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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is included. (AG)

TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

MACHINE OPERATOR, CERAMICS (pottery and porc.) 6-66.912

B-538 S-261

U. S. Employment Service in
Cooperation with
Tennessee State Employment Service

June 1963

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

MACHINE OPERATOR, CERAMICS (pottery and porc.) 6-66.912

B-538

Summary

The General Aptitude Test Battery, B-1002B, was administered to a final sample of 51 workers employed as Machine Operators, Ceramics 6-66.912 by the American Lava Corporation, Chattanooga, Tennessee. The criterion consisted of supervisory ratings. On the basis of mean scores, standard deviations, job analysis data, and their combined selective efficiency, Aptitudes G-Intelligence, F-Finger Dexterity and M-Manual Dexterity were selected for inclusion in the final test norms.

GATB Norms for Machine Operator, Ceramics 6-66.912, B-538.

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
G	CB-1-H CB-1-I CB-1-J	80	G	Part 3 Part 4 Part 6	75
F	CB-1-O CB-1-P	75	F	Part 11 Part 12	70
M	CB-1-M CB-1-N	70	M	Part 9 Part 10	70

Effectiveness of Norms

The data in Table IV indicate that only 67 percent of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 76 percent would have been good workers. 33 percent of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 24 percent would have been poor workers.

I. Purpose

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Machine Operator, Ceramics 6-66.912.

II. Sample

During the period May 15 to May 24, 1962, the GATB, B-1002B, was administered to 55 workers employed as Ceramic Machine Operators by the American Lava Corporation, Chattanooga, Tennessee. Seventy-four workers were employed by the company in this job classification and only 19 did not volunteer to participate in this study. Of the 55 workers tested, four were eliminated from the final sample; three because of failure to understand the test instructions and one because criterion data were not obtained. Therefore, the final sample consists of 51 workers; 6 male and 45 female.

The employer prefers applicants in good general health, 18 to 35 years of age, with 12 years of education or better. No tests were used to screen applicants and no previous experience is required. Applicants were selected for employment primarily on the basis of an interview. One month on-the-job training is generally sufficient to learn the job. No worker was included in the final sample who, in the supervisor's opinion, did not have adequate work experience to be validly rated.

TABLE I

Means (M), Standard Deviations (σ), Ranges, and Pearson Product-Moment Coreelations with the Criterion (r) for Age, Education, and Experience

N = 51	M	σ	Range	r
Age (years)	36.4	7.7	23-56	.063
Education (years)	9.8	1.8	6-12	.039
Experience (months)	56.3	42.0	1-204	.259

III. Job Description

Job Title: Machine Operator, Ceramics (pottery and porc.) 6-66.912

Job Summary: Operates pre-set automatic, semi-automatic, and manually operated machines to drill, mill, grind, saw, tap, head, cut, thread, turn or groove green technical ceramic pieces for electronic, mechanical, industrial and other uses. Receives oral instructions from supervisor, group leader or set-up man as to machine to be operated, pieces to be machined, operating procedure, inspection, and transfer of machined pieces to next production process. Places green ceramic pieces on feeder in manner appropriate to correctly feed and machine pieces automatically. Places pieces to be machined in jig or chuck; pushes and pulls levers or depresses foot pedals or any combination in order to machine piece semi-automatically. Holds piece between thumb and forefinger and positions piece in front of bit or tap; then moves piece around bit or tap for boring, drilling, or tapping operations and retracts piece when machining manually. Inspects piece for defects such as cracks and chips; periodically, or as instructed, gages piece on snap gage or go/no-go gage and discards defective pieces. Passes piece over stream of air or passes stream of air over pieces and/or cleans hole in piece by putting piece on and off of a rotating brush. Stacks completed pieces in an orderly fashion in tray and carries to storage shelves or hand cart. Counts individually or operates ratio scale to count number of machined pieces. Records number of machined pieces on job card or ticket. Reports any unusual conditions to group leader or set-up man; performs other related duties as directed by supervisor; maintains safety and good housekeeping rules.

IV. Experimental Battery

All the tests of the GATB, B-1002B, were administered to the sample group.

