

PERS 290

THE USE OF PSYCHOLOGICAL TESTS  
FOR THE SELECTION OF COLOURED  
AS MINE WORKERS



Conducted at

BLACK MOUNTAIN MINE

NATIONAL INSTITUTE FOR PERSONNEL RESEARCH  
COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH

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SUMMARY

The NIPR was requested to devise a battery of tests for the selection and classification of Coloureds as mineworkers. Over 100 people were tested on a variety of tests and norms were established on the most appropriate test.

OPSOMMING

Die NIPN is genader om 'n toetsbattery op te stel vir die keuring en klassifikasie van Kleurlinge as mynwerkers. Meer as 'n 100 mense is getoets op die verskillende toetse en norms is bepaal op die mees toepaslike toets.

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1. PURPOSE

In August 1978 the NIPR was requested by Black Mountain Mine (BMM) to devise an appropriate battery of tests for the selection and classification of Coloured Mine workers. The NIPR undertook to test 100 employees to establish which tests were appropriate, and to provide norms.

2. BACKGROUND

BMM intends producing lead, copper and zinc. It is situated at Aggenys in the Northern Cape. There are no other industries in the area. Development of the mine itself was started in 1977 and it is expected to be operational by 1980.

The area has been designated a Coloured Preferential Area and BMM is obliged to employ Coloureds.

The employees are mainly recruited from Pella and Pofadder. They have attended the Roman Catholic mission schools in these areas up to about standard six. Those who seek further schooling have to travel to Springbok, 120 km away.

3. TESTS USED

The choice of tests was based on the following consideration : -

Since the employees would be handling expensive heavy machinery, it had been decided that a certain amount of schooling was necessary. Level of education would be determined partially by availability but a minimum of standard four would be aimed at.

The following tests were chosen for preliminary application.

### 3.1 The Figure Classification Test (FCT)

This is a non-verbal test of concept identification involving such concepts as symmetry, direction of rotation, size etc. It has yielded normal distributions of scores on Coloured urbanized men in the education range std 4 to 7.

### 3.2 The Normal Battery

This is a battery consisting of five tests, viz. Mental Alertness, Reading Comprehension, Vocabulary, Spelling and Computation. It has been found appropriate for Black testees in the education range standard 7 to 10.

### 3.3 The Continuous Symbol Checking Test (CSC)

This was designed to measure pattern of work performance over a period. It was included on an experimental basis in order to obtain validation material.

## 4. SUBJECTS

To establish whether test are of an appropriate difficulty level a sample of at least 120 testees is required. The subjects should be homogeneous in respect of schooling, age, sex and race because these factors influence performance on tests of cognition.

The sample was however fairly heterogeneous. Schooling ranged from nothing to twelve years. Age ranged from 13 to 45 years. Since not enough employees were available for a suitable sample, schoolleavers from Pella and Pofadder were tested as well. The sample was supplemented by a group of BMM employees who were being trained at Libanon Gold Mine. This group was tested on arrival at the latter mine on the Western Witwatersrand.

For the purposes of analysis the subjects were divided into four groups: -

	<u>N</u>
a) BMM employees	39
b) Pella schoolleavers	22
c) Pofadder schoolleavers	34
d) BMM trainees in Johannesburg	18

Age and education are shown in Table I

Group	N	A $\bar{x}$	Sd	N	B $\bar{x}$	Sd	N	C $\bar{x}$	Sd	N	D $\bar{x}$	Sd	N	Total $\bar{x}$	Sd
Age	39	26,3	6,9	22	14,1	1,1	34	16,1	2,7	18	23,6	6,8	113	20,5	7,2
Education	39	Std 6,2	2,2	22	Std 6	0	34	Std 6	0	18	Std 6,8	1,0	113	Std 6,3	1,6

TABLE I : SAMPLE CHARACTERISTICS

Testing was carried out over five days from September 11th to 15th and on the 28th. Groups tested ranged in size from 10 (at BMM) to 22 (at Pella).

