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OCTOBER 1974

A COMPARISON OF THE INFLUENCE OF INSTRUCTIONAL SET ON TEST RESULTS FOR MENTAL LEVEL AND RACIAL GROUPS,

Charles H. Cory

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20. ABSTRACT (cont'd)

non-Black subgroups. Lack of motivating instructions significantly lowered the test performance of Category IV personnel on the most cognitive experimental tests, but did not affect the performance of IVs, non-IVs, Blacks or non-Blacks on more noncognitive tests.

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FOREWORD

This research was performed under Task Area PF55.521.005.01.08 (The Prediction of Performance). It was carried out in-house to investigate questions that arose during the development of experimental classification tests for Category IVs and Blacks in connection with Work Unit SD.01 (Development of Screening, Selection and Classification Instruments and Procedures for Marginal Personnel). Results of the test development research will be published shortly.

The assistance of the Naval Training Center, San Diego, in conducting the study is gratefully acknowledged. Extensive computer analyses on the project data sets were carried out by Ms. Nancy Neffson.

J. J. CLARKIN Commanding Officer

SUMMARY

Problem

Research conducted at NPRDC has focused on developing tests that would predict the performance potential of Category IV and Black enlisted personnel more accurately than does the operational classification battery. In interpreting the results of this research, the motivational conditions prevailing during administration of both the experimental and the operational batteries must be considered. Previous research results indicate that general orienting statements made before tests are given can affect the level and interrelationships of test results. The present study was designed to identify the effects of different instructional conditions on test performance. Its objectives were; (a) to determine whether different pretest instructions are associated with different levels of test performance of Category IVs, Category I-IIIs, Blacks, and non-Blacks, (b) to determine which types of pretest instructions, if any, serve to maximize total group and/or subgroup test performance, and (c) to estimate the effects of different types of instructions on test performance.

Approach

A battery consisting of five recently developed experimental tests was administered to four different samples of enlisted recruits. The tests varied in the extent to which they required cognitive, perceptual, and psychomotor abilities. Comparisons of subgroup means on the experimental tests were made by analyses of variance and covariance. Results were analyzed for Category IV and non-IV, and Black and non-Black subgroups.

Findings and Conclusions

1. The performance of Category IV personnel on the two most cognitive of the experimental tests was lowered significantly when test administration instructions did not contain motivating statements. No similar effects were found for IVs on the low-cognitive tests or for non-IVs on any of the tests. Differences in pretest instructions did not significantly affect the performance of either the Black or the non-Black subgroup (pages 5-9).

2. More than 16% of the Blacks in the study identified themselves as Caucasian during the testing situation. This suggests that, whenever possible, future research concerned with racial bias should include provisions for independently estimating the accuracy of questionnaire responses (pages 8 and 9).

Recommendations

1. Motivating instructions should be provided before tests are administered to Navy enlisted personnel to ensure that the test performance of Category IVs is consistent with their abilities (pages 5-9).

2. Future research with experimental questionnaires using self-reported biographical data should provide for independent checks of the accuracy of question responses whenever possible. Scales based on self-reported biographical data should not be adopted for operational use until such checks have been made (pages 8 and 9).

TABLE OF CONTENTS

	ige
FOREWORD	V
SUMMARY	vii
BACKGROUND AND PURPOSE	1
PROCEDURES	
Data Collection	2
Samples	2
Dependent Variables and Covariates	2
A	
Experimental tests	2
Biographical variables and operational tests	4
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Analysis	5
RESULTS	
Comparisons of the Means of the Experimental	
Variables	6
	6
Further Comparisons	0
FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS	11
REFERENCES	12
APPENDIX: INSTRUCTIONS READ FOR EACH OF THE SAMPLES	13
DISTRIBUTION LIST	14

LIST OF TABLES

Table		Page
l	Instructional Conditions and Subgroup <u>N</u> s for Four Samples	3
2	Subgroup <u>z</u> Means Computed by Rows for Five Experimental Tests and an Overall Average \ldots	7
3	Means and Standard Deviations for Each Experimental Test Arranged by Instructional Condition and Mental Level/Racial Group	8
4	Means of Category IVs on AFQT and GCT	9
5	Original and Adjusted Means of Category IVs on the Five Experimental Tests	10

A COMPARISON OF THE INFLUENCE OF INSTRUCTIONAL SET ON TEST RESULTS FOR MENTAL LEVEL AND RACIAL GROUPS

BACKGROUND AND PURPOSE

During recent years, the Center has conducted a program concerned with developing and validating tests for evaluating low mental level (Category IV) and/or Black enlisted personnel. It has been felt that the present classification tests, which emphasize academic "trainable" types of abilities rather than practical intelligence, are not appropriate for such personnel. The success of this program will help to ensure that all personnel are used to their full effectiveness.

