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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 also included. (AG)

TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

PRESS OPERATOR (glass mfg.) 4-65.415

B-436 or S-170

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

U. S. DEPARTMENT OF LABOR
Bureau of Employment Security
Washington 25, D. C.
July, 1961

GATB #2275
June, 1959

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR PRESS OPERATOR 4-65.415

B-436 or S-170

Summary

The General Aptitude Test Battery, B-1002A, was administered to a sample of 51 male applicants who were later employed as Press Operator 4-65.415 at Corning Glass Works, Greenville, Ohio. The criterion consisted of broad category supervisory ratings. On the basis of mean scores, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes G-Intelligence, N-Numerical Aptitude, F-Finger Dexterity, and M-Manual Dexterity were selected for inclusion in the test norms.

GATB Norms for Press Operator 4-65.415 : B-436 or S-170

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Press Operator 4-65.415.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for B-436 or S-170

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	95	G	Part 3 Part 4 Part 6	90
N	CB-1-D CB-1-I	105	N	Part 2 Part 6	100
F	CB-1-O CB-1-P	75	F	Part 11 Part 12	70
M	CB-1-M CB-1-N	100	M	Part 9 Part 10	95

Effectiveness of Norms

The data in Table V indicate that 15 of the 17 poor workers, or 88 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 88 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 27 of the 29 workers who made qualifying test scores, or 93 percent, were good workers.

TECHNICAL REPORT

Problem

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 Press Operator 4-65.415.

Sample

The GATB, B-1002A, was administered during the period May to October 1957, to 64 male applicants who were later employed as Press Operator 4-65.415 at Corning Glass Works, Greenville, Ohio. Applicants were referred on the basis of education and/or prior work experience. The test results were not used as a basis either for referral or for hiring. The training time consisted of a period of 15 to 18 months. During the training period, 13 of the original sample of 64 men terminated their employment, were promoted, or were transferred to other departments. Therefore, the final sample for this study consists of 51 men.

Table II shows the means, standard deviations, ranges, and Pearson product-moment correlations (corrected for broad categories) with the criterion for age, education, and experience.

TABLE II

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

Press Operator 4-65.415
N = 51

	M	σ	Range	c^r
Age (years)	28.9	6.6	19-45	.003
Education (years)	11.3	1.2	8-12	-.082
Experience (months)	22.4	1.2	20-24	.709**

**Significant at the .01 level

There are no significant correlations between age or education and the criterion. The relatively wide range of ages in this sample is not a chance occurrence in that the company made an effort to obtain this variability to prevent eventual mass personnel losses because of retirements. Also the company set no specific educational requirements, but an effort was made to obtain workers with some high school training, and not less than an eighth-grade education. The correlation of .709 between experience and the criterion is significant at the .01 level. This may indicate that those workers who had more training at the time of criterion collection performed best on the job, or it may indicate a bias on the part of the raters in favor of those workers. However, no attempt was made to correct the criterion for experience because the criterion is based on broad category ratings to which the statistical correction technique for nullifying the influence of experience is not applicable.

III. Job Description

Job Title: Press Operator 4-65.415

Job Summary: Operates an automatic glass-forming machine to form molten glass into sealed-beam type lamp lenses and reflectors; diagnoses defects and makes machine adjustments to produce product within specifications; records operational data.

Work Performed: Follows written specifications for determining various operational data pertaining to dimensions, temperatures, and allowable tolerances. Starts, stops, and controls operation of machine, determining its proper operation by observing operations, recorders, and gauges. Makes various valve and wrench adjustments as necessary to produce quality ware. Adjusts feeder attachment to maintain proper shape and size of drop, adjusts shears, delivery chutes, needle height, sleeve, and stroke lever; lubricates chutes and adjusts to assure that gob of glass loads in mold in proper position. Adjusts burners, timing, and mechanisms on hole punch. Controls mold temperature, stroke, dwell, alignment and timing to form ware according to specifications. Diagnoses glass defects and faulty machine operation, and makes operating adjustments and minor repairs. Changes machine equipment such as molds, shears, and plungers with the assistance of Operator's Assistant. Assists in machine and feeder setups. Records data on operations as directed.