V. Criterion

The criterion data collected consisted of two sets of independent ratings made by the first-line supervisor on USES Form SP-21, "Descriptive Rating Scale." A period of at least two weeks elapsed between the first and second ratings. The rating scale consisted of nine items covering different aspects of job performance, with five alternatives for each item. Weights of one through five, indicating the degree of job proficiency attained, were assigned to the alternatives. A reliability coefficient of .87 was obtained for the criterion. Therefore, the two sets of ratings were combined, resulting in a distribution of final criterion scores of 37-74, with a mean of 57.3 and a standard deviation of 9.3.

VI. Qualitative and Quantitative Analyses

A. Qualitative Analysis

On the basis of the job analysis data, the following aptitudes were rated "important" for success in this occupation:

Intelligence (G) - required in receiving oral instructions from supervisor, group leader or set-up man as to machine to be operated, pieces to be machined, operating procedure, inspection, and transfer of machined pieces to next production process.

Form Perception (P) - required in inspecting machined ceramic piece for gross defects.

Motor Coordination (K) - required in pushing and pulling levers, positioning ceramic piece in front of bit or tap, putting ceramic piece on and off of rotating brush, and in stacking completed ceramic pieces.

Finger Dexterity (F) and Manual Dexterity (M) - required in placing green ceramic pieces on feeder, placing pieces to be machined in jig or chuck, moving pieces around bit or tap, passing pieces over stream of air, and in stacking completed ceramic pieces.

On the basis of the job analysis data, V-Verbal Aptitude was rated "irrelevant" for success in this occupation.

B. Quantitative Analysis:

TABLE II

Means (M), Standard Deviations (σ), and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB; N = 51

Aptitudes	M	σ	r
G-Intelligence	80.6	13.8	.221
V-Verbal Aptitude	85.2	11.5	.269
N-Numerical Aptitude	76.2	19.1	.109
S-Spatial Aptitude	86.9	13.8	.025
P-Form Perception	86.1	19.3	.133
Q-Clerical Perception	88.3	15.6	.159
K-Motor Coordination	89.0	18.1	.089
F-Finger Dexterity	99.3	20.0	.165
M-Manual Dexterity	90.5	18.7	.090

C. Selection of Test Norms:

TABLE III

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important	X				X		X	X	X
Irrelevant		X							
Relatively High Mean						X	X	X	X
Relatively Low Sigma	X	X		X					
Significant Correlation with Criterion									
Aptitudes to be Considered for Trial Norms	G						K	F	M

Trial norms consisting of various combinations of Aptitudes G, K, F and M with appropriate cutting scores were evaluated against the criterion by means of the Phi Coefficient technique. A comparison of the results showed that B-1002 norms consisting of G-75, F-70 and M-70 had the best selective efficiency.

VII. Validity of Norms (Concurrent)

The validity of the norms was determined by computing a Phi Coefficient between the test norms and the criterion and applying the Chi Square test. The criterion was dichotomized by placing 33 percent of the sample in the low criterion group because this percent was considered to be the unsatisfactory or marginal workers.

Table IV whows the relationship between test norms consisting of Aptitudes G, F and M with critical scores of 75, 70 and 70, respectively, and the dichotomized criterion for Machine Operator, Ceramics 6-66.912. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV

Validity of Test Norms for Machine Operator, Ceramics 6-66.912
(G-75, F-70, M-70)

N = 51	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	9	25	34
Poor Workers	9	8	17
Total	18	33	51

Phi Coefficient = .26
X^2 = 3.468
P/2 < .05

The data in the above table indicate a significant relationship between the test norms and the criterion for the sample.

VIII. Conclusions

On the basis of the results of this study, Aptitudes G, F and M with minimum scores of 75, 70 and 70, respectively, have been established as B-1002 norms for Machine Operator, Ceramics 6-66.912. The equivalent B-1001 norms consist of G-80, F-75 and M-70.

IX. Determination of Occupational Aptitude Pattern

The specific norms established for this study did not meet the requirements for incorporation into any of the 35 OAP's included in Section II of the Guide to the Use of the General Aptitude Test Battery, January 1962. The data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.