The motivation of the subjects is an important point to be considered in the administration of tests. For test results to be most valid, subjects must be motivated to do their best. Test performance can also be influenced by other conditions. For example, it has been found that the performance of Blacks on written tests was affected by the race of the examiner (Katz, Roberts, & Robinson, 1965; Kennedy & Vega, 1965; Katz, Henchy, & Allen, 1968). Experimentallyinduced anxiety and terms used to describe a test have also been contributing factors (Katz & Greenbaum, 1963; Katz et al., 1965).

Recruits are presently motivated to do their best on classification tests because they know that their Navy job assignments depend on their test scores. Similar incentives were not available for the experimental tests, but it was felt that performance would be maximized if they were administered early in recruit training, when recruits take and are encouraged to do their best on many tests. However, observations by the testing staff indicated a substantial lack of interest in the experimental tests, which contrasted with the general attitude prevailing during administration of the operational tests. Thus, the question was raised as to whether motivation could be improved by modifying test instructions.

The present study had the following objectives:

1. To determine whether the different conditions prevailing during the administration of tests are associated with different levels of test performance of Category IVs, Category I-IIIs, Blacks, and non-Blacks. 2. To determine which types of instructions, if any, serve to maximize total group and/or subgroup test performance.

3. To estimate the effects of different types of instructions on test performance.

PROCEDURES

Data Collection

The experimental tests used for the study were administered at the Naval Training Center (NTC), San Diego, to men in their second week of recruit training about 1 week after the regular Navy classification tests were given. The administrators were two Caucasian Chief Petty officers. Testing sessions lasted about two hours.

Samples

Four samples, ranging in size from 392 to 518 men (seven to nine companies), were used. Each sample provided 5 days of input into experimental testing. Directly procured Filipino TNs were eliminated from the samples prior to test administration because it was felt that, because of language problems, the test performance of these men would not be comparable to that of other recruits.

The independent variables consisted of four different sets of orienting instructions. Each set was read to a sample before testing was begun. A prime objective of one of the sets was to instill a maximum motivational condition (Implied Threat) that would be equivalent to that existing for the operational tests. Summaries of the instructions and the Ns for the four conditions are shown in Table 1. Copies of the instructions are given in the Appendix.

Dependent Variables and Covariates

Experimental tests. The following five tests served as dependent variables. They were chosen as being representative of several different types of experimental tests under evaluation.

Instructional Conditions and Subgroup Ns for Four Samples

	Abbre-		Ś	Subgroup N	dno	Δ
Sample	viation	Instructional Condition	Non-IV	ΓΛ	BL	Non-BL
1. No instructions	IN	No instructions were given prior to test administration	348	65	4	409
2. Reassurance	REA	Subjects were told the tests were experimental and that no record would be kept of the results	414	57	11	460
3. Exhortation	EX	Subjects were told the tests would be used for future classification of personnel and were urged to do their best	441	77	27	491
4. Implied threat	THR	Subjects were urged to do their best and were told reports of the test results would be forwarded to their company commanders and posted on the command bulletin boards	329	63 16	16	376

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(1) <u>Memory for Numbers Test</u> (MEM) -- a paced test of memory span, administered by tape recording. It is similar to the memory span tests frequently used in IQ tests. The recording presents a series of 4 to 10 digits, a short period of silence, and a request that the subject write the numbers in the correct sequence. The test includes 21 number series, having a total of 146 digits. Score on MEM consists of the number of digits correctly recorded.

(2) <u>Dominoes</u> (DOM)--an 88-item reasoning test involving the determination of similarities and differences among pictorial representations of dominoes.

(3) <u>Word Finding Test</u> (WORD) -- a 60-item speed test involving matching stimulus and response words in different columns of a page.

