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APTITUDE AREA SCORES AS PREDICTORS OF TIME SERVED IN ARMY OCCUP--ETC(U)
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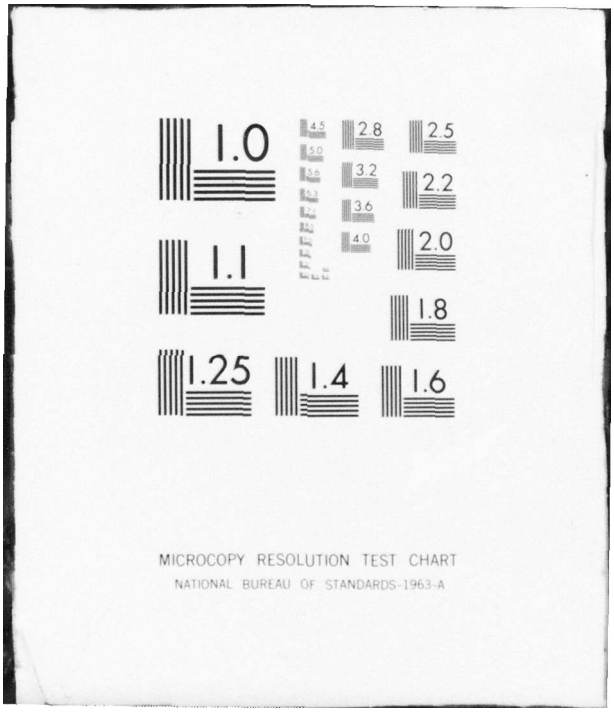
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(6) APTITUDE AREA SCORES AS PREDICTORS OF TIME SERVED IN ARMY OCCUPATIONS,

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(10) Warren R. Graham

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APTITUDE AREA SCORES AS PREDICTORS OF TIME SERVED IN ARMY OCCUPATIONS

PURPOSE

How long an applicant will remain on the job once an organization has expended the funds required to recruit, select, and train him is critical personnel information. Few attempts, if any, have been reported to develop methods of using aptitude tests to predict future time in occupation. The present study seeks a preliminary answer to the question of whether aptitude and information tests can be used successfully for this purpose. The specific objective was to examine the possibility of predicting the percent of service time a soldier may be expected to remain in an Army occupation both after classification and after completion of a training assignment.

Interest in this problem evolves from the fact that the ultimate value of a personnel classification system depends on the degree to which successful employment in an occupation corresponds to initial classification for training. The fact that a man remains in an occupation can be considered to be one criterion of his successful performance of the duties required by the occupation. In civilian life, transfer from one job to another is often considered symptomatic of unacceptable performance. In the Army, however, service in an occupation may be interrupted by reassignment for a variety of reasons, including a requirement for overseas service in another occupation.

If classified and trained personnel do not enter and remain in the occupations into which they were classified, then a loss of the cost of selection, classification, and training results. Time employed in an occupation is related to frequency of reassignment.[1] The personnel classification system may need a means of taking into account the possibility of reassignment and time to be spent in an occupation. This concept of classification technique presupposes the feasibility of predicting which occupational assignments each man eventually will serve in, and how long he will serve in each.

POPULATION AND SAMPLE

The population selected for study was comprised of soldiers classified for training from November 1952 through October 1953, and who served only one extended active duty tour. The sample was limited to men on active duty at least 21 months and not more than 24 months during the period studied.

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[1] Graham, Warrent R. Job Reassignments in a Sample of Enlisted Men, 1952-1955. U.S. APRO Research Memorandum 60-11, April 1961.

These soldiers served during mobilization for the Korean War, and during demobilization after hostilities had ceased. Mobilization efforts produced a peak personnel strength about June 1952. From June 1952 to June 1955, active duty strength dropped rapidly. Thus, much of the population for the study was inducted during mobilization and released from active duty during demobilization. In view of such conditions, reassignments between occupations probably were occurring with near maximum frequency. In fact, reassignment after classification is known to have affected approximately 46 percent of the sample of soldiers in the present study.

