

WAIS-III IN SOUTH AFRICA (Poster session: PsySSA 2000 congress)

The WAIS-III was administered to a representative sample of English-speaking South Africans with a view to creating norms for South Africa. Permission from the Psychological Corporation was obtained in December 1997 and testing was done from June 1998 to May 2000. Appropriate changes were made to measures in Arithmetic and some additional items were written for Vocabulary, Information and Comprehension.

Sample

For each of the following nine age groups a sample of 100 would be tested: 16-17; 18-19; 20-24; 25-29; 30-34; 35-44; 45-54; 55-64; 65-69. This would give a total sample of 900. According to the 1996 census figures about 50% of the English-speaking population would be people of colour and about 50% would be white. Only 3% would be African. In order not to have a predominantly white sample it was decided that the norm sample would consist of 25% Africans, 25% coloureds, 25% Indians and 25% whites. The equal sample sizes would also facilitate the analysis of items for ethnic bias. The distribution of educational qualifications for the English-speaking population as a whole determined the distribution of educational qualifications for each of the four ethnic samples.

Volunteer registered psychologists who received training assisted with test administration. Eventually a sample of 800 was tested. A fairly close match between the planned samples and the realised samples were obtained. Unfortunately particular difficulties were experienced with finding persons older than 54. It was also difficult to find English-speaking Africans with formal educational qualification lower than Grade 12.

Biased items

The suitability of items was investigated statistically and the comments of 26 experts were invited regarding the suitability of the items in the verbal subtests. Eleven of these gave feedback. Differential item functioning was investigated with the Mantel-Haenszel technique. Ten items were replaced and three more were slightly modified. Only items biased against Africans, coloureds and Indians were replaced.

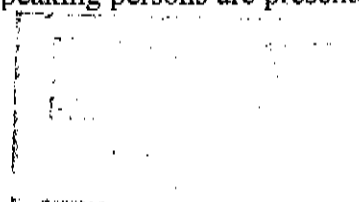
The number of items replaced in Subtests 2, 9 and 11:

Vocabulary	4
Information	4
Comprehension	2

Scaled scores before and after replacement of biased items

The raw scores were transformed to scaled scores according to the US norm tables. This would provide information on the performance of South Africans relative to US citizens. Scaled scores were also calculated after biased items had been replaced.

The means of scaled scores before replacement and after replacement of items regarded as biased against disadvantaged South African English-speaking persons are presented in Table 1. The same information is presented in Figure 1.



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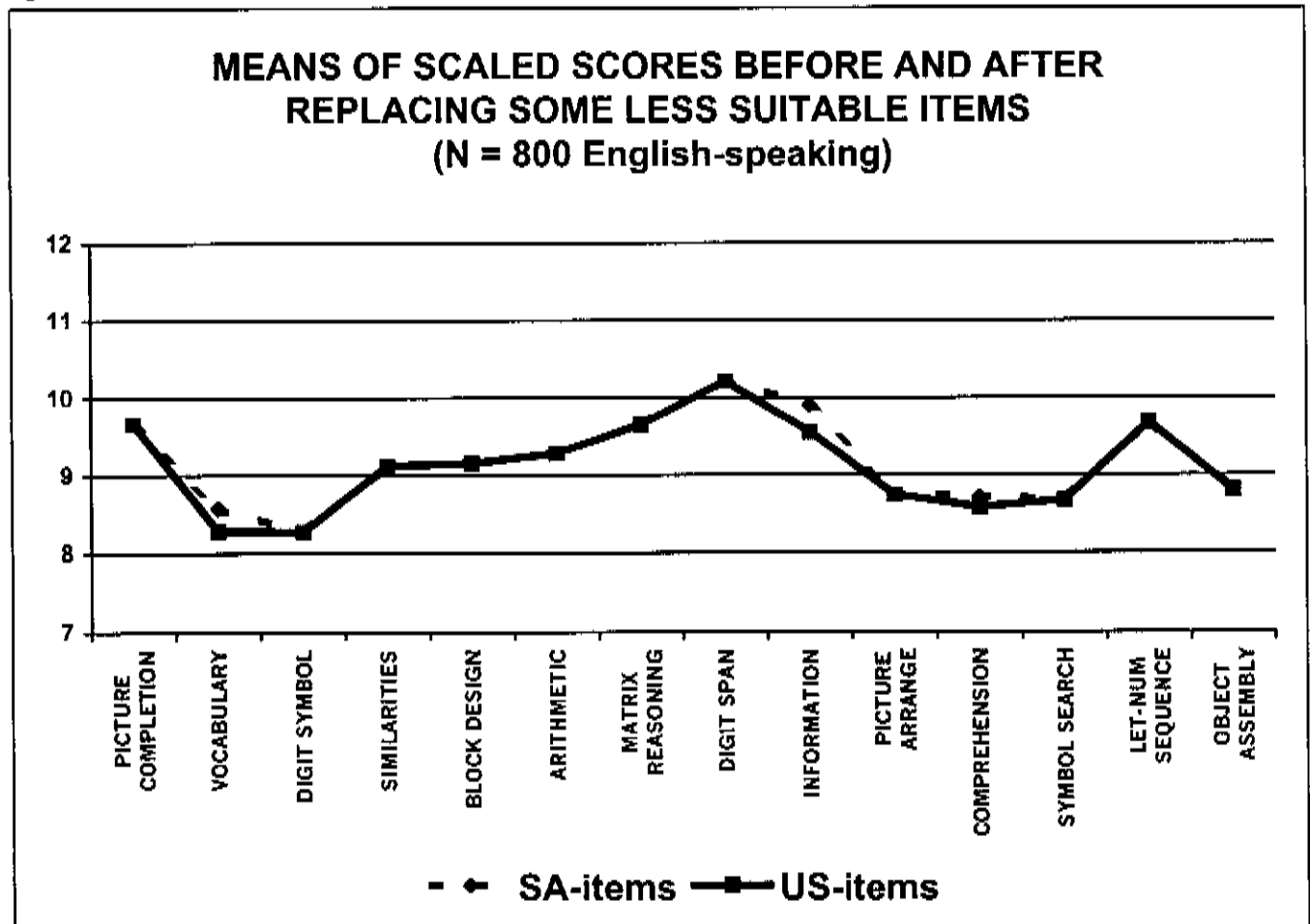
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Table 1

