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Department of the Army
THE ADJUTANT GENERAL'S OFFICE
Personnel Research and Procedures Division
PERSONNEL RESEARCH BRANCH

PRB Technical Research Note 20

CONSTRUCTION OF A
SELF-DESCRIPTION BLANK TO SELECT ARMY DRIVERS

October 1953

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FRB TECHNICAL RESEARCH NOTE 20

CONSTRUCTION OF A SELF-DESCRIPTION BLANK TO SELECT ARMY DRIVERS

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October 1953

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BRIEF

This study is part of a larger research program to investigate the psychological factors involved in selection tests of safe drivers for Army motor vehicles. Previous studies have been concerned with both cognitive and non-cognitive factors that may be measured by driver selection tests. Information was available from these previous studies on the psychometric characteristics of items in non-cognitive self-description or biographical information blanks. This information was used in constructing the new operational instrument described in this Research Note--the Army Self-Description Blank (Transport), DA PRT 2612.

The specific information used included:

1. Validities of various types of items (forced choice pairs, yes-no items, etc.) for predicting criterion ratings of driver behavior and checklist results of bad driving habits.
2. Intercorrelations of keys to self-description blanks composed of the various types of items.
3. The validity of a key to a driver's self-description blank composed of items selected on the basis of test constructors' judgments and improved by eliminating all items with high positive item-key correlation.

The new blank is composed of:

1. Twenty, five-choice items on previous driving experience.
2. Twenty, two-choice (or Yes-No) items, eight of which are designed to check maintenance experience and the remaining twelve, experience of the "hot-rod" type. It is expected that the hot-rod items will tend to hold down the scores of those who falsely claim to all kinds of experience and of those whose background actually does include reckless and irresponsible driving behavior.
3. One-hundred-twenty, two-choice personality items designed to tap attitudes, interests, biographical characteristics, and accident proneness.

CONSTRUCTION OF A SELF-DESCRIPTION BLANK TO SELECT ARMY DRIVERS

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CONSTRUCTION OF A SELF-DESCRIPTION BLANK TO SELECT ARMY DRIVERS

I. NATURE OF THE PROBLEM

A. PURPOSE OF THE STUDY

This study was to develop a personality test for selecting efficient drivers for the Army. Intended use of the test with recruits at reception centers required that it be brief enough to be administratively feasible as well as valid enough to make an independent contribution to the prediction of driving efficiency. The Army Self-Description Blank (Transport), DA PRT 2612, resulted from this study. Its construction and the research underlying it are described in this Research Note.

B. BACKGROUND

The construction of this operational test is part of a larger program of research on motor vehicle safety. The communication authorizing this research directed The Adjutant General's Office to "investigate psychological factors involved in safe motor-vehicle operation." In compliance with this directive, there has been research in both cognitive and non-cognitive areas. One of the first steps in the research on non-cognitive factors, was the development of a pool of test items. These items were validated on a sample of Army Drivers. The next step was the selection of items from the pool for inclusion in a test (Driver's Self-Description Blank, Booklet F - C, DA AGO PRT 2457) for cross-validation purposes. The cross-validation was done under contract (1). It was planned to use the data from this cross-validation in constructing the operational self-description blank. For that reason items suggested by several hypotheses and certain methodological considerations pertinent to the problem of constructing such a blank were included in PRT 2457.

It was felt that the information obtained in the previous studies would be of value in selecting and arranging items for the operational test. Unfortunately, some unforeseen delays in data collection and analysis permitted the use of only a portion of these data. This Research Note is limited to a discussion of those research findings actually used in the construction of the operational blank. Those findings which are primarily methodological in nature will be reported as part of another research program devoted chiefly to the improvement of personality measurement techniques and the development of personality theory.

II. METHOD

A. DESIGN OF THE STUDY

This study made use of information from other research to construct the best operational instrument possible on the basis of available evidence. The following data were available:

1. Validities of various item types such as multiple answer, forced-choice pairs, and single stimulus (Yes-No) items in predicting driver effectiveness.
2. Interrelationships among keys composed of items of the types described.
3. Effectiveness of a test constructors' judgment key improved by elimination of all items with high positive item-key correlation (+.20 or above).

