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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

EXPERIMENTAL ASSEMBLER (any ind.) 6-78.642

B-613 S-333

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

March 1965

GATB# 2539

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

EXPERIMENTAL ASSEMBLER (any ind.) 6-78.642

B- 613 S-333

Summary

The General Aptitude Test Battery, B-1002, was administered to a final sample of 61 men employed as Experimental Assemblers 6-78.642 at Minnesota Mining and Manufacturing Company, St. Paul, Minnesota. The criterion consisted of supervisory ratings. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes V-Verbal Aptitude, P-Form Perception, K-Motor Coordination and F-Finger Dexterity were selected for inclusion in the final test norms.

GATB Norms for Experimental Assembler 6-78.642, B-613. S-333

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
V	CB-1-J	85	V	Part 4	85
P	CB-1-A CB-1-L	75	P	Part 5 Part 7	75
T	CB-1-G CB-1-K	70	K	Part 8	75
F	CB-1-O CB-1-P	85	F	Part 11 Part 12	80

Effectiveness of Norms

The data in Table IV indicate that only 61 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, 80 percent would have been good workers. 39 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 20 percent would have been poor workers.

TECHNICAL REPORT

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 Experimental Assembler 6-78.642.

II. Sample

The GATB, B-1002B, was administered during the period July 26 through August 6, 1962 to an initial sample of 34 men employed as Experimental Assemblers 6-78.642 by the Minnesota Mining and Manufacturing Company, St. Paul, Minnesota. Thirty-six men are employed in the job by the company, however, two men were on vacation at the time of testing. All of the men in the sample were either transferred or promoted to this job based on their seniority. Workers usually meet production standards after three months of on-the-job experience. All of the workers in the sample are considered experienced. In selecting men for the job, the company prefers high school graduates who express an interest in mechanical work and who have had a good attendance record on previous jobs.

The GATB, B-1002A, was administered during the period December 1962 through July 1964 to a second sample of 27 men employed as Experimental Assemblers 6-78.642 by the Minnesota Mining and Manufacturing Company, St. Paul, Minnesota. The selection of the second sample remained the same as that for the original sample with the following exception: the company was informed as to whether the individual passed or failed the plant battery which consisted of aptitudes V-85, P-75, K-75 and F-70. However, the amount of emphasis placed on the results is doubtful since it was found that 67 percent of those not hired passed the battery and 10 percent of those hired failed the battery. Another reason for using the additional sample was that of the 4 aptitudes used in the plant battery formulated on the original sample, only P was found to have a statistically significant higher mean in the additional sample. Therefore, the two samples appear suitable to be combined.

TABLE I

Means (M), Standard Deviations (σ), Ranges, and Bi-Serial Correlations with the Criterion for Age, Education, and Experience

N = 61	M	σ	Range	r_{bis}	$\sigma_{r_{bis}}$
Age (years)	34.7	11.5	19-61	-.175	.159
Education (years)	11.0	1.7	7-14	.196	.158
Experience (months)	26.9	28.6	3-120	.199	.158

III. Job Description

Job Title: Experimental Assembler (any ind.) 6-78.642

Job Summary: Assembles, inspects, tests, and adjusts a variety of optical electrical, and mechanical devices on pilot run basis to improve assembly methods and to discover and correct deficiencies in materials, specifications and production equipment prior to production runs.

Work Performed: Reads and interprets blueprints, sketches, diagrams, schematics, and narrative instructions to determine required parts, tools, production equipment, and assembly methods. Selects required parts and tools from cribs and bins and lays out on work bench to provide desired assembly arrangement. Assembles up to 100 units or components of specified optical, electrical, or mechanical devices for slide projectors, plastic tape dispensers, "Thermofax" duplicating machines, and ribbon-bow-making machines using power and hand tools such as electric drills, automatic riveters, air screw-drivers, wrenches, pliers, and screwdrivers. Inspects, tests, and adjusts assembled devices for specified functioning using light meter, ammeter, voltmeter, stop watch, rulers, feeler guages, spring tension tester, torque tester, and depth micrometer. May write notes, make sketches, and confer with foreman concerning production procedure changes.