Means before replacement and after replacement of items regarded as biased (N = 800)

ETHNICITY	PICTURE COMPLETION	VOCABULARY	DIGIT SYMBOL	SIMILARITIES	BLOCK DESIGN	ARITHMETIC	MATRIX REASONING	DIGIT SPAN	INFORMATION	PICTURE ARRANGE	COMPREHENSION	SYMBOL SEARCH	LET-NUM SEQUENCE	OBJECT ASSEMBLY
SA-items	9.67	8.57	8.27	9.12	9.15	9.28	9.65	10.21	9.91	8.74	8.71	8.67	9.68	8.80
US-items	9.67	8.28	8.27	9.12	9.15	9.28	9.65	10.21	9.56	8.74	8.57	8.67	9.68	8.80

Figure 1



The changes observed were very small.

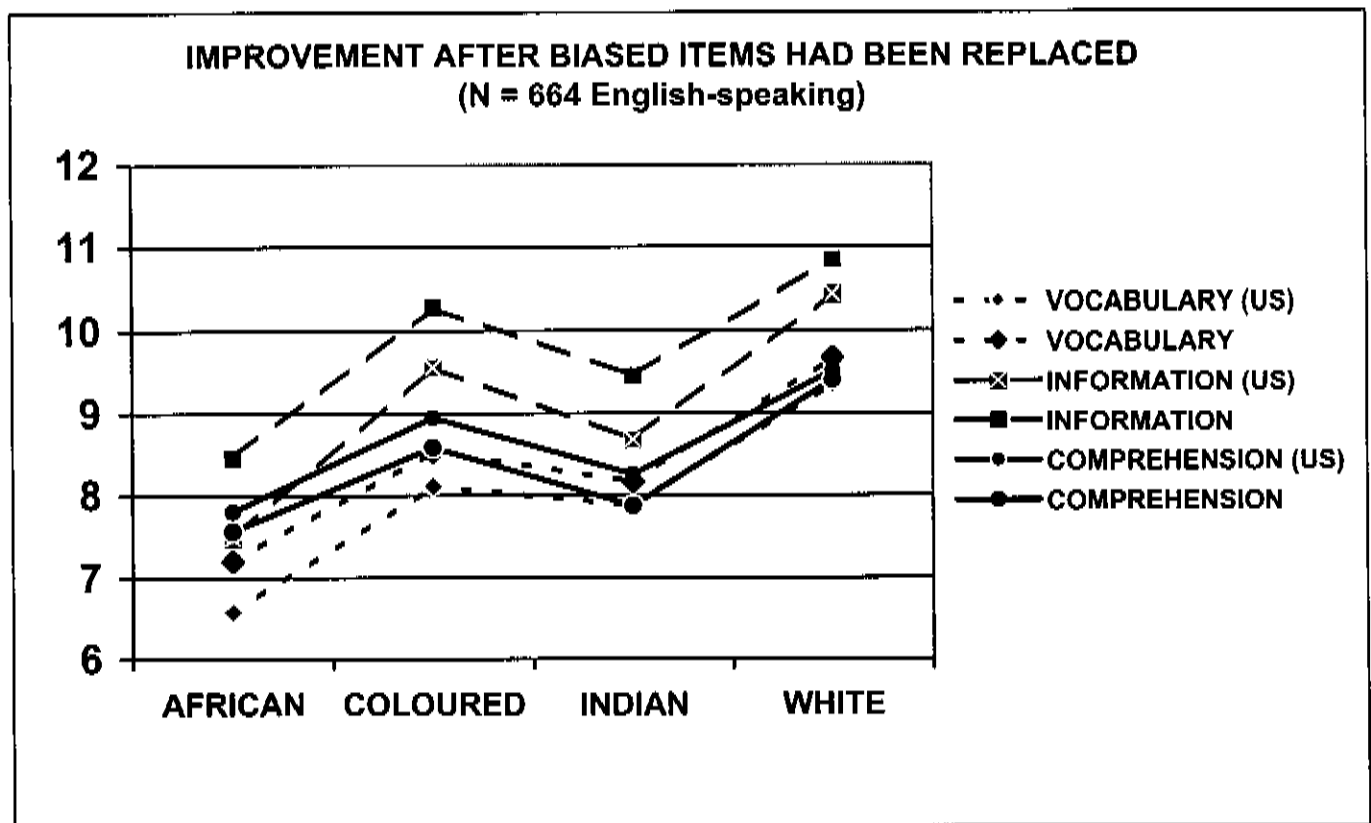
The changes brought about in the performance of the four ethnic groups were also investigated. As the sample did not realise in a balanced way for the ethnic groups at the higher ages, only persons between 16 and 54 were included in the comparison. In Table 2 the means of the three verbal subtests in which items were replaced are given for the US items and after replacement of less suitable items. In Figure 2 it can be seen that replacement of items led to minimal shrinkage of the gap between ethnic groups.

The largest difference to be brought about was for Test 9. This was 0.34 of a standard deviation and this effect size is still rather small, especially if it is borne in mind that all groups improved due to greater relevance of the items.