IV. Experimental Battery

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

V. Criterion

The criterion consisted of pooled supervisory ratings expressed in three broad categories. The Department Head and his assistant, in June 1959, jointly rated each worker in one of three categories: (1) highest third, (2) middle third, and (3) lowest third. The distribution of the broad category ratings assigned the sample group was 15 in the highest third, 19 in the middle third, and 17 in the lowest third. For computational purposes, the qualitative ratings were converted to quantitative scores of 62, 51, and 39, for the highest third, middle third, and lowest third, respectively.

VI. 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.

Intelligence (G) - required to apply knowledge and follow specifications for operation of the machine and to use judgment in diagnosing and determining how to correct faulty machine performance.

Spatial Aptitude (S) and Form Perception (P) - required to understand and visualize working relationships of machine parts in order to set up, adjust and repair machine. Also required to observe, detect, and diagnose imperfections in glass.

Clerical Perception (Q) - required to read recorder and gages and to record operational data.

Manual Dexterity (M) - required for rapid and coordinated use of hands and arms to manipulate controls for machine operation and to use hand tools to make mechanical adjustments and repairs.

On the basis of the job analysis data, none of the aptitudes are considered obviously unimportant for performing the duties of this job. Therefore, none of the aptitudes are considered "irrelevant".

B. Quantitative Analysis:

Table III shows the means, standard deviations, and Pearson product-moment correlations (corrected for broad categories) with the criterion for the aptitudes of the GATB. The means and standard deviations of the aptitudes are comparable to general working population norms with a mean of 100 and a standard deviation of 20.

TABLE III

Means (M), Standard Deviations (σ), and
Pearson Product-Moment Correlations (Corrected for Broad Categories)
with the Criterion (c^r) for the Aptitudes of the GATB

Press Operator 4-65.415
N = 51

Aptitudes	M	σ	c^r
G-Intelligence	107.1	11.8	.231
V-Verbal Aptitude	97.0	13.7	.259
N-Numerical Aptitude	106.6	12.0	.334*
S-Spatial Aptitude	111.8	15.8	-.083
P-Form Perception	100.7	15.2	.177
Q-Clerical Perception	101.3	11.2	.224
K-Motor Coordination	98.5	18.7	.060
F-Finger Dexterity	97.5	19.6	.357*
M-Manual Dexterity	110.2	17.9	.430**

**Significant at the .01 level
*Significant at the .05 level

Aptitudes G, N, S, and M have the highest mean scores and Aptitudes G, V, N, and Q have relatively low standard deviations.

For a sample of 51 cases, correlations of .359 and .276 are significant at the .01 level and the .05 level of confidence, respectively. Aptitude M correlates significantly with the criterion at the .01 level. Aptitudes N and F correlate significantly with the criterion at the .05 level.

C. Selection of Test Norms

TABLE IV

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			X			
Significant Correlation with Criterion			X					X	X
Aptitudes to be considered for trial norms	G		N	S		Q		F	M

Trial norms consisting of various combinations of Aptitudes G, N, S, Q, F, and M with appropriate cutting scores were evaluated against the criterion by means of the tetrachoric correlation technique. A comparison of the results showed that B-1002 norms consisting of G-90, N-100, F-70, and M-95 had the best selective efficiency.

VII. Validity of Norms

The validity of the norms was determined by computing a tetrachoric correlation coefficient between the test norms and the criterion and applying the Chi Square test. The criterion was dichotomized by placing workers in the "highest third", and "middle third" in the high criterion group. Workers in the "lowest third" were placed in the low criterion group. This resulted in 17 of the 51 workers or 33 percent of the sample being placed in the low criterion group.

Table V shows the relationship between test norms consisting of Aptitudes G, N, F, and M with critical scores of 90, 100, 70, and 95 respectively, and the dichotomized criterion for Press Operator 4-65.415. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE V

Validity of Test Norms for Press Operator 4-65.415
(G-90, N-100, F-70, M-95)
N = 51

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	7	27	34
Poor Workers	15	2	17
Total	22	29	51
	r_{tet} = .88	X^2 = 18.476	
	σr_{tet} = .13	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 G, N, F, and M with minimum scores of 90, 100, 70 and 95 respectively, have been established as B-1002 norms for the occupation of Press Operator 4-65.415. The equivalent B-1001 norms consist of G-95, N-105, F-75, and M-100.

IX. Determination of Occupational Aptitude Pