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Leonard E. Shupe
Iowa State College

A. R. Lauer
Iowa State College

THE PREDICTION OF DRIVING ABILITY FROM LABORATORY MEASURES AND EXPERIENCE INDICES FROM A SYSTEMATIZED INTERVIEW

LEONARD E. SHUPE AND A. R. LAUER

THE PROBLEM

The U. S. Army is faced with the problem of selecting drivers for immediate and active service in the motorized units. Although the youth of America are mechanically inclined, intimate acquaintance with the operation and care of motor vehicles is not at all universal. Many have driven but slightly, and usually have had experience with passenger type vehicles only.

It is unfortunate that the information and skill about driving and the potential power of motor vehicles is too frequently picked up incidentally. As a result, far too many accidents occur in civilian driving. The age of the average man in the army ranks parallels closely that of the highest accident group in the total population. This seems to be due to two factors: (1) enough experience to give a degree of confidence, but, (2) not enough to inculcate the inherent dangers involved in driving. As a result, much unnecessary loss in man power and materials is occasioned by unscientific selection and training of personnel.

The army faces a double problem. First, there is that of taking a given personnel and getting equipment moved immediately. This will be referred to later as present ability. The second is that of training a given personnel to a high level of efficiency for combat and transport purposes. This is referred to in the article as potential ability. These two may or may not overlap and the purpose of the present study is to determine the extent of certain components of each type of ability and the possibility of selecting personnel from a given set of data obtained from the soldier's record, by interview and from certain specific tests which can be quickly administered. Time will not permit amplification of details on the tests, but it suffices to say that they covered intelligence, knowledge of motor vehicles and principles of safe manipulation, experience, actual manipulation of a command car and certain psycho-physical laboratory tests to ascertain fitness for operation of a motor vehicle.

Method and Procedure

These data were composited into the following scores for purposes of analysis:

Alertness—an abbreviated intelligence test having a reliability of .85.

Compensation—a pencil and paper test of the degree to which a driver tends to offset his weaknesses. The reliability of this test was found to be about .70.

Knowledge—a test of knowledge of driving and efficient motor car operation.

Present ability—a composite score based on experience, actual performance at the wheel and certain characteristics of immediate importance to driving such as visual acuity, distance judgment and strength.

Potential ability—a composite score based on psych-physical tests necessary to the proper control of a motor vehicle.

Results

Coefficients of correlations between the various tests showed a great deal of variation, for example; with actual and potential scores, r equals .437; with knowledge and present ability, or actual scores, r equals .315; when intelligence and potential scores were correlated, r equaled .303; with intelligence and compensation, r equaled -.017; and in the correlation of intelligence with knowledge of driving practices the coefficient was found to be .689.

Table I

Correlations

Variable	1	2	3	4	5
1. Alertness	.....	-.017	.689	.176	.303
2. Compensation	-.017	.....	.053	.059	.271
3. Knowledge	.689	.053	.....	.315	.190
4. Actual	.176	.059	.315	.....	.437
5. Potential	.303	.271	.190	.437	.....

The Pearson product-moment coefficient of correlation was computed by the deviation method.

An examination of the standard errors of these coefficients of correlation, reveals that some of the differences and resemblances may be attributed to errors of sampling. However, in the case of

the correlation between intelligence and knowledge, the result is statistically significant, since the coefficient of .689 has a standard error of only .065. This coefficient is well above three times the standard error. The coefficient of correlation between present and potential ability scores also shows statistical significance.

Table Ia Standard Errors of r

Variables	-	2	3	4	5
1. Alertness	.....	.124	.065	.120	.113
2. Compensation	.124	.....	.123	.124	.115
3. Knowledge	.065	.123	.....	.112	.120
4. Actual	.120	.124	.112	.....	.100
5. Potential	.113	.115	.120	.100	.....

In order to utilize other measures of relationships present among these various tests of driving ability, partial correlations were computed. These calculations show from no relationship between knowledge and potential scores when intelligence is held constant, to the relatively high value of .689 when intelligence and knowledge were correlated with compensation held constant. Other values were found as follows: .409 between actual, or present ability scores, and potential, with intelligence held constant; .436 when present ability and potential scores were correlated with present ability scores held constant; .679 when intelligence and knowledge were correlated with present ability scores held constant; and .674 when intelligence and present ability scores were used with potential scores held constant.

Table II Partial order correlations of the first order
Variables: 1. Alertness; 2. Compensation; 3. Knowledge; 4. Actual; 5. Potential.

$r_{12.3} = -.075$	$r_{23.1} = .090$	$r_{14.2} = .175$
$r_{14.3} = -.061$	$r_{24.1} = .063$	$r_{15.2} = .310$
$r_{15.3} = .242$	$r_{25.1} = .290$	$r_{34.2} = .313$
$r_{24.3} = .044$	$r_{35.1} = -.028$	$r_{35.2} = .183$
$r_{25.3} = .266$	$r_{45.1} = .409$	$r_{45.2} = .436$
$r_{45.3} = .404$	$r_{13.2} = .689$	$r_{12.4} = -.029$

$r_{13.4} = .679$	$r_{13.5} = .674$
$r_{15.4} = .255$	$r_{14.5} = .051$
$r_{23.4} = .036$	$r_{23.5} = .002$
$r_{25.4} = .261$	$r_{24.5} = .068$
$r_{35.4} = .073$	$r_{34.5} = .263$
$r_{12.5} = -.104$	

Partial correlations of the second order produced a value of .434 when present ability and potential scores were used as variables while intelligence and knowledge were held constant. A

value of .409 was obtained when variables, present ability and potential ability were used with intelligence and compensation held constant. Correlation of present ability and potential ability yielded .406 when compensation and knowledge were held constant.

Table IIa Partial order correlations of the second order
Variables: 1. Alertness; 2. Compensation; 3. Knowledge; 4. Actual; 5. Potential

r14.23 = –.061	r34.12 = .267	r45.23 = .406
r23.13 = .049	r45.12 = .409	r15.23 = .252
r35.12 = –.066	r45.13 = .434	r25.13 = .286

Partial correlations of the third order gave the value .441 when present ability and potential ability scores were correlated with intelligence, compensation, and knowledge held constant.

Table IIb Partial order correlations of the third order
Variables: 1. Alertness; 2. Compensation; 3. Knowledge; 4. Actual; 5 Potential.

r41.235 = –.185 r42.135 = –.087 r43.125 = .318 r45.123 = .441

Table III

The coefficient of multiple correlation was found, using it to estimate the success of the actual or present driving ability of a person from the known characteristics of intelligence, knowledge, compensation and potential driving ability. This coefficient was .527.

Table III Multiple correlation
Variables: 1. Alertness; 2. Compensation; 3. Knowledge; 4. Actual; 5. Potential.

R4(1235) .527

Table IV

In order to predict the scores a driver might make on the actual test, a formula was obtained for the prediction, by developing a multiple regression equation. The equation thus developed was Y equals .568X plus 32.3, where Y was the present ability scores and X the potential scores.

A second multiple regression equation gave the formula Y equals .201Z plus .507X plus 2.8, where Y was the present ability score, Z the knowledge score and X the potential score.

Correlations between other tests were computed, but these given here represent the major results of the study.

Table IV. Multiple regression equations to predict actual scores from potential scores.
Variables: Z equals knowledge; X equals potential; Y equals actual, or present ability scores.
Y equals .568X plus 32.3 or Y equals .291Z plus .507X plus 2.8

Conclusions

From zero order and multiple correlation of scores, based on sixty-five cases, the following summary is made, and it seems that the following tentative conclusions may be drawn:

1. The highest correlation obtained was .689 between intelligence and knowledge of motor vehicles. This might be expected both from the experience factor and the power of observation.
2. The correlation between potential and present ability scores was .437, indicating considerable association; but possibly two separate categories of measured traits or characteristics.
3. Intelligence or alertness is a more important factor in selecting *potential ability* groups than in selecting *present ability* groups.
4. Knowledge is much more important as a factor in selecting *present ability* personnel.
5. Compensation is unrelated to intelligence but seems to be an important factor in selecting *potential ability* groups. It has been a neglected factor in all aptitude testing.
6. In general it *seems that quickly administered tests*, when used in conjunction with the experience record, would be quite valuable in selecting personnel both for present as well as *potential ability* to operate a motor vehicle.

Department of Psychology,
Iowa State College,
Ames, Iowa