Table 2
Means for subpopulations on two versions of three verbal tests

ETHNICITY		VOCABU-LARY (US)	VOCABU-LARY	Difference in terms of Std.	INFORMATION (US)	INFORMATION	Difference in terms of Std	COMPREHENS ION (US)	COMPREHENS ION	Difference in terms of Std
AFRICAN	Mean	6.58	7.20	0.22	7.48	8.46	0.34	7.56	7.80	0.08
	N = 153	Std.	2.74	2.78	2.70	3.01		2.85	2.83	
COLOURED	Mean	8.11	8.53	0.19	9.56	10.28	0.25	8.58	8.95	0.14
	N = 180	Std.	2.56	2.49	2.88	2.99		2.66	2.64	
INDIAN	Mean	7.87	8.16	0.12	8.68	9.46	0.26	7.87	8.25	0.14
	N = 171	Std.	2.44	2.35	2.89	3.14		2.65	2.62	
WHITE	Mean	9.35	9.67	0.11	10.43	10.84	0.13	9.40	9.51	0.04
	N = 160	Std.	2.93	2.83	2.86	3.01		3.01	3.01	
Total	Mean	7.99	8.40		9.06	9.79		8.36	8.64	
	N = 664	Std.	2.83	2.74	3.03	3.16		2.87	2.84	

Figure 2



In the rest of the analysis the scores calculated after replacement of items were used.

Means of IQ scores, Index scores and scaled scores.

The means of scaled scores of South Africans are reported in Table 1. In general these scores are considerably lower than 10. South Africans are scoring about a third of a standard deviation below the US population even after some verbal items that could have disadvantaged them had been removed. The educational level of English-speaking South Africans is, however, considerably below that of the US. In

South Africa about 22% of the English-speaking population has at least passed Grade 12. In the USA the corresponding figure is about 50%. This could of course have contributed to the difference, as there is a positive correlation between education and achievement on the WAIS-III.

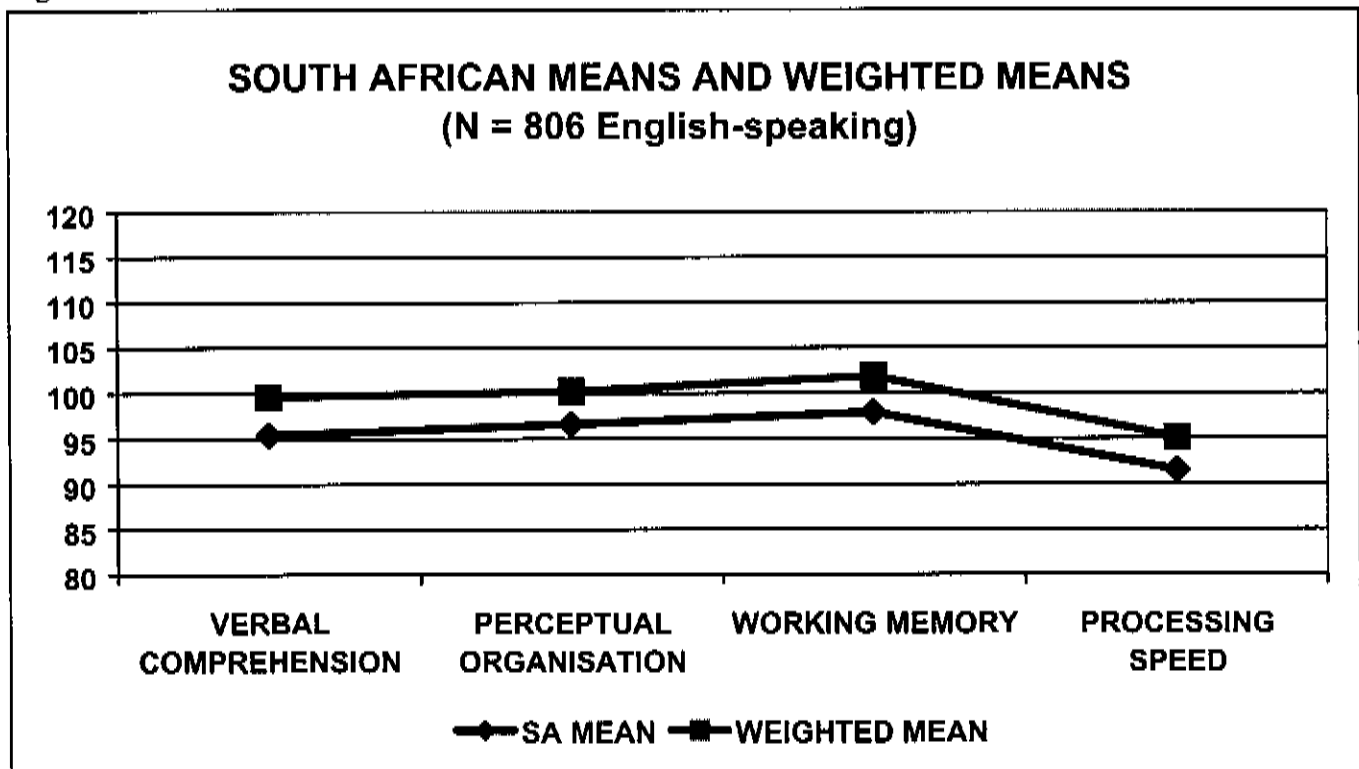
In order to see what the means would have been if the distribution of education had been the same the sample was weighted according to the US distribution of education. The results are shown in Table 3.

