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Normative Data from the Standardisation of *Raven's Standard Progressive Matrices* in Kuwait in an International Context

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Editor's Note: This is a modified version of the original paper. Table 2 has been lengthened. The data is also reported in Abdel-Khalek & Raven (2006) and again in Abdel-Khalek & Raven (2008).

Abstract

A probability sample (N=6,594) of Kuwaiti school students aged 8-15 responded to the Raven Standard Progressive Matrices. The test was administered, untimed, in group sessions. In this paper, the smoothed summary age norms for Kuwait (which will themselves be of interest to many psychologists and others working in Kuwait and neighbouring countries) are first compared with what has become the standard international reference data for such work, namely the 1979 British norms, and thereafter with data collected in a wide range of cultures. It emerges that, at any point in time, the norms are remarkably stable across cultures, but have changed dramatically over time. These findings show that, while as yet unidentified features of the environment have a dramatic effect on scores, aspects of the environment that many people would have expected to have a significant effect (such as differences in calligraphy) are much less important than might have been thought.

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Normative Data from the Standardisation of *Raven's Standard Progressive Matrices* in Kuwait in an International Context

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Raven's Standard Progressive Matrices (SPM) test was constructed to measure the eductive component of ***g*** as defined in Spearman's theory of cognitive ability (Raven, Raven, & Court, 1998, updated 2003, p. G1). Kaplan and Saccuzzo (1997) stated that "research supports the Raven Progressive Matrices (RPM) as a measure of general intelligence, or Spearman's ***g*** factor… In fact, the Raven may be the best single measure of ***g*** available" (p. 359).

In the same vein, Jensen (1998) maintained that "in numerous factor analyses, the Raven tests, when compared with many others, have the highest ***g*** loading and the lowest loadings on any of the group factors. The total variance of Raven scores in fact comprises virtually nothing besides ***g*** and random measurement error" (p. 541). He added that Raven's Progressive Matrices is often used as a "marker" test of Spearman's ***g***. That is, if it is entered into a factor analysis with other tests of unknown factor composition, and if the Matrices has a high loading on the general factor of the matrix of unknown tests, its ***g*** loading serves as a standard by which the ***g*** loadings of the other tests in the battery can be evaluated" (p. 38).

By the same token, Lynn, Allik, Pullman, and Laidra (2004) stated that "the Progressive Matrices is widely regarded as the best test of abstract or non-verbal reasoning ability, and this is itself widely regarded as the essence of "fluid intelligence" and of Spearman's ***g***" (p. 1250). Mackintosh (1996, p. 564) has described it as "the paradigm test of non-verbal, abstract reasoning ability".

This view is not, of course, universally accepted. Indeed, Raven, Raven and Court (1998, 2000) refer to several studies which emphasize a spatial ability loading, and a review of the extensive literature dealing with this topic from the point of view of researchers keen to distinguish "Working Memory" from ***g*** has been provided by Ackerman, Beier, and Boyle (2002).

The Standard Progressive Matrices test enjoys good psychometric characteristics (see: Court & Raven, 1995; Kline, 2000; Murphy & Davidshoffer, 1998). A huge body of published research bears on the validity of this test (Gregory, 1992). Therefore, it has gained widespread acceptance and use in many countries all over the five continents (Irvine & Berry, 1988). No other test has been so extensively used in cross-cultural studies of intelligence. Lynn and Vanhanen (2002) summarized

a plentiful number of studies based on normative data for the test has been collected in 61 countries. For all these reasons, Kaplan and Saccuzzo (1997) concluded that "with its new worldwide norms and updated test manual, the Raven holds promise as one of the major player in the testing field in the 21t century" (p. 361).

The Arab countries are in a great need of standardized intelligence tests with local norms. Indeed, the three series of the Progressive Matrices test, i.e., the Standard, Coloured, and Advanced, are already available in the majority of the Arab countries. The Standard Progressive Matrices test has been administered to different samples in most Arab countries. However, the vast majority of these studies have been either unpublished or published in Arabic.

In 1988, Abdel-Khalek found that the test-retest reliability reached .82 among Egyptian college students. A clear and high-loaded factor was extracted from the five sets of the test. The factor analysis of the total score of the test and four subscales of Thursone's Primary Mental Abilities yielded a general and high loaded factor, on which the Matrices loading was .77, denoting high concurrent validity.