The original follow-up sample consisted of 1,070 soldiers classified at eleven reception stations. The Personnel Qualification Records (DA Form 20) were examined, and 710 cases (about 70%) were found suitable for analysis. Cases were rejected for such causes as incomplete records, hospitalization, early discharge, and confinement.

VARIABLES

The tests of the Army Classification Battery are currently organized into eight composites called aptitude areas. Each aptitude area score is the sum of two tests optimally weighted to predict training success in a particular occupational area, such as Motor Maintenance, Electronics, Clerical, etc. To contribute maximally to classification efficiency, each aptitude measure would be associated with one and only one occupation. This occupation would be made up of only those jobs for which success is most accurately predicted by a particular aptitude measure (aptitude area score). The occupations, or Allocation Categories, used in the study are presented below. The corresponding aptitude area composites are indicated by abbreviations (one, Radio Code, was not analyzed in the present study). Scores on the primed (') aptitude areas were not available at the time of testing, and were obtained by multiple regression predictions from component tests of the other four aptitude areas. The procedure is described in Appendix A.

Occupation or Allocation Group	Aptitude Area	Component Tests and Weights
Infantry--Combat	IN'	1/3 Arith. Reasoning + 2/3 Classif. Inventory
Artillery, Armor, Engineer--Combat	AE'	1/2 General Information + 1/2 Automot. Inform.
Electronics (Electronics and Electrical Maintenance)	EL'	1/3 Mech. Aptitude + 2/3 Electronics Infor.
General Maintenance (Precision Maintenance and Military Crafts)	GM	1/3 Pattern Analysis + 2/3 Shop Mechanics
Motor Maintenance	MM	1/3 Mechanical Aptitude + 2/3 Automotive Inform.
Clerical	CL	1/3 Verbal + 2/3 Clerical Speed
General Technical	GT	1/2 Verbal + 1/2 Arithmetic Reasoning

Time-in-occupation was defined as the percentage of time spent in assignment to a given occupation during the first two years of military service. To equate the time served in different occupations, the actual period served in each occupation was transformed into a percentage of total time each man served on duty status. This procedure had the effect of making each time estimate a function of actual working time, since it removed time-in-transit, hospitalization, casual time and other non-working time from consideration. Temporary duty (three months or less) was not considered time-in-occupation.

ANALYSIS

Each aptitude area score was correlated with percent of time spent in each occupation, first in the total sample, and then within occupational samples broken out as follows: The total sample was sorted by initial occupational groups, that is, according to the occupation in which a man received initial training or was otherwise awarded an MOS. From each initial occupational group, those who were later reassigned to a second occupation were sorted out and grouped by second occupation. Within each occupation correlations were computed between each aptitude area score and the criterion (percent of time spent in the occupations). Thus, the possibility was examined that any of the seven aptitude areas was related to time in any of the occupations.

Prediction of tenure was assessed only in terms of the aptitude area scores as operationally weighted to predict training and job success. Ideally, the individual ACB test scores would have been used to predict tenure, and the best weighted composites obtained for multiple prediction. However, it was possible to obtain only data relative to prediction of tenure in an occupation by established aptitude area composites without being able to estimate the upper limit for such predictions.

RESULTS

Coefficients of correlation between aptitude area scores and time-in-occupation are presented in Tables 1 and 2. Table 1 presents the coefficients for the total sample of 710 cases and indicates the prediction that might be possible before personnel are classified. The table is, in effect, an indication of the degree to which individuals were initially assigned in occupations in line with their higher aptitude area scores. A large number of predictions appear that cannot be considered due to sampling variability (coefficient significant at the .05 level), and many are of an order of magnitude to indicate important relationships. Presumably, the predictions might even be made to exceed those presented if the individual test scores were optimally weighted for the purpose. The presence of a wide range of correlation coefficients from .42 to -.53 indicates that the aptitude areas not only predict time-in-occupation, but do it with considerable differential capability.