Table 3
Means for the norm group without and with weighting (N = 806)

	SA mean	Weighted mean
VERBAL IQ	95.41	99.76
PERFORMANCE IQ	93.87	97.53
FULL SCALE IQ	94.37	98.75
VERBAL COMPREHENSION	95.43	99.62
PERCEPTUAL ORGANISATION	96.60	100.20
WORKING MEMORY	97.88	101.80
PROCESSING SPEED	91.51	95.05
PICTURE COMPLETION	9.66	10.13
VOCABULARY	8.55	9.33
CODING	8.26	8.90
SIMILARITIES	9.11	9.76
BLOCK DESIGN	9.15	9.74
ARITHMETIC	9.26	10.08
MATRIX REASONING	9.66	10.39
DIGIT SPAN	10.20	10.72
INFORMATION	9.89	10.76
PICTURE ARRANGEMENT	8.74	9.13
COMPREHENSION	8.70	9.36
SYMBOL SEARCH	8.66	9.33
LET.NUM SEQUENCE	9.68	10.30
OBJECT ASSEMBLY	8.81	9.14

The means of the South Africans is about a third of a standard deviation below US means. PIQ is slightly lower than VIQ, so knowledge of English does not figure prominently as debilitating factor. South Africans do particularly poorly on Coding, and Symbol Search is also one of the lower scores. After weighting, the means are close to the US mean. The means for VIQ and PIQ are now close to 100. Most scaled scores differ much less than a third of a standard deviation from the US norm. The results for the four index scores are presented graphically in Figure 3.

Figure 3



It appears that, given equal education, mean scores of South Africans on the WAIS-III can be expected to be similar to that of the US population. The educational level in South Africa is, however, much lower. Would it then be appropriate to develop norms for the sample tested in South Africa? It is important to look at the performance of the four ethnic subpopulations and males and females to see if they perform similarly, given the same formal qualifications. The four samples were matched on educational level.

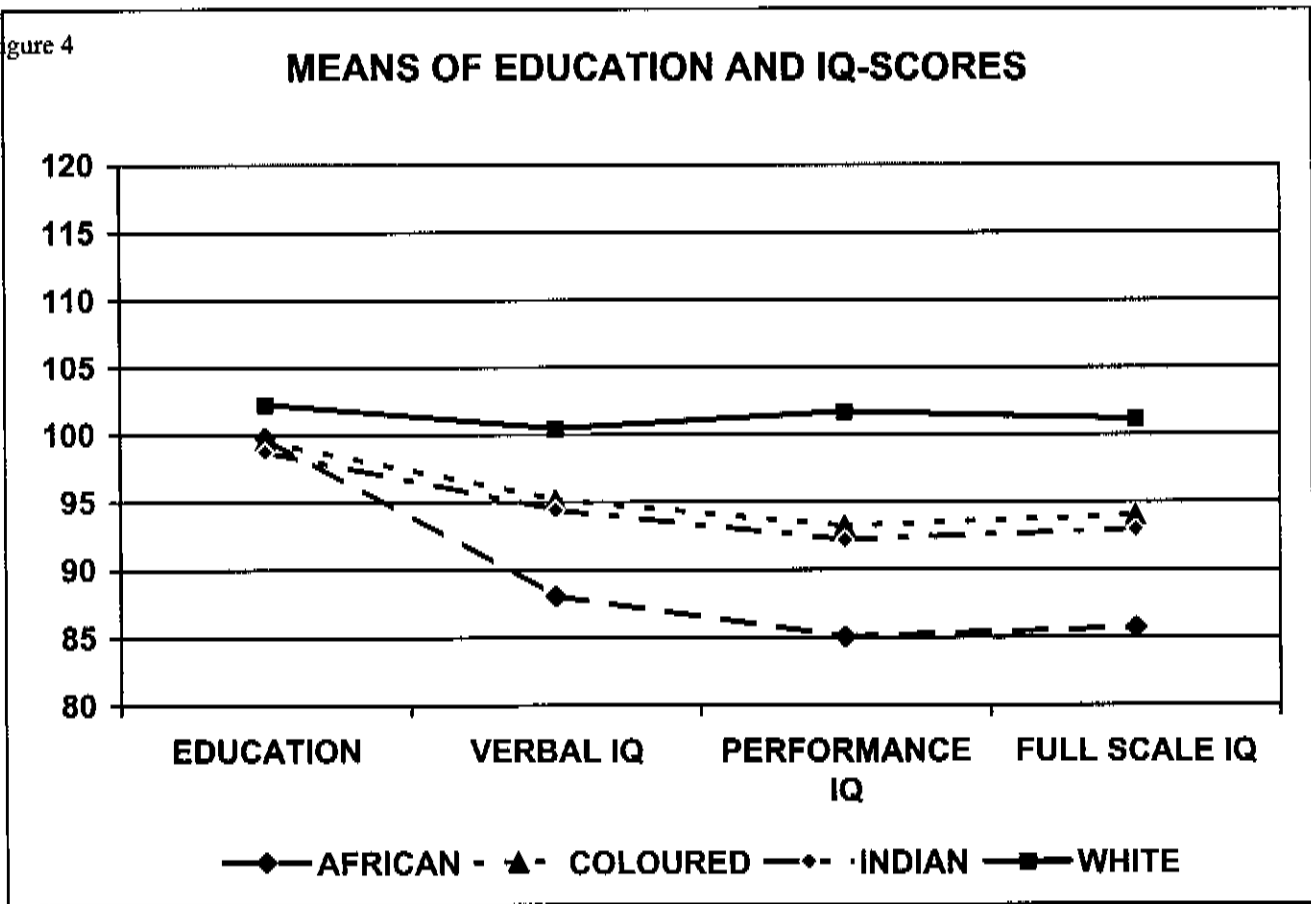
Means of ethnic groups

Sample realisation was poor and skewed for one of the ethnic groups for 55 years and up. Comparisons between ethnic groups will therefore be done only for those aged below 55. The means for the 664 persons in the sample younger than 55 is presented in Table 4 for four ethnic groups. Even though the samples were drawn to be comparable as far as formal education is concerned, they were not perfectly matched. The scale used for educational qualification was transformed to a scale with a mean of 100 and a standard deviation of 15 in order to represent educational level on the same scale as the IQ scores.