More recently, Abdel-Khalek and Lynn (submitted) examined the sex differences on the test and found a small sex difference of .08 *d* (1.2 IQ points) favouring girls.

Using a Kuwaiti sample of school children (N=968), Abdel-Khalek (submitted) found the test-retest reliability ranged from .69 to .85, while alpha coefficients ranged between .88 to .93 denoting good temporal stability and internal consistency. The loadings of the five sets on the only salient factor ranged from .72 to .89 indicating the good factorial validity of the scale.

The objective of the current investigation was primarily to create Kuwaiti norms for the Standard Progressive Matrices (SPM) test, but these norms are presented here in an international context since the comparative data that have emerged are of considerable importance to cognitive psychology.

Method

Participants

A sample of 6,594 8-15 year olds was recruited. All of them were Kuwaiti citizens and students in the governmental schools in the six districts in Kuwait. In each district one elementary, intermediate and secondary school for both boys and girls were randomly chosen. The selection of school districts used a stratified random sampling procedure. The test was administered to at least 60 students in each age group of boys and the same for girls in each of the six districts of Kuwait.

The Test

The original, 1958, version of the SPM (Raven, J. C., 1958) was employed but adapted in the sense that, in the Arabic test booklets the main matrix and the six or eight alternatives were transposed to read from right to left following the custom of Arabic writing.

Procedure

The SPM was administered to students by a group of competent and trained testers. The testers in the boys' schools were male, and female in girls' schools. In every class, testing was carried out by a tester and an assistant. Testing was carried out in whole classes of 25-30 students. Verbal instructions were given to the students on how to do the test. The test was given without time limits. The testing was carried out in the year 2002. The raw data of the completed answer sheets were scored by computer.

Results and Discussion

Table 1 presents the Kuwaiti norms in the context of the 1979 norms for Great Britain. It will be seen that, in the younger age groups, although the scores obtained by the less able children in Kuwait in 2003 are considerably lower than those achieved in the UK, the general impression is one of remarkable similarity. There is not space here to speculate on the reasons for the decline in the discrepancy among the older age groups, but it would be inappropriate not to draw attention to the ceiling effect which now restricts the variation in scores among the more able from age 12 onwards (and which exacerbates the non-Gaussian within-age distributions which, among other things, make it inappropriate to process the data in terms of means and Standard Deviations, let alone IQ scores).

Table 2 presents the Kuwaiti norms for selected age groups in the context of a wider range of international data.

Table 1

Standard Progressive Matrices

Smoothed 2004 Norms for Kuwait in the Context of 1979 British Standardisation

Age in Years (Months)

	8	8.5	8.5	9	9.5	9.5	10	10.5	10.5	11	11.5	11.5
	7(9)	8(3)	8(0)	8(9)	9(3)	9(0)	9(9)	10(3)	10(0)	10(9)	11(3)	11(0)
	to	to	to	to	to	to	to	to	to	to	To	to
Perc.	8(2)	8(8)	8(11)	9(2)	9(8)	9(11)	10(2)	10(8)	10(11)	11(2)	11(8)	11(11)
	UK	UK	KW	UK	UK	KW	UK	UK	KW	UK	UK	KW
95	40	42	40	44	46	43	48	49	45	50	51	48
90	38	40	37	42	44	41	46	47	43	48	49	46
75	33	36	31	38	41	35	42	43	39	44	45	43
50	25	31	20	33	36	27	38	39	32	40	41	37
25	17	22	14	25	28	18	32	33	23	34	36	29
10	14	17	11	17	19	12	23	27	15	29	31	19
5	12	13	10	14	14	11	17	22	12	24	25	16
n	174	153	811	166	198	788	172	194	807	187	164	833

Age in Years (Months)

	12	12.5	12.5	13	13.5	13.5	14	14.5	14.5	15	15.5	15.5
	11(9)	12(3)	12(0)	12(9)	13(3)	13(0)	13(9)	14(3)	14(0)	14(9)	15(3)	15(0)
	to	to	To	to	to	to	to	to	to	to	to	To
Perc.	12(2)	12(8)	12(11)	13(2)	13(8)	13(11)	14(2)	14(8)	14(11)	15(2)	15(8)	15(11)
	UK	UK	KW	UK	UK	KW	UK	UK	KW	UK	UK	KW
95	52	53	50	54	54	52	55	56	53	57	57	54
90	50	51	47	52	53	50	54	54	52	55	55	52
75	46	47	45	49	49	46	50	50	49	51	51	49
50	41	42	40	43	44	42	45	46	45	47	47	46
25	37	38	33	39	41	36	42	42	40	42	42	41
10	31	32	24	33	35	30	36	36	33	36	36	34
5	26	27	19	28	29	23	30	33	26	33	33	29
n	164	174	827	185	180	890	196	189	815	191	171	758