IV. Experimental Battery

All the tests of the GATB, B-1002B, were administered to the initial sample of 34 individuals; all the tests of the GATB, B-1002A, were administered to the second sample of 27 individuals.

V. Criterion

The criterion consisted of rank-order ratings made by the first and second-line supervisors. A reliability coefficient of .855 was obtained for the initial sample (N=34) and a reliability coefficient of .794 was obtained for the second sample (N=27). Therefore, for each of the two samples, the rank-order ratings made by the first and second-line supervisors were combined to obtain the final rank-order ratings. The supervisors who provided these ratings determined that the critical criterion score should not be the same for the two samples because the ranges of ability for these samples were not comparable. Accordingly, 15 of the 34 workers in the initial sample were placed in the low criterion group, and 9 of the 27 workers in the second sample were placed in the low criterion group. Since the appropriateness of combining the two samples to obtain a single distribution of final criterion scores was highly questionable, the final criterion consisted only of identifying the high and low criterion group workers, and Bi-Serial correlation coefficients were computed to obtain aptitude-criterion relationships.

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 to understand instructions and to make judgments in determining required parts, tools, production equipment and assembly methods.

Spatial Aptitude (S) - required to read and interpret blueprints, sketches, diagrams and schematics.

Form Perception (P) - required to perceive differences in parts, to fit parts together and to inspect completed units for flaws.

Finger Dexterity (F) - required to manipulate and adjust small parts such as springs and screws and to set and operate devices such as spring-tension tester and micrometers.

Manual Dexterity (M) - required to assemble parts, handle tools, such as wrenches, screwdrivers, electric drill and riveters, and to adjust and align assembled devices for specified operation.

B. Quantitative Analysis:

TABLE II

Means (M), Standard Deviations (σ), and Biserial Correlations with the Criterion for the Aptitudes of the GATB; N = 61

Aptitudes	M	σ	r_{bis}	$\sigma_{r_{bis}}$
G-Intelligence	100.4	14.8	.411*	.141
V-Verbal Aptitude	97.1	12.2	.460*	.136
N-Numerical Aptitude	97.2	15.9	.258	.154
S-Spatial Aptitude	108.5	19.2	.374*	.145
P-Form Perception	96.4	17.6	.369*	.145
Q-Clerical Perception	97.3	11.5	.286	.152
K-Motor Coordination	95.5	16.2	.437*	.138
F-Finger Dexterity	101.4	20.5	.393*	.143
M-Manual Dexterity	106.7	20.4	-.011	.163

*Significant

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									
Relatively High Mean	X			X				X	X
Relatively Low Sigma	X	X				X			
Significant Correlation with Criterion	X	X		X	X		X	X	
Aptitudes to be Considered for Trial Norms	G	V		S	P		K	F	M

Trial norms consisting of various combinations of Aptitudes G,V,S,P,K,F,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 V-85, P-75, K-75, and F-80 had the best selective efficiency.

VII. Validity of Norms

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 39 percent of the sample in the low criterion group because this percent was considered to be the unsatisfactory or marginal workers.

Table IV shows the relationship between test norms consisting of Aptitudes V, P, K and F with critical scores of 85, 75, 75 and 80, respectively, and the dichotomized criterion for Experimental Assembler 6-78.642 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 Experimental Assembler 6-78.642
(V-85, P-75, K-75, F-80)

N = 61	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	5	32	37
Poor Workers	16	8	24
Total	21	40	61

Phi Coefficient = .546

χ^2 = 18.178

P/2 < .0005

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 V, P, K, F with minimum scores of 85, 75, 75 and 80, respectively, have been established as B-1002 norms for the occupation of Experimental Assembler 6-78.642 The equivalent B-1001 norms consist of V-85, P-75, T-70 and F-85.

IX. Determination of Occupational Aptitude Pattern

The data for this study did not meet the requirements for incorporating the occupation studied into any of the 36 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.