Table 4
Means for educational level and IQ scores for ethnic groups

ETHNICITY	N	EDUCATION		VERBAL IQ		PERFORMANCE IQ		FULL SCALE IQ	
		Mean	Std.	Mean	Std.	Mean	Std.	Mean	Std.
AFRICAN	153	99.78	15.94	88.06	12.82	85.04	12.60	85.71	12.91
COLOURED	180	99.53	15.47	95.16	12.31	93.19	11.98	93.97	12.02
INDIAN	171	98.74	15.25	94.40	13.02	92.17	13.95	92.95	13.59
WHITE	160	102.26	13.78	100.46	14.90	101.69	13.57	101.11	14.27
Total	664	100.04	15.16	94.60	13.91	93.10	14.22	93.52	14.19

Figure 4



For educational level the Duncan multiple range test indicated no significant differences. The difference between the highest (white) and lowest (Indian) mean is 0.24 of a standard deviation. For practical purposes the distribution of educational qualification for these groups is the same.

Table 5
Means of index scores for ethnic groups

ETHNICITY	VERBAL COMPREHENSION	PERCEPTUAL ORGANISATION	WORKING MEMORY	PROCESSING SPEED
AFRICAN	88.56	88.07	90.21	84.76
COLOURED	96.00	95.47	96.78	91.62
INDIAN	92.77	94.94	99.36	90.68
WHITE	100.73	104.97	102.16	96.38
Total	94.59	95.92	97.23	90.94

Figure 5

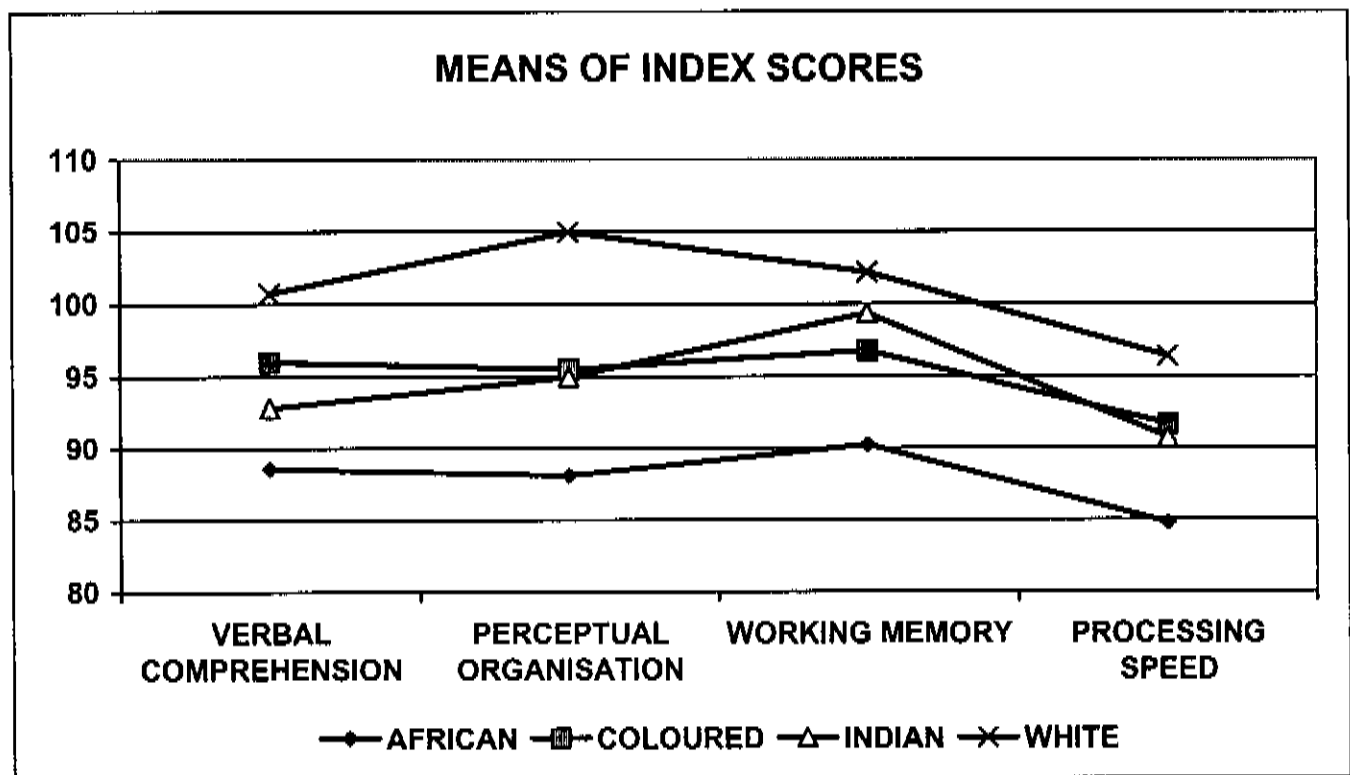
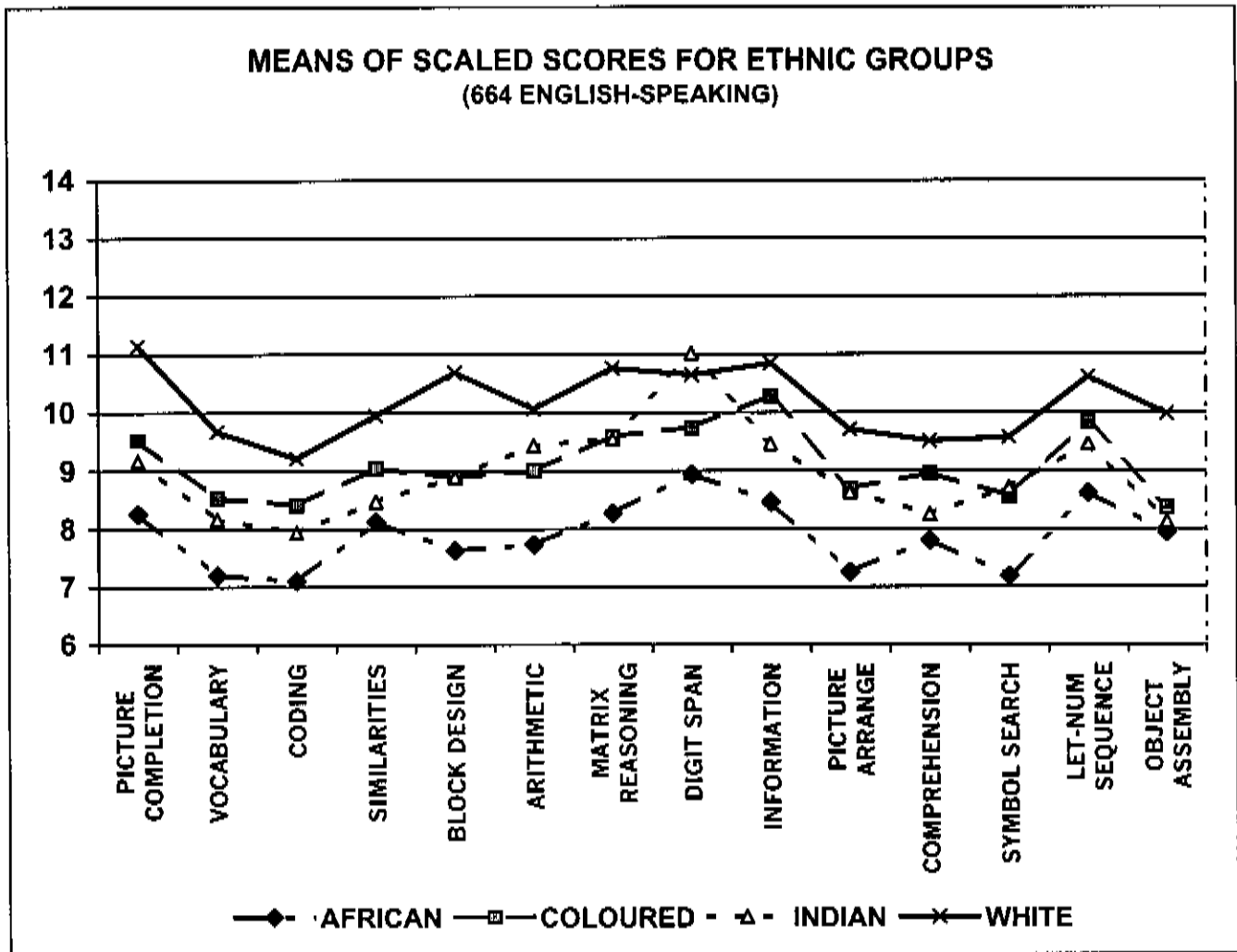