Table 2

Some Indications of Cross-Cultural Stability

Standard Progressive Matrices

Selection of Cross-Cultural and Birth Cohort Norms

Most European and Similar Norms Omitted

	Age in Years (Months)													
	8.5 8(3) to 8(8)	8.5 8(0) to 8(11)	9 8(9) to 9(2)	9.5 9(3) to 9(8)	9.5 9(0) to 9(11)	10 9(9) to 10(2)	10.5 10(3) to 10(8)	10.5 10(3) to 10(8)	10.5 10(3) to 10(8)	10.5 10(3) to 10(8)	10.5 10(3) To 10(8)	10.5 10(5) to 10(10)	10.5 10(3) to 10(8)	10.5 10(0) to 10(11)	10
Perc	UK	**KW**	UK	UK	**KW**	UK	UK38	UK	TW	PRC	PL	US	**KW**	P&M
95	42	**40**	44	46	**43**	48	48	49	52	50	49	47	**45**	46
90	40	**37**	42	44	**41**	46	45	47	50	49	46	45	**43**	43
75	36	**31**	38	41	**35**	42	39	43	46	42	43	41	**39**	37
50	**31**	**20**	**33**	**36**	**27**	**38**	33	**39**	**41**	**39**	**37**	**36**	**32**	**28**
25	22	**14**	25	28	**18**	32	23	33	35	32	26	28	**23**	17
10	17	**11**	17	19	**12**	23	15	27	27	25	19	21	**15**	12
5	13	**10**	14	14	**11**	17	13	22	23	18	13	17	**12**	11

	11 10(9) To 11(2)	11.5 11(3) to 11(8)	11.5 11(3) to 11(8)	11.5 11(0) to 11(11)	11	12 11(9) to 12(2)	12.5 12(3) to 12(8)	12.5 12(0) to 12(11)	12.5 12(3) to 12(8)	12	13 12(9) to 13(2)	13.5 13(3) to 13(8)	13.5 13(0) to 13(11)	14 13(9) to 14(2)
Perc	UK	UK	QA	**KW**	P&M	UK	UK	**KW**	US	P&M	UK	UK	**KW**	UK
95	50	51	48	**48**	49	52	53	**50**	51	52	54	54	**52**	55
90	49	49	45	**46**	46	50	51	**47**	49	49	52	53	**50**	54
75	44	45	41	**43**	41	46	47	**45**	46	45	49	49	**46**	50
50	**40**	**41**	**38**	**37**	**33**	**41**	**42**	**40**	**40**	**39**	**43**	**44**	**42**	45
25	34	36	31	**29**	22	37	38	**33**	34	30	39	41	**36**	42
10	29	31	25	**19**	14	31	32	**24**	28	18	33	35	**30**	36
5	24	25	19	**16**	12	26	27	**19**	22	14	28	29	**23**	30

	14.5 14(3) to 14(8)	14.5 14(0) to 14(11)	14 13(9) to 14(2)	14 13(0) to 14(11)	14 13(0) to 14(11)	15 14(9) to 15(2)	15.5 15(3) to 15(8)	15.5 15(5) to 15(10)	15.5 15(0) to 15(11)	15.5 15(3) To 15(8)	20 18 to 22	20 18 to 22	25 20 to 29	20 18 to 22
Perc	UK	**KW**	UK38	*AR64*	*AR00*	UK	UK	PL	**KW**	US	UK42	UK92	B	TN
95	56	**53**	53	*49*	*56*	57	57	56	**54**	56	55	59	58	56
90	54	**52**	52	*48*	*55*	55	55	54	**52**	54	54	58	56	53

75	50	**49**	48	*44*	*52*	51	51	51	**49**	51	49	57	53	51
50	**46**	**45**	44	*39*	*48*	**47**	**47**	**47**	**46**	**46**	44	**54**	**49**	**47**
25	42	**40**	38	*35*	*44*	42	42	42	**41**	40	37	49	43	27
10	36	**33**	28	*27*	*39*	36	36	34	**34**	35	28	44	38	27
5	33	**26**	23	*22*	*36*	33	33	26	**29**	29	23	39	34	19