B. SAMPLES

Drivers in the Second, Fourth and Fifth Army Areas were used in the contract research previously referred to (1). Testing was done in three different runs. The data obtained from the first run were not relevant to the purpose of the present study. In the second and third runs a total of 773 drivers were tested. This number was reduced markedly by eliminating from the present study all enlisted men (EM) who did not drive enough to be rated as drivers, EM who were not known well enough to be rated by at least four raters, and EM who had not been on their current assignment long enough to provide an adequate sample of driving behavior. The size of sample was still further reduced by eliminating all but white, male, enlisted Army drivers. This screening and the elimination of inadequately marked papers reduced the sample in the second run to 124 and in the third run to 331 cases. Table 1 presents information on these examinees available from the previous contract research (1).

TABLE 1
PERTINENT REFERENCE VARIABLES DESCRIPTIVE OF ENLISTED MEN
IN SECOND AND THIRD TEST RUN

Variable	Run 2		Run 3	
	(N = 124)		(N = 331)	
	M	S.D.	M	S.D.
Years of Education	9.8	1.9	9.9	2.2
Aptitude Area I Score	96.7	17.6	94.8	16.8
Reading and Vocabulary Score			96.5	19.1
Age			22.8	2.8
Months of Service			25.5	19.5
Miles of Driving Per Month			807.1	428.5
Months of Experience Driving Army Vehicles			17.9	19.3

C. VARIABLES

Criterion. The criterion instrument used was, Ratings for Drivers Form X-2 DA PRT 2408. The instrument included ratings of safe driving behavior and a checklist of bad driving habits. The criterion measure was a weighted combination; the ratings were given a weight of two and the checklist a weight of one. Ratings were made by superiors and associates.

Predictor. Of the predictor instruments administered in the previous research, the one of interest in the present study was Driver's Self-Description Blank, Booklet F - C, 1951, DA AGO PRT 2457. This test included a total of 360 items for which several keys were prepared as follows:

Section I included 30 multiple-answer questions, chiefly on vehicle driving experience. A few items tapped other background factors. It was expected that Section I would correlate positively with the criterion. Twenty-nine of these items were included in Key 1.

Section II included 30 Yes-No items designed to measure maintenance and driving experience. Fifteen of these items covered experience, chiefly maintenance. They were expected to correlate positively with the criterion. All 15 items were included in Key 2. The other fifteen items covered experience with vehicles popularly known as "hot-rods". They were expected to correlate negatively or not at all with the criterion but positively with other measures of driving experience. Such items were expected to function as suppressors. All 15 of these items were included in Key 3. They were not keyed in such a way as to subtract from the score; rather, an examinee earned a point if he indicated he had not had the experience described. Therefore, the key was expected to have a positive correlation with the criterion.

Section III included 90 forced choice pairs. These items were paired on the basis of equal p-value, equal item-key correlation (r_{it}), and disparate validities. The items for this part of the test were the best in the available pool on the basis of p-values and validity coefficients. Section III was expected to correlate positively with the criterion. Eighty-nine items were included in Key 4.

Section IV included 210 Yes-No Self-Description items. These items were selected on the basis of high validity, p-value within the range .15 to .85 and low or negative r_{it} . Among them, however, were ten items chosen for their suppressor characteristics (low validity and high r_{it}). Forty two items were included in Key 5 and ten in Key 6 (the suppressor key).

D. ANALYSIS OF THE DATA

1. Validities of Item Types. Validities of the total PRT 2457 and of its parts were determined by the contractor for two administrations (Run Two and Run Three). From Run Two the contractor reported a validity of .14 for the part of

PRT 2457 which contained all of the experience items (Keys 1, 2, and 3) and .14 for the part containing the forced choice and the two-choice personality items (Keys 4, 5, and 6). From Run Three, the contractor reported validities ranging from -.05 to .12 as shown in Table 2.