Table 6
Mean scaled scores for ethnic groups

ETHNICITY	PICTURE COMPLETION	VOCABULARY	DIGIT SYMBOL	SIMILARITIES	BLOCK DESIGN	ARITHMETIC	MATRIX REASONING	DIGIT SPAN	INFORMATION	PICTURE ARRANGE	COMPREHENSION	SYMBOL SEARCH	LET-NUM SEQUENCE	OBJECT ASSEMBLY
AFRICAN	8.26	7.20	7.10	8.12	7.63	7.73	8.27	8.94	8.46	7.25	7.80	7.18	8.61	7.93
COLOURED	9.53	8.53	8.41	9.04	8.89	9.00	9.59	9.74	10.28	8.69	8.95	8.56	9.83	8.37
INDIAN	9.17	8.16	7.94	8.47	8.89	9.43	9.54	11.01	9.46	8.63	8.25	8.71	9.45	8.13
WHITE	11.14	9.67	9.21	9.95	10.68	10.06	10.76	10.64	10.84	9.71	9.51	9.57	10.60	9.97
Total	9.53	8.40	8.18	8.90	9.03	9.07	9.56	10.10	9.79	8.59	8.64	8.52	9.64	8.59

Figure 6



The distances between the means remain more or less the same for all the scores. A notable exception is digit span where Indians score on a par with whites. The mean for Indians and coloureds is about a third of a standard deviation below that for whites and the mean for Africans is about a third of a standard deviation further down.

The Duncan multiple range test indicated no significant differences between Indians and coloureds in VIQ and PIQ, so these groups will be collapsed for calculating norms.