Table 1

APTITUDE AREA SCORES AS PREDICTORS OF TIME-IN-OCCUPATION WITHIN TOTAL SAMPLE (before classification)

N = 710

Aptitude Area Scores	Correlation Coefficients						
	Infantry Time	Artil-Armor-Eng Time	Electronics Time	General Maint. Time	Motor Maint. Time	Clerical Time	General Tech. Time
IN' (1/3AR+2/3CI)	-.03	-.08**	.07	-.02	.42*	.19*	.08*
AE' (1/2GIT+1/2AI)	-.01	.19*	.08*	-.01	.08**	.07	.06
EL' (1/3MA+2/3ELI)	-.10*	.01	.09**	.02	.04	.12*	-.45*
GM (1/3PA+2/3SM)	.01	-.03	.11*	.04	.04	.12*	.07
MM (1/3MA+2/3AI)	-.01	-.05	.09**	.00	.04	.06	.06
CL (1/3VE+2/3ACS)	-.53*	-.09**	.02	-.02	-.29*	.23*	.07
CO (1/2VE+1/2AR)	-.02	-.04	.04	-.03	-.02	.09**	.07

*Significant at the .01 level.

**Significant at the .05 level.

On the basis of information contained in Table 1, the following conditional generalizations are suggested by considering only coefficients of near .20 or greater to be safely interpretable. For the total sample (before classification and training):

1. High scores in IN' and CL aptitudes are related to entry and to long future service in Clerical jobs.

2. High scores in AE' aptitudes are related to entry and long future service in Artillery-Armor-Engineer jobs.

3. High scores in IN' aptitudes are related to entry and future long service in Motor Maintenance jobs.

4. High scores in EL' aptitudes are related to future non-entry and short service in General Technical jobs.

5. High scores in CL aptitudes are related to future non-entry and short service in Infantry and in Motor Maintenance jobs.

Table 2 presents the correlation coefficients for each occupational group after classification and initial training has taken place. For example, of the 250 men classified and trained as an advanced Infantry group, some were later transferred to Artillery-Armor-Engineer, Clerical, or General Technical occupations. Data for each initial occupational group were analyzed in the same way as data for the total group (Table 1). The time that men spent in these non-temporary second occupations was predicted by some of the aptitude area test scores. Only coefficients predictive at the .05 level of significance are shown in Table 2. Non-significant coefficients or coefficients based on fewer than fifteen transferees to a second occupation are omitted, thereby avoiding the need to present a complete intercorrelation matrix for each group. Thus, in the case of the Infantry group, no coefficients for time-in-Infantry are presented because none reached the .05 level of significance of difference from zero correlation. However, for those initially classified and trained as Clerks, the aptitude areas predicted only time-in-Clerical occupations, and these correlations were negative. The negative correlations indicate that high Clerical Aptitude scores (CL) are associated with short time spent in Clerical occupations; that is, men initially assigned and trained as clerks who had high aptitude for clerical work were soon transferred to some other occupation, and the higher the clerical aptitude score, the sooner the transfer was likely to occur.

Interpretations of results shown in Table 2 are based on the assumption that coefficients of .20 or higher are safely considered of practical importance. Taking each initial occupation group separately, the following general statements are made concerning prediction of time spent in occupation.

Initial occupation: Infantry. High IN', CL, and GT scores are related to entry and to long future service in Clerical and General Technical jobs as second occupation.

Initial occupation: Artillery-Armor-Engineer. High IN', EL', CL, and GT scores are related to reassignment and long future service in Clerical jobs as second occupation.

Initial occupation: General Maintenance. High IN', EL', GM, MM, CL, and GT scores are related to reassignment and future long service in Clerical jobs as second occupation.

Initial occupation: Clerical. High IN', AE', EL', CL and GT scores are related to non-entry and future short service in Clerical jobs as first occupation

Initial occupation: General Technical. High CL scores are related to entry and long service in Clerical jobs as second occupation.