TABLE 2
VALIDITY OF DRIVER'S SELF-DESCRIPTION BLANK, PRT 2457

(N = 331)

Variable	No. of items	r
Key 1, 5-Choice Experience	29	.09
Key 2, 2-Choice Experience	15	.08
Key 3, 2-Choice "Hot-Rod" Experience	15	.10
Key 4, Forced Choice Pairs	89	-.05
Key 5, 2-Choice Personality	42	.12
Key 6, 2-Choice Suppressor	10	-.04
Sum of Above Keys	200	.10

Although these correlations were all low, PRT 2457 was considered to have promise for two reasons: (1) its low intercorrelations with other tests in the total experimental battery, and (2) it was evident that certain improvements could be made. For example, it was found in giving the test that many items used terms which were not meaningful to the examinee. These terms could be eliminated. Also, at the very outset the length of the test appeared to account for much of the examinees' lack of motivation to complete the task. Two ways of shortening the test without loss of validity were possible. One way was the shortening of the Driving Experience part of the test--a feasible change since a single item (number of years of experience driving a truck) seemed to be accounting for most of the valid variance. Another way was to eliminate the 90 forced choice pairs which had little or no validity. Further, elimination of the forced choice section would permit use of its content in a form more suitable to the driving selection population.

2. Intercorrelations of Item Types. Table 3 shows the intercorrelation of the parts of the test. Inspection of the table suggests that those keys designed to act as suppressors behaved as expected. The "Hot-Rod" key had sufficient correlation with both 5-choice and 2-choice experience keys to be of value as a suppressor on them. The other intercorrelation coefficients were low enough to indicate sufficient independent contribution by each of the subtest keys.

3. Test and Constructors' Judgment Key. To increase the confidence with which item (and key) validities could be accepted, a test constructors' judgment key had been developed. This key was for the Driver's Self-Description Blank, DA AGO PRT 2371, a part of the same item pool from which the items of PRT 2457 were drawn. Five test technicians keyed PRT 2371 according to their judgment to select "good, safe" drivers. Only those items were selected on which there was unanimous agreement. All items having positive item-key correlations of .20 or above were eliminated. This resulted in a key of 43 items, nearly all of which were also in PRT 2457. The test constructors' key, validated (in effect cross-validated) on a sample of drivers from the validation study of PRT 2457, had an r of .16 with the criterion. This information was also used in selecting items for the operational self-description blank.

TABLE 3
INTERCORRELATIONS OF KEYS FOR PRT 2457

(N = 128)

Variable	Intercorrelations				
	1	2	3	4	5
Key 1, 5-Choice Experience					
Key 2, 2-Choice Experience	.57				
Key 3, 2-Choice "Hot-Red" Experience	-.38	-.49			
Key 4, Forced Choice Pairs	.08	.07	-.01		
Key 5, 2-Choice Personality	.26	.11	-.04	.14	
Key 6, 2-Choice Suppressor	--	--	--	--	.39
Total Test Score	.61	.48	-.06	.63	.54

III. CONSTRUCTION OF THE OPERATIONAL BLANK

A. SOURCES OF ITEMS

Nearly all items selected for the operational instrument, Army Self-Description Blank (Transport), DA PRT 2612, had been used in both PRT 2457 and in other instruments validated in the contract research (see Section IB). Unfortunately, the item analysis of PRT 2457 had not been completed at the time the new blank was prepared. The "improvements" had to be made on the basis of key validities, item-analysis data from the previous validation of the item pool, and the

results of such a priori keying experiments as those described for the test constructors' judgment key.

B. THE SELECTION OF ITEMS

Length of Test. To be feasible for use in an operational situation, it was necessary that the instrument be short. It was decided to prepare a test that could be administered in about 45 minutes, including time for directions, passing out materials, and collecting papers.

Format. It was decided to employ five-choice items to measure driving experience, two-choice (Yes-No) items to measure maintenance and "Hot Rod" experience, and two-choice (Yes-No) items to measure attitudes, interests, personality, etc.