\continued
\Table 2 continued

Notes

AR (Argentina). The data were supplied by Lilia Rossi Case, Rosa Neer, and Susana Lopetegui. The 1964 data were collected by Direccion de Psicologia - Buenos Aires from 880 children studying in La Plata – Buenos Aires. The year 2000 data were collected by Lilia Rossi Case and her colleagues. The sample consisted of 1,740 young people who were studying, or had finished, high school or secondary level, equally distributed between males and females, plus students at public and private schools of La Plata – Buenos Aires, selected according to geographical and socio economic criteria. Full details of the study can be found in Cayssails (2001).

B (Belgium). Data collected between 1984 and 1990 by J.J. Deltour by asking students taking a course in psychometrics each to test 10 adults with equal numbers from each of four educational levels (i.e. not in Such a way as to match the total population proportions from each level). The sample was neither stratified for age nor socio-economic status. See Deltour (1993).

P&M (Pune and Mumbai [Bombay], India). A carefully drawn sample of 5,161 Mumbai (Bombay) and 5,127 Pune young people were tested under the supervision of Professor C. G. Deshpande, by selected personnel from the Department of Applied Psychology, University of Mumbai and the Jnana Prabodhiai Institute of Psychology. The 78 schools involved included Government, Government Aided, and Private Schools teaching in Marathi, English, Hindi, and Gujarathi in the correct proportions. Full details are published by Manasayan (Delhi) as a Supplement to the Indian edition of the SPM Manual.

PL (Poland). Data from the 1989 Polish standardisation. See Jaworowska & Szustrowa (1991).

PRC (People's Republic of China). Data from a 1986 study of 5,108 respondents drawn from all main cities of China. Testing organised by Professor Hou Can Zhang of Beijing Normal University.

QA (Qatar). Data collected by Alanood Mubarak Ahmad AL Thani, Umm Alqura University, Saudi Arabia as part of a Masters degree programme. A random sample of 1,135 children drawn from 7 boys' and 7 girls' public elementary schools in Doha City was tested.

TN (Tunisia). Data collection organised by Riadh Ben Rejeb between 2000 and 2002 following a sampling design intended to yield 5 men and 5 women in each 5-yearly age group between 15 and 60 in each of 6 geographic areas of the country, but which, in fact, yielded a total sample of 509.

TW (Taiwan). Data collection from 2506 young people organised by Emily Miao. See Miao (1993).

UK (United Kingdom of Great Britain and Northern Ireland). Main $8^1/_2$ -15 year olds' data obtained from a nationally representative sample of UK schoolchildren, excluding those attending special schools, tested in 1979 (see Raven, J., 1981). 20 year olds' data derived from the 1992 standardisation of the SPM and APM in Dumfries, Scotland (see Raven, J., Raven, J. C., & Court, J. H., 2000). 1938 and 1942

data put together by J. C. Raven and collaborators following procedures described in Raven, J. (2000).

US (United States of America). National norms compiled by weighting and combining a series of norms for School Districts having known demographic compositions and, as far as possible, derived from representative samples of those districts. See Raven, J. (2000).

Unfortunately, we do not have normative data for all age groups for all the countries whose results are shown in the table. We have therefore, in Table 2, focused on those age groups for which norms for a fairly wide range of countries are available. Thus, at 10 years of age, we have included norms for the UK, USA, People's Republic of China, Pune and Mumbai (India), Qatar, Poland, and Taiwan. At 20 years of age we show the available data for the UK, Tunisia, and Belgium.

We do in fact have relatively complete data for a wide range of European and Europeanised countries such as Germany, France, Spain, Slovakia, Russia, New Zealand, and Australia but we have not included it here because it adds little to the observations that can be made from the data that are included in Table 2.

To facilitate comprehension we have deleted the rows giving the figures for the 10^{th}, 25^{th}, 75^{th} and 90^{th} percentiles.

Two things strike one immediately. The first is the similarity between the normative data collected by different people using different sampling procedures in these different countries. The second is the wide within-age variance in the norms from within each of these countries.

The similarity in the norms across countries having such different calligraphies, such different reading and writing systems, such different values, such different educational systems, such different child rearing practices, such different family sizes, such differential access to television, and at such different stages in economic development strongly suggests that cultural variation in these socio-demographic characteristics has much less impact that is commonly assumed.