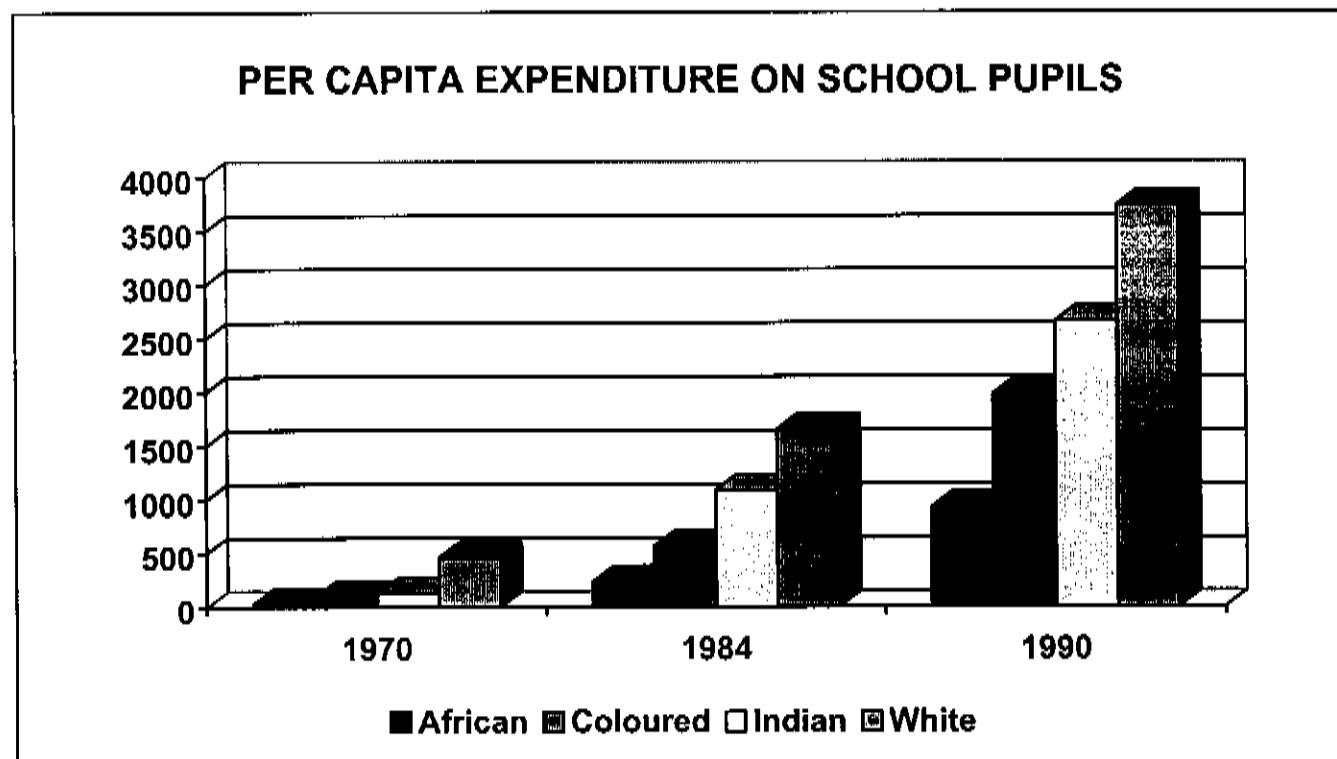
Possible explanation for differences

It seems that differences between ethnic groups are not simply a language matter. Differences are as large for verbal subtests as for performance subtests. Neither is it a phenomenon limited to speeded tests. The difference for Matrix Reasoning, which has no time limit, is as large as the difference for Symbol Search, which is a speed test. We observe a pervasive difference over a wide variety of cognitive tasks. A possible explanation may be looked for in the quality of education that had been provided to these ethnic groups over the past half a century. The per capita state expenditure on the education of children from these ethnic groups in various years is presented in Table 7 and Figure 7.

Table 7.
PER CAPITA EXPENDITURE ON LEARNERS IN SOUTH AFRICA IN RAND

Year	African	Coloured	Indian	White
1970	25	94	124	461
1984	234	569	1088	1654
1990	930	1983	2659	3739

Figure 7



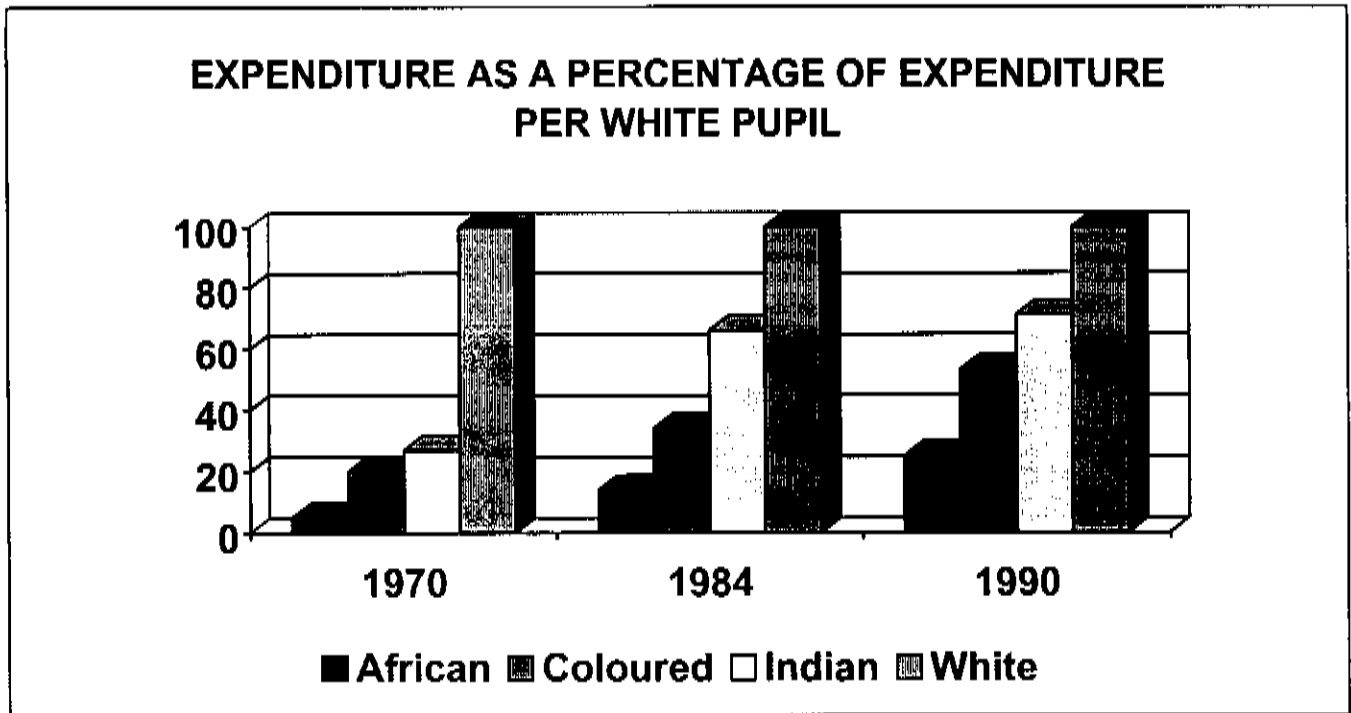
From: Race Relations Survey 1991/1992 South African Institute of Race Relations Johannesburg (p 195)