## 5. RESULTS

After the first session of testing the Normal Battery was omitted because : -

- i) On two of the subtests, Mental Alertness and Computation, scores were positively skewed i.e. the tests were too difficult for the sample;
- ii) On the three remaining subtests, Reading Comprehension, Vocabulary and Spelling, the scores were negatively skewed i.e. the tests were too easy for the sample. Table II shows the raw scores obtained on the Normal Battery which does not discriminate consistently in this sample.

## Normal Battery

Education Standard	MA (54)	Comprehension (20)	Vocabulary (36)	Spelling (18)	Computation (30)
2	5	5	2	0	0
6	9	16	27	11	7
5	8	5	22	7	5
8	8	7	9	6	0
9	27	19	29	15	8
8	25	18	29	11	8
5	23	15	30	12	8
4	13	4	12	6	0
6	26	19	32	15	7
6	19	15	27	11	9
1	7	13	9	4	0
5	14	14	20	15	12

TABLE II : NORMAL BATTERY : RAW SCORES

- iii) Considerable difficulty was experienced in explaining to the testees how to mark the answer sheets of the Normal Battery. Many testees marked the reusable books in error. This increased the administration time from two and a half hours to over three hours. Together with the other two tests, this would mean that the testees would be occupied for six hours. When one considers that only 10 to 15 people were tested at a time, it is clear that this is an untenable situation, from the point of view of both testers and testees.

The results obtained by the FCT and the CSC were analysed further. Analysis of variance was done across the four groups to determine whether they differed significantly from each other on various factors. The groups were found to differ significantly in terms of age, FCT scores and CSC scores. Schooling could not be taken into account since all the schoolleavers were in Std 6. Table III gives mean age, FCT scores and CSC scores for each of the four groups.

Group	A			B			C			D		
	N	$\bar{x}$	Sd	N	$\bar{x}$	Sd	N	$\bar{x}$	Sd	N	$\bar{x}$	Sd
Age	39	26,3	6,9	22	14,4	1,1	34	16,1	2,7	18	23,6	6,8
FCT	39	19,9	7,7	22	22,5	5,2	34	18,2	4,7	18	23,1	5,2
CSC (Total)	39	552,6	287,9	22	521,3	272,8	34	741,5	152,5	18	776,4	143,8
CSC (No. of errors)	39	22,6	22,7	22	32,6	61,5	34	36,6	22,9	18	29,4	14,8

TABLE III : MEAN AGE, FCT SCORES AND CSC SCORES

Because these groups differed significantly they should not be combined for norm purposes. However, for interim application, a norm table for the FCT was computed. This can be used on a temporary basis until further samples have been tested. (see Appendix A). Lines have been drawn on this table to indicate recommended cut-off points.

The correlation of the FCT scores with schooling for the combined group was 0,43 which is significant at the five per cent level. Schooling also correlated significantly with the total score on the CSC although not to such a great extent, (0,27). Table IV shows the correlations among the variables of age, schooling, FCT scores and CSC scores for the whole group.

	Age	Education	FCT scores	CSC (Total)	CSC (errors)
Age	-				
Education	0,16	-			
FCT scores	-0,16	<u>0,43</u>	-		
CSC (total)	-0,10	<u>0,27</u>	<u>0,41</u>	-	
CSC (errors)	-0,08	-0,10	-0,07	<u>0,24</u>	-

TABLE IV : CORRELATIONS AMONG VARIABLES (COMBINED GROUP)  
(N.B. Figures underlined are significant at the 5% level)

