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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

ASSEMBLER, COMMUNICATIONS EQUIPMENT (electronics) 7-00,803

B-522

S-245

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

April 1963

GATB #2419

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

ASSEMBLER, COMMUNICATIONS EQUIPMENT (electronics) 7-00.803

B-522

Summary

The General Aptitude Test Battery, B-1002B, was administered to a final sample of 51 females employed as Assemblers, Communications Equipment 7-00.803 at the Dictagraph Corporation in Danbury, Connecticut. 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 K-Motor Coordination, F-Finger Dexterity, and M-Manual Dexterity were selected for inclusion in the final test norms.

GATB Norms for Assembler, Communications Equipment 7-00.803. B-522

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
T	CB-1- G CB-1- K	100	K	Part 8	100
F	CB-1- O CB-1- P	100	F	Part 11 Part 12	95
M	CB-1- M CB-1- N	115	M	Part 9 Part 10	110

Effectiveness of Norms

The data in Table IV indicate that 12 of the 17 poor workers, or 71 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 71 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 28 of the 33 workers who made qualifying test scores, or 85 percent, were good 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 Assembler, Communications Equipment 7-00.803.

II. Sample

The General Aptitude Test Battery, B-1002B, was administered on January 12, 1962 to a sample of 51 of a total of 110 women employed as Assembler, Communications Equip. 7-00.803 at the Dictagraph Corporation in Danbury, Connecticut. All of the employees tested were included in the final sample.

The selection of individuals for the job by the company is based on an interview relating past experience with the duties of hearing aid assembler or any experience working with small soldering irons. The company has no requirement as to age or education and no tests are used.

The selection of individuals for inclusion in the sample was based on the following requirements: (1) The individual had to be able to read and write English. (2) This individual must have completed the training period which is one month. (3) The individual had to be performing the various job duties required for the jobs of hearing aid assembler and home fire alarm systems assembler.

The training period for the Assemblers is approximately one month. The operations are relatively simple but due to the high cost of the units the company insists that the worker going through the training period work slowly so that the job is learned thoroughly before she is placed into a working unit. All the workers in the sample are considered experienced workers.

TABLE I

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

N = 51	M	σ	Range	r
Age (years)	31.9	10.8	19-55	.091
Education (years)	11.0	1.8	6-14	-.128
Experience (months)	6.7	2.1	3-10	.103

III. Job Description

Job Title: Assembler, Communications Equipment (electronics) 7-00.803.

Job Summary: Works interchangeably as assigned to any one of several work stations on the assembly of several varieties of small hearing aid receivers and a home fire alarm detector. Because of the sub-miniature size of the components and the completed assembly, the work is done under magnifying glasses using pencil-tip soldering irons, tweezers, hand files, pliers, wire cutters, screw drivers, jigs and hand arbor presses.

Work Performed: Selects plastic bottom part of chassis and inserts minute pins, and/or screws depending on the particular model in production. Some models do not need this step because the top and bottom are held in place by the wiring of the components sandwiched between. Inspects this partial assembly and hand files the ends of the metal parts to remove any burrs or unevenness. Removes any filings or other particles using small brush. Places partially completed chassis in an individual plastic container and passes it to the next work station.

Removes chassis from container and places it in fixture. Uses tweezers to place tiny components such as condensers, resistors, transformers and transistors in proper location on the chassis and solders one lead of each component to its proper connection according to schematic diagram. Two or more workers may be assigned to this partial assembly, each installing different components. Replaces unit in plastic box ready for the next work station.

Removes chassis from container and places it in a fixture. Straightens wire leads and cuts them to proper length using tweezers and a hand cutter. Positions plastic upper chassis over lower one and uses tweezers to insert wire leads through holes. Cuts and bends leads to proper length and direction using tweezers and hand cutter. Solders leads to proper terminals or components on top side of chassis. Places unit in plastic container ready for next work station.

Removes completed chassis from container and positions it in bottom part of plastic hearing aid housing. Solders leads. Places plastic cover on housing and seals it with clear cement using a small brush. Visually inspects to be sure it is completely sealed and returns the unit to the plastic container ready for inspection.

IV. Experimental Battery

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

V. Criterion

The criterion for this study consisted of supervisory ratings based on the Descriptive Rating Scale developed by the United States Employment Service, Form SP-21. Ratings were prepared during February 1962 by each worker's foreman. The Descriptive 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 performance attained were assigned to each alternative.

One foreman rated 29 employees and the other foreman rated 22 employees. For identification purposes the letter "A" was assigned to the group which consisted of 29 ratings and the letter "B" to the group which consisted of 22 ratings. Analysis revealed that the foreman who rated group "B" assigned higher ratings than the foreman who rated group "A". The scores for group "A" ranged from 16 to 31. For group "B" the scores ranged from 20 to 35. To make sure that both sets of rating scales were weighted equally, original scores for each set were adjusted by using the formula for standard scores.

The range of final scores was 28 - 72, with a mean score of 50.3 and a standard deviation of 10.42.

Qualitative and Quantitative Analyses:

A. Qualitative Analysis:

The job analysis indicated that the following aptitudes measured by the GATB appear to be important for this occupation:

Spatial (S) - required to work from drawing showing location of component parts on the chassis; to visualize from flat drawings how parts will fit into the chassis.

Form Perception (P) - required for cutting leads to size and judging slight differences in lengths; to recognize shadings in various colors of parts which are color coded.

Finger Dexterity (F) - required to manipulate and insert minute parts, straighten leads and pull leads through chassis; and to inspecting chassis and pins for smoothness.

Manual Dexterity (M) - required to assemble and place chassis in plastic box, to bend leads, and to use such hand tools as tweezers, soldering irons and wire cutters.

On the basis of the job analysis data, N-Numerical Aptitude was rated "irrelevant" for successfully performing the duties of this job.

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	91.9	18.4	.219
V-Verbal Aptitude	95.5	17.4	.105
N-Numerical Aptitude	91.9	19.0	.174
S-Spatial Aptitude	93.2	17.8	.137
P-Form Perception	103.6	13.3	.003
Q-Clerical Perception	108.1	17.2	-.107
K-Motor Coordination	112.2	10.6	.033
F-Finger Dexterity	115.5	14.1	.122
M-Manual Dexterity	111.7	11.8	.546**

**Significant at the .01 level

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

Trial norms consisting of various combinations of Aptitudes P, 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 K-100, F-95 and M-110 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 shows the relationship between test norms consisting of Aptitudes K, F and M with critical scores of 100, 95 and 110, respectively, and the dichotomized criterion for Assember, Communications Equipment 7-00.803 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 Assembler, Communications Equipment 7-00.803 (K-100, F-95, M-110)

N = 51	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	6	28	34
Poor Workers	12	5	17
Total	18	33	51

Phi Coefficient = .52
χ^2 = 13.898
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 K, F and M with minimum scores of 100, 95 and 110, respectively, have been established as B-1002 norms for Assembler, Communications Equipment 7-00.803. The equivalent B-1001 norms consist of T-100, F-100 and M-115.

IX. Determination of Occupational Aptitude Pattern

The specific norms established for this study did not meet the requirements for incorporation into any of the existing 35 OAP's (revised 10/61). The data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.