Table 8
PER CAPITA EXPENDITURE ON LEARNERS IN SOUTH AFRICA AS A PERCENTAGE OF WHITE EXPENDITURE (%)

Year	African	Coloured	Indian	White
1970	5	20	27	100
1984	14	34	66	100
1990	25	53	71	100

Figure 8

Per capita expenditure as a percentage of expenditure on white pupils



About 5% to 25% of the amount spent on the education of a white child was spent on the education of an African child. For coloureds the percentage was about 40% and for Indians it was about 60%. It is possible to see the general deficit in performance on the WAIS as a reflection of poor quality education. Africans, coloureds and Indians may not have benefitted as much from the education they received.

Means of gender groups

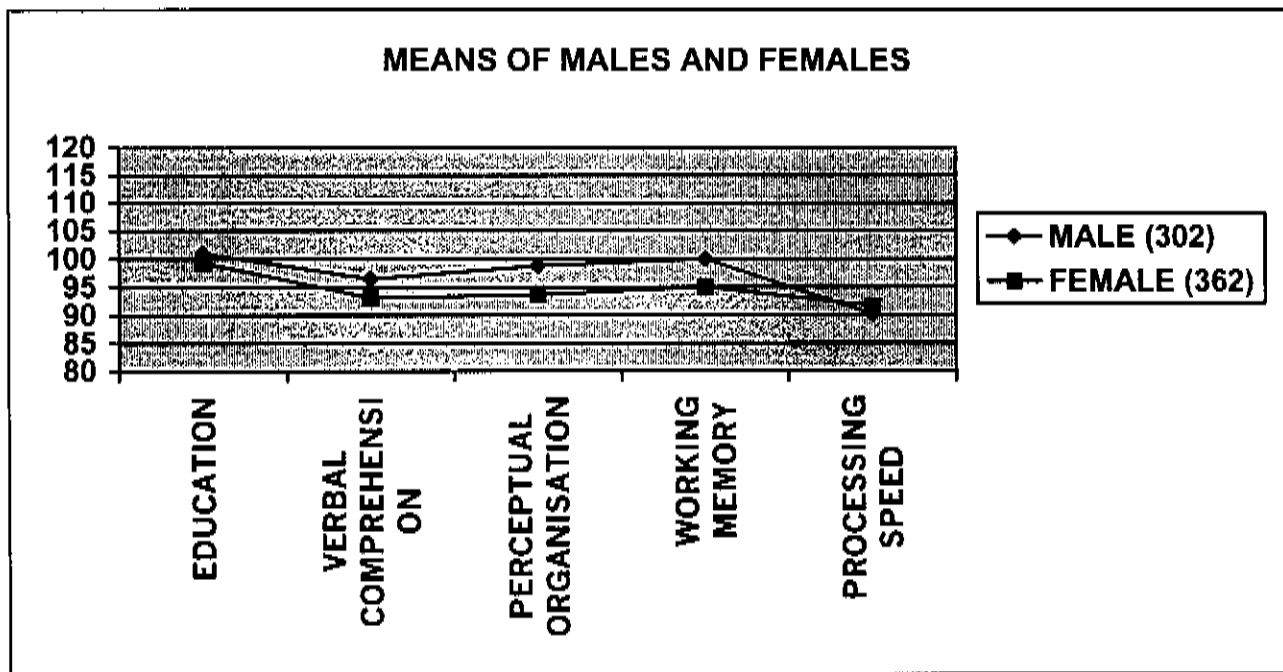
The means for males and females for persons below age 55 is given in Table 11.

Table 9

Means of education and index scores for gender groups

GENDER	EDUCATION	VERBAL COMPREHENSION	PERCEPTUAL ORGANISATION	WORKING MEMORY	PROCESSING SPEED
MALE	100.96	96.40	98.72	99.94	90.14
FEMALE	99.28	93.08	93.59	94.96	91.62

Figure 9



Males scored significantly better than females on Perceptual Organisation and for Working Memory. Females scored numerically higher on Processing Speed, but differences for Processing Speed and Education were not significant.

Norms

It has been suggested by one of the members of the advisory committee that it will be unethical to provide one set of norms for these four ethnic groups. There are vast differences between them regarding educational experiences and making deductions about intellectual ability without taking quality of educational experience into consideration will be irresponsible.

It could be suggested that separate norms should be provided for each of the ethnic groups. We could then have three or four sets of South African norms. Unfortunately the sample size per ethnic group is so small that norms calculated on these small samples are bound to be rather inaccurate for indicating positions far away from the median. Having various WAIS IQ scores in the same country for people speaking the same language would be a first for the Wechsler. It is felt by researchers at the Psychological Corporation that this could be seen as condoning the apartheid system. Yet they do agree that separate norms for groups that have had different learning opportunities is desirable.

It has been suggested by them that T-scores be given for groups that can be clearly distinguished as far as educational opportunity is concerned. It is therefore proposed that T-scores be provided for three groups: Africans, coloureds and Indians combined, and whites. For each of these groups the mean scaled score according to the US norm will also be provided to serve as a point of reference for the test user.

In practice US norm tables will be used as a start. Then the appropriate South African norm tables will be used to determine the T-scores for VIQ, PIQ, FSIQ and the four index scores. This will allow the test user to get an idea of the performance of the testee relative to others who probably experienced more or less similar educational opportunities.

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