(4) Listening Skills Test, Revised (LST) -- a 35-item recorded, paced test involving both assimilation and low-level reasoning using simple, aurally-presented data.

(5) <u>Maze Test</u> (MAZ) -- a group-administered speed test, patterned after the Porteus Maze Test. Test subjects are given six maze patterns, each having five entrances and a goal box, and are asked to identify the entrances leading to the goal box.

Scores for the last four tests are totals of the correct answers. All five experimental tests used for the study were developed or adapted by this Center to be especially appropriate for lower mental level personnel.

Biographical variables and operational tests. Scores on the following biographical variables and operational tests were used as covariates:

(6) <u>Socioeconomic Status</u> (SES) -- a variable based on responses to questions concerning home and environmental characteristics, and parents' educational and occupational status.

(7) <u>Rural-urban Origin</u> (RUR)--a binary variable coded 1 if the man's family lived on a farm or in a small town during his teenage years and 0 if otherwise.

(8) Years of Education (YR-ED).

(9) <u>Armed Forces Qualification Test</u> (AFQT) -- a measure of vocabulary, arithmetic reasoning, spatial reasoning, and knowledge of tools and equipment. The test score is expressed as a percentile rank.

(10) <u>General Classification</u> <u>Test</u> (GCT) -- a measure of ability to comprehend and define words and to reason verbally.

(11) Arithmetic Reasoning Test (ARI) -- a measure of quantitative aptitude involving mathematical-reasoning and problem solving.

(12) <u>Mechanical Test</u> (MECH) -- a measure of basic mechanical and electrical knowledge and of comprehension of mechanical principles and relationships.

(13) <u>Clerical Test</u> (CLER) -- a measure of perceptual speed and accuracy that requires checking to determine whether pairs of numbers are the same or different.

Scores on the Navy operational tests (10 to 13 above) are expressed as Navy Standard Scores. These scores have means of about 50 and standard deviations of about 10 for a typical fullrange recruit population.

Analysis

Scores on the experimental tests were merged with the biographical variable and operational test scores to form records for subjects in all the instructional condition samples. This tape was sorted into files of Blacks and non-Blacks, and then into files of IVs and non-IVs. For each of the four files, the four condition means for each of the experimental tests were tested for significant differences in a one-way analysis of variance design. If significant differences were found, the means differing significantly were identified, using Duncan's New Multiple Range Test as adjusted for different Ns. As a check on the equality of abilities within the Black and IV subgroups, analyses of variance and Duncan's tests were computed for the eight biographical and operational test variables. For Category IVs, the group having significant subgroup differences, an analysis of covariance was conducted on the five experimental test scores using AFQT and GCT as covariates.

RESULTS

Comparisons of the Means of the Experimental Variables

Subgroup means for experimental test and instructional conditions are shown in Table 2, together with the results of comparisons using the multiple-range test. For clarity of presentation, the subgroup means were converted to \underline{z} means by subtracting the mean of their row and dividing by the row standard deviation. Thus, the mean score of a row would be approximately 0, and differential effects of the instructional conditions on test performance for a subgroup would be reflected in variations of the means in the rows. Entries in the last section of Table 2 consist of averages of the 5 \underline{z} means for each instructional condition subgroup. Raw score means and standard deviations for the five experimental tests are shown in Table 3.

The differences among the means shown in Table 2 were not statistically significant, and were especially small for non-IVs and non-Blacks. Differences among IV and Black means were larger and appeared to be consistently associated with specific instructional conditions. For instance, the z means of Blacks were lower than those of non-Blacks for all five tests administered under Exhortation conditions (p < .06 by sign test), and were considerably higher than z means of non-Blacks for three of the tests administered under Reassurance instructions. Similarly, the z means of IVs were higher than those of non-IVs for all five tests administered under REA (p < .06 by sign test) and were lower than those of the non-IVs for four of the five tests administered under Implied Threat. These characteristics of the data were worth exploring further because the small Ns for IVs and Blacks substantially reduced for these groups the power of the analyses of variance. Therefore, the possibility of other systematic differences among the subgroups was investigated by computing analyses of variance for the comparison variables.

Further Comparisons

Two of the 16 analyses of variance conducted with the comparison variables were statistically significant. For Blacks, none of the analyses was significant, compared with significant differences in the AFQT and GCT means of IVs. The means of the IV instructional condition subgroups on these variables are shown in Table 4.