Table 2

APTITUDE AREA SCORES AS PREDICTORS OF TIME-IN-OCCUPATION WITHIN EACH OCCUPATIONAL GROUP AS CLASSIFIED BY INITIAL MOS

		Correlation Coefficients[a]								
	Initial Occupation	Infantry Group (N = 250)			Art-Armor-Eng Group (N = 146)			Gen Maint. Group (N = 53)	Clerical Group (N = 55)	Gen-Tech. Group (N = 98)
Aptitude Area Score	Second Occupation	Artil-Armor-Eng Time	Clerical Time	General Tech Time	Artil-Armor-Eng Time	Motor Maint. Time	Clerical Time	Clerical Time	Clerical Time	Clerical Time
IN' (1/3AR+2/3CI)		-.11	.21	.20			.34	.39	-.37	
AE' (1/2GT+1/2AI)				.15		.14	.13		-.30	
EL' (1/3MA+2/3ELI)				.19			.22	.35	-.29	
GM (1/3PA+2/3SM)				.16			.19	.32		
MM (1/3MA+2/3AI)				.13			.19	.31		
CL (1/3VE+2/3ACS)		-.14	.25	.20			.42	.43	-.32	.25
GT (1/2VE+1/2AR)		-.13	.25	.21	.13		.37	.39	-.38	.16

[a]The correlations presented are significant at the .05 level for the N of each group as given. Omitted correlations were either non-significant or had fewer than fifteen cases that spent time in a second occupation.

Predicted scores IN', AE' and EL' may be poor differential predictors because they are composites of tests used in the remaining aptitude areas. Greater differential predictability of time-in-occupation may be expected from use of actual rather than predicted test scores.

SUMMARY

The study explored the feasibility of predicting the amount of time a man will serve in an Army occupation by using the scores of the Army aptitude area test composites. Since the amount of time a man spends in an occupation can be considered a supplementary criterion of successful performance in the occupation, prediction of time-in-occupation offers some additional evidence of the validity of the aptitude areas for on-the-job performance. The study sought to test the hypothesis that the correlation between aptitude area scores and time in each occupation was significantly greater than zero.

Results indicate that aptitude area scores can significantly predict time-in-occupation, both before classification (for the total group), and after classification (within homogeneous occupational groups). The results also indicate that differential prediction of the time-in-occupation criterion is likely to be quite high, since the range of obtained validity coefficients was .42 to -.53 for the total group of 710 cases. Even more significant results might be obtained if the ~~ACB~~ Army Classification Battery scores were to be studied independently as predictors of tenure rather than in the operational composites based on relationship to training and job performance.

APPENDIX

PREDICTION OF MISSING ACB SCORES

Three new Army Classification Battery tests have been made operational since the present sample was tested. Consequently, scores for these three tests were not recorded on the Personnel Qualification Records of the present sample. The missing test scores are:

General Information Test (GIT)

Electronics Information Test (ELI)

Classification Inventory (CI)

The above tests are used to compute additional aptitude area scores, which are described and estimated below.

To provide data that would reflect current testing and classification procedures, the missing scores were predicted by multiple regression from the other ACB scores available in the records: RV, AR, PA, MA, ACS, SM, AI. Regression weights for these tests were computed from a representative sample of 540 cases for which a correlation matrix that included the missing tests was available.

The regression weights were obtained by treating each missing test as a dependent variable, and the predictor tests as independent variables. A separate set of regression coefficients was calculated for each missing test. By this means, the predicted scores (GIT', ELI' and CI') were obtained for use in the computation of the missing aptitude area scores.

To assure that the predicted scores were based on stable as well as valid regression weights, they were applied to a second sample of 1,500 cases as a cross-validation sample. The results were as follows:

ACB Tests	Validity (N = 540)	Cross-Validity (N = 1500)
$r_{CI,CI'}$	.64	.60
$r_{GIT, GIT'}$	.83	.80
$r_{ELI, ELI'}$	.82	.79

Once the above predicted scores were obtained, estimates of the missing aptitude area scores could be computed by combining them with available scores for the second test of each aptitude area composite. The efficiency with which aptitude area scores were estimated is indicated by the following correlation coefficients from the more recent validation sample:

$$r_{IN,IN'} = .80$$

$$r_{AE,AE'} = .89$$

$$r_{EL,EL'} = .84$$

All of the above calculations were made on coefficients corrected for restriction in range.

The correlation coefficients between estimated and obtained aptitude area scores closely approached the magnitudes of the reliability coefficients for such scores. In general, the predicted and the obtained scores were believed to be sufficiently equivalent to provide useful estimates of the correlation that would be obtained had the missing tests actually been administered to the sample under study.