The forced choice format, which has been used successfully for leadership prediction, did not appear to work well in the present situation. It is believed this failure was due, in large part, to the low verbal level of the examinees, and to the fact that many of the forced choice alternatives were long statements requiring ability to deal with fairly complex or abstract language and concepts. It is quite possible that different content, or the same content in simpler, shorter statements, might have proved satisfactory. However, since the new instrument is intended for use with recruits, many of whom will have low verbal ability, it was decided to avoid the possibility of difficulty with the forced choice items in the operational situation. Rather than retain the forced choice format, those statements which comprised the forced choice alternatives were separated for use as Yes-No items. The same statements in Yes-No form would be much easier to read and understand. As indicated above, the best items in the original pool had been selected for inclusion in the forced choice section of PRT 2457. These items were therefore regarded as good content for the new instrument.

Driving Experience Items. From the 30 five-choice driving experience items in Section I of PRT 2457, nineteen were selected for the operational instrument. These items were selected on the basis of their individual validities and because the key composed of them had promising cross-validities. All items were carefully examined for overlapping content and clarity of meaning. A practice item was added, making 20 items in Part I.

Maintenance and Hot-Rod Experience Items. Part II of the new blank includes 20 two-choice items, eight of which are designed to measure legitimate maintenance experience and 12 of which measure experience of the "Hot-Rod" type. These items are intermingled to mask the otherwise obvious characteristics of the "Hot-Rod" items. It is expected that the legitimate experience items will correlate with the criterion and that, as heretofore, the "Hot-Rod" items will tend to hold down the scores of both those who falsely claim all kinds of experience and of those whose experience background actually does include a good deal of reckless and irresponsible driving behavior.

Personality Items. One-hundred-twenty 2-choice personality items were selected for Part III of the new instrument. These 120 items were selected on several bases. Some of the items were included because they had been in the test constructors' judgment key. Some were included because they were in line with certain hypotheses which had been checked in the validation of the original pool of items. For example, items believed to tap characteristics associated with accident proneness had been put into a key and had been found to give promising results. Items expressing belief in luck or fate were found to be associated with poor criterion scores. All items were examined for evidences of verbiage, triteness, or other objectionable characteristics observable by inspection. Only those items whose validity indexes were .10 or above were included.

Carelessness Key. If the examinee is careless, if he disregards the items and merely marks the answer sheet mechanically, if he lacks the necessary reading comprehension, if he responds erratically because of emotional disturbance, then his answers cannot be regarded as valid indicators of his experience, attitudes, or personality. A key designed to detect invalid marking, due to any of the above reasons, was constructed and incorporated into the operational instrument. This key consists of six items (in Part III of the new test) having very extreme p values. The rationale, borrowed from the "F" key of the Minnesota Multiphasic Personality Inventory, is that people who understand the items and mark the answer sheet carefully will very seldom answer these items in a deviant or unusual fashion. A score of four or more on this key would indicate that the test paper should be carefully scrutinized for possible sources of invalidity.

C. VALUE OF THE NEW INSTRUMENT

Findings on previous instruments which have become available since the new instrument, PRT 2612, was prepared tend to justify the selection of items. Items used in both the new blank and in PRT 2457 held up well in the cross-validation of the latter. Of those items which had been administered as Yes-No personality items in both the original and the cross-validation studies, 50% had item-validity coefficients of .10 or above. That the attempt to develop a pool of items relatively free from the influence of verbal ability was reasonably successful is shown by a correlation of .07 between the total key for PRT 2457 and Aptitude Area I. Also, none of the parts of PRT 2457 correlated higher than .14 with Reading-Vocabulary Score (the latter used as another measure of verbal ability). Progress reports on the validation now in progress of the Army Self-Description Blank (Transport), DA PRT 2612 are encouraging.

REFERENCES

Reports of the Personnel Research Branch, Personnel Research and Procedures Division, The Adjutant General's Office, Department of the Army.

1. PRS Report 981. Aptitude tests for Army motor vehicle operators. (Contract DA 49-083 OSA 191, Iowa State College). 31 October 1952.

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