		Instr	uctional	Conditiona	
Test	Subgroup	NI	REA	EX	THR
MEM	Non-IV	00	-02	05	-04
	IV	-07	20	-07	-03
	Black	-48	46	-24	21
	Non-Black	-02	01	05	-06
DOM	Non-IV	01	-01	01	-01
	IV	-06	22	00	-15
	Black	-05	-08	-08	21
	Non-Black	-05	04	04	-04
WORD	Non-IV	05	-01	-01	03
	IV	05	03	03	-23
	Black	-20	-13	-13	-06
	Non-Black	04	01	01	-01
LST	Non-IV	06	00	01	-08
	IV	04	25	-01	-20
	Black	27	25	-12	-04
	Non-Black	00	04	03	-09
MAZ	Non-IV	06	-06	-01	02
	IV	21	04	-09	-16
	Black	04	25	-19	15
	Non-Black	06	-04	01	-02
	Non-IV	04	-03	 01	 - 02
Average	IV	03	17	-03	-15
eruge	Black	-08	27	-15	09
	Non-Black	01	00	03	-04

Subgroup z Means Computed by Rows for Five Experimental Tests and an Overall Average

Note.

1. Decimal points are omitted from the z means (Condition mean - Total subgroup mean) (Total subgroup s.d.

2. None of the differences among the means in this table was statistically significant at p < .05.

3. Sample sizes are: NI, 348, 65, 4, 409; REA; 414, 57, 11, 460; EX, 441, 77, 27, 441; THR, 329, 63, 16, 376.

^aAbbreviations: NI--No Instructions. REA--Reassurance. EX--Exhortation. THR--Implied Threat.

		Inst	Instructional Condition				Overall	
Test	Subgroup	NI	REA	EX	THR	Mean	S.D.	
MEM	Non-IV	112.39	111.95	113.17	111.71	112.35	16.29	
	IV	95.50	100.58	95.49	96.18	96.81	18.83	
	Black	96.50	114.64	101.15	109.69	105.74	19.17	
	Non-Black	109.96	110.53	111.24	109.23	110.32	17.40	
DOM	Non-IV	42.26	42.04	42.28	42.05	42.16	8.61	
	IV	29.19	32.07	29.84	28.29	29.84	10.10	
	Black	27.75	27.45	27.44	30.38	28.28	10.12	
	Non-Black	40.31	41.20	41.17	40.44	40.82	9.54	
WORD	Non-IV	33.85	33.12	33.42	33.73	33.51	6.91	
	IV	28.87	29.56	28.76	26.71	28.51	7.88	
	Black	27.00	32.27	27.59	28.12	28.59	7.88	
	Non-Black	33.21	32.62	33.02	32.81	32.92	7.18	
LST	Non-IV	27.73	27.45	27.49	27.10	27.45	4.28	
	IV	19.03	20.44	19.19	18.25	19.22	4.91	
	Black	20.75	20.64	18.44	18.88	19.14	5.92	
	Non-Black	26.51	26.73	26.69	26.09	26.53	5.03	
MAZ	Non-IV	23.37	22.71	22.97	23.12	23.02	5.45	
	IV	19.34	18.21	17.31	16.80	17.90	6.94	
	Black	16.00	17.55	14.26	16.81	15.69	7.51	
	Non-Black	22.89	22.27	22.55	22.38	22.52	5.79	

Means and Standard Deviations for Each Experimental Test Arranged by Instructional Condition and Mental Level/Racial Group

		Instructional	Condition	
Test	NI	REA	EX	THR
AFQT	23.32	21.98	20.35	19.07
GCT	42.90	44.25	40.83	38.59

Means of Category IVs on AFQT and GCT

<u>Note</u>. For AFQT, the NI mean was significantly greater than the THR and EX means (p < .01). For GCT, the REA mean was significantly greater than the NI, EX, and THR means and the NI mean was significantly greater than the THR mean (all differences at p < .01).

Duncan's multiple range tests found the mean of the NI subgroup on AFQT to be significantly higher than the AFQT means of the other subgroups. On GCT, REA had the highest mean of any subgroup and NI the next highest mean. Past research results showed that both AFQT and GCT have substantial correlations with some forms of the experimental tests used in this study (Thomas, 1969). Thus, it was possible that differences on these variables might be influencing the differences observed on the dependent variables. To check this possibility, an analysis of covariance was conducted for IVs using AFQT and GCT as covariates.