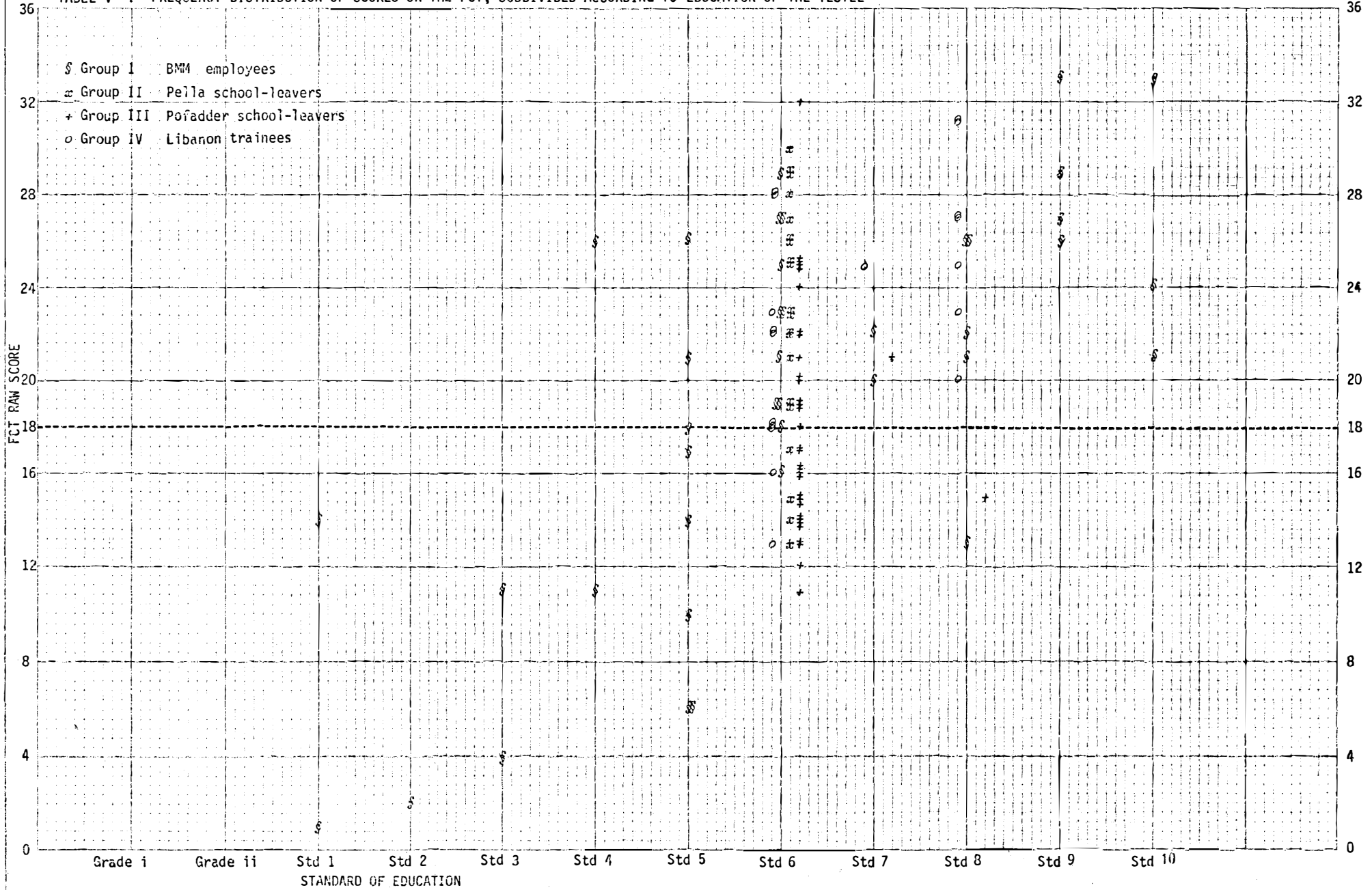
A frequency distribution of the FCT scores, subdivided according to standard of education was drawn up. This gives an indication for whom the test is most appropriate (see Table V). It appears that the test is suitable for those applicants with seven to ten years of schooling. This is very similar to results found with Blacks and Coloureds elsewhere.

The use of the CSC cannot at present be recommended. Although the test does appear to give useful information about the testee there is not yet a standardized administration procedure. An initial procedure has been developed and has since been revised (based on testing at BMM). More important, the interpretation of the test is too subjective and until a more objective method is developed the test cannot be made available. Results need to be compared with an objective criterion to establish the predictive validity of the test.