Furthermore, the variance *within* countries reconfirms this observation. If these cultural variables *did* have the impact on scores that is often asserted they would surely influence the within-culture variance. Everyone in each of these cultures is exposed to much the same cultural environment, yet it seems that it neither restricts nor enhances the within-cultural variance.

From the data for 11 year olds, it would seem that the norms for the 50th and lower percentiles in India, Kuwait, and Qatar are lagging increasingly behind.

Missing from the table are some data that many people find embarrassing and which lack political correctness. The data in question have to do with Blacks in the USA and South Africa, many Native American groups (with the exception of the Eskimos), and other groups lacking a tradition of literacy.

It is not possible to include these data in a simple table like Table 2 because most of the samples leave much to be desired. Nevertheless such data as exist (see Raven, 2000, Court & Raven, 1995, and as yet unpublished data collected with the *Coloured* Progressive Matrices) reveal huge differences between these groups and the data cited in Tables 1 and 2.

Changes over Time

To contextualise these observations it is, however, important to draw attention to the data in Table 2 documenting change in the norms for the SPM over time in both the UK and Argentina. These data form a subset of a much larger accumulation presented in Raven (2000b) and Flynn (1984, 1987). What we see from these data is that the environment *has* had a dramatic effect on scores – but again without significantly reducing the within-age variance. (The figures in Table 2 do not in reality fully document the strength of this conclusion because the SPM has only 60 items thus denying more able people, especially in the later birth cohorts, an opportunity to reveal their true abilities.)

To avoid creating a misleading impression it is important to draw attention to the fact that similar increases have been documented on a wide range of *verbal* measures of *eductive* (i.e. "meaning making" or "reasoning") ability. They are not limited to pictorial or diagrammatic tests of the kind we are concerned with here.

It follows from these observations that the increase is *not* due to such things as schools attempting to enhance levels of "creativity" by encouraging children to tackle non-verbal puzzles or handle computer games or any of the explanations most widely favoured by psychologists and listed by Thorndike (1975, 1977) as possible explanations of the increase he had documented in the norms on the Stanford-Binet test.

From the point of view of interpreting the data it is, however, perhaps still more important to note that exactly the same increase has occurred in height and life expectancy, and it is worth dwelling on some of the implications of this.

First, no one would conclude from the fact that life expectancy is measured by a Rasch Scale analogous to that used to measure eductive ability via the RPM that the variance must be determined by some single underlying ability analogous to speed of neural processing. Nor would they seek a single factor explanation of the increase over time. Nor would they conclude from the fact that backward projection of the increase to the time of the Greeks that the Greeks must have had impossibly short life expectancies and therefore that the measures must be devoid of meaning.

Nor would they conclude from the fact that there are ethnic and socio-economic differences in life expectancy that both the measures themselves and the differences between groups have no meaning. And nor would they expect that the same factors as are responsible for the within cohort variance are the same as those responsible for the increase over time. Yet all of these claims have been made by Flynn or others in connection with the increase in *Raven Progressive Matrices* (RPM) scores.

Finally, it is worth nothing that the causes of the increase in height and life expectancy and the ethnic and cultural differences associated with them have proved just as difficult to pin down as those on the RPM.

Despite these caveats, it is essential, when seeking to interpret the cultural differences documented in Table 2, to bear in mind that the cross-birth-cohort data show that the environment not only *can*, but *has*, had effects which completely swamp the (relatively small) differences between cultural groups.

Conclusion

Normative data for the Standard Progressive Matrices derived from testing a large representative sample of young people in Kuwait are expected to be of considerable interest to psychologists, teachers, and others working in Kuwait and neighbouring countries. However, when viewed in the context of parallel data from several other countries and cultures, the data acquire a much wider significance in that they reveal remarkable similarity in the norms across cultures at any point in time accompanied by dramatic change over time.

The data clearly show that variation in features of the environment that many people would have expected to markedly influence scores – such as variance in calligraphy, educational systems, and cultural norms – have much less effect than many people would have expected whilst as yet unidentified features of the environment have a much greater effect than many people would have suspected.

In this a context, such cross-cultural differences as remain appear to merit less attention than might otherwise have seemed to have been the case.

And when the cross-birth-cohort data are themselves compared with similar data relating to life expectancy, the logic of many arguments put forward by psychologists would seem to be, at best, highly questionable.

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