Results of the analysis confirmed the covariation of GCT and AFQT with instructional conditions. When this influence was removed from the data (Table 5), the IV means for both MEM and DOM, the high-cognitive tests in the experimental battery, were significantly lower under NI than under any type of orienting instructions. Thus, the motivation and performance of IVs taking high-cognitive tests appears to be improved by motivating instructions.

One-sixth (16.7%) of the men coded Black on the Enlisted Master Tape Record (EMTR) identified themselves as Caucasian on the SES

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			Instructional Condition					
Experimental Test						REA (<i>N</i> =57)	EX (<i>N</i> =77)	THR (<i>N</i> =63)
1.	MEM	Orig.	95.50 89.35	100.58	95.49 97.52	96.18 98.52		
2.	DOM	Adjust. Orig.	29.19	32.07	29.84	28.29		
		Adjust. Orig.	26.26 28.87	30.79 29.56	30.47 28.76	31.42		
3.	WORD	Adjust.	28.75	28.67	28.92	28.09		
4.	LST	Orig. Adjust.	19.03 18.56	20.44 19.51	19.19 19.51	18.29 19.99		
5.	MAZ	Orig. Adjust.	19.34 19.16	18.21 17.45	17.31 17.50	16.80 17.9		

Original and Adjusted Means of Category IVs on the Five Experimental Tests

Note. For both MEM and DOM the adjusted means for NI were lower than those for the three other conditions at p <.05.

questionnaire. Since the EMTR is an official record, it seems reasonable that it is the more accurate of the two sources. Thus, the Blacks answering the questionnaire incorrectly either did not pay sufficient attention to this item or falsified their answer. An error rate of 17% per question would seriously reduce the accuracy of a scale that might be formed from biographical information for use in classification or assignment. Therefore, it would be desirable to see if this rate of errors is (1) atypical, (2) typical only for certain types of questions, (3) typical for the bulk of questions for certain groups having particular education or racial characteristics, or (4) typical of all questions for the generality of enlisted personnel.

FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

1. An important finding of the study is that Category IV personnel performed significantly better on cognitive tests if the motivating conditions were made explicit. However, the test performances of non-IV, Black, and non-Black groups were not significantly affected by increasing motivational conditions.

The expected maximum influence of this effect would be a slight lowering of the validities of high-cognitive tests for Category IVs. No similar effect would be expected for lowcognitive tests. Thus, promising low-cognitive tests from the present studies may safely be used for operational classification decisions. Promising high-cognitive tests found in the ongoing research may be used operationally, provided highly motivating instructions were used during the experimental administration phase of their development. Otherwise, these tests should be used with caution and early follow-up research should be conducted to check their effectiveness.

2. About 17% of the Blacks in the study identified themselves as Whites during the testing situation--a rate of errors which, if typical, would seriously lower the accuracy of biographical information scales. Future research with experimental questionnaires using self-reported biographical information should provide for independent checks of the accuracy of question responses whenever possible. No scale based on self-reported biographical information should be adopted for operational use until the accuracy of the self-report information has been substantiated.

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APPENDIX

INSTRUCTIONS READ FOR EACH OF THE SAMPLES

1. No Instructions:

Monitor says nothing before administration of the tests. At the conclusion, he says, "The tests which you have finished taking are experimental in nature and may be used for future classification and assignment in the Navy. Are there any questions?"

2. Reassurance:

"The tests which you will take today are experimental tests which will be used for research purposes only. The results will not affect your career in the Navy. However, they may be used for future assignment of personnel, so you should do your best. If you do not know the answer to a question, answer using your best guess."

3. Exhortation:

"These are special tests which will be used in the future classification of enlisted personnel. Answer each question to the best of your ability. If you do not know the answer, guess. Often your best hunch will be right."

4. Implied Threat:

"These are special tests for use in the evaluation and assignment of enlisted personnel, so you should do your best on them. If you are not sure of the answer to a question, guess. Often your best hunch will be correct. Results of the tests will be forwarded to your companies and will be posted in about four weeks."

13

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14