## 6. RECOMMENDATIONS

- i) Use of the Normal Battery for the selection of workers for BMM is not recommended.
- ii) Use of the Figure Classification Test to measure the intellectual ability of Coloureds with seven to ten years of schooling is recommended. Results are to be interpreted with the aid of the temporary norm table provided (see Appendix A).
- iii) A further 100 Coloured applicants in the appropriate schooling range should be tested and the results forwarded to the NIPR so that a more appropriate norm table can be calculated.
- iv) Train and register another person to use A-tests. This person should be of the same racial groups as the testees. See Appendix B for a list of dates and venues for the training course for the registration of A-test users.
- v) A validation of the Figure Classification Test should be done i.e. test scores should be correlated with results obtained from the training courses.

TABLE V : FREQUENCY DISTRIBUTION OF SCORES ON THE FCT, SUBDIVIDED ACCORDING TO EDUCATION OF THE TESTEE







## APPENDIX A

A 1 2 1

## FIGURE CLASSIFICATION TEST

NORM GROUP - Black Mountain Mine N = 113

Coloured Men in the Northern Cape: 57 Mine Employees  
56 School Children

AGE Range 13 - 45 yrs Mean 20,5 yrs S D 7.2 yrs

SCHOOLING Range Std 1 - 10 Mean Std 6,3 S D 1,6 yrs

SCORE Mean 20,4 S D 6,29

RELIAB. COEF. K -R = 0,8 K -R = 0,88  
  (Corrected)

## FIGURE CLASSIFICATION TEST

NORM GROUP

N = 113

RAW SCORE	UNIT NORMAL SCORE	STANDARD SCORE	PERCENTILE SCORE	STANINE SCORE	STEN SCORE
2	-2.62	23	.44		1
3	-2.37	25	.88		1
4	-2.22	27	1.33		1
5	-2.10	28	1.77		1
6	-1.93	30	2.65	1	1
7	-1.81	31	3.54		2
8	-1.81	32	3.54		2
9	-1.81	32	3.54		2
10	-1.75	32	3.98		2
11	-1.58	33	5.75		2
12	-1.44	35	7.52	2	2
13	-1.27	36	10.17		3
14	-1.02	39	15.49	3	3
15	- .80	41	20.80		4
16	- .65	43	25.67		4
17	- .52	44	30.10		4
18	- .40	45	34.53	4	4
19	- .22	47	41.17		5
20	- .08	48	46.91		5
21	.04	50	51.77	5	5
22	.21	51	58.39		6
23	.37	53	64.59		6
24	.47	54	68.13		6
25	.60	55	72.55	6	6
26	.81	57	79.20		7
27	1.03	59	84.96	7	7
28	1.22	61	88.94		8
29	1.44	63	92.48		8
30	1.66	65	95.14	8	8
31	1.81	67	96.46		9
32	2.01	69	97.79	9	9
33	2.37	72	99.12		10



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**TRAINING COURSES FOR THE REGISTRATION OF A-TEST USERS**

Training courses for the registration of A-Test users will be presented during 1979, as in the past.

These are intensive courses covering a normal working week from Monday to Friday from 08h00 to 16h00, daily.

Fees have had to be increased. The fee includes refreshments and lunches but not accommodation. Parking of private vehicles can be arranged at an additional cost. The fees for courses in Johannesburg from January 1979 will be R285 per candidate and as in the past, 10 percent higher at other centres. The fees include all course material and stationery.

Courses will be presented in:

JOHANNESBURG	DURBAN	CAPE TOWN	PORT ELIZABETH
February 12 - 16	April 23 - 27	March 19 - 23	June 18 - 22
May 14 - 18	June 25 - 29	November 19 - 23	
June 4 - 8	October 22 - 26		
July 9 - 13			
July 30 - 3 August			
September 17 - 21			
December 3 - 7			

Demand for attendance is such that applications must reach the Institute at least a month before the starting date to ensure accommodation. Since the Johannesburg courses must accommodate the rest of the Republic and South West Africa as well as foreign candidates, applicants from other centres where courses are presented will only be considered under exceptional circumstances.

Letters and envelopes should be marked: Training Course for A-Test Users.

Further information can be obtained from Miss M P Smit of the Test Distribution Division, at telephone number (011)39-4451, Extension 43.

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