200 and 0.308, respectively. Both values were above 0.05, 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. Descriptive statistics giving the mean scores, standard deviations, median and range obtained by the urban and rural samples are given in Table 2. The urban sample scored significantly higher than the rural sample ($t = 2.265$,

Table 2
Urban-rural differences on the Standard Progressive Matrices in Libya.

Region	(N)	Mean	SD	Median	Range
Urban	300	42.14	9.93	44.00	45
Rural	300	40.14	10.31	40.50	45
Total	600	40.80	10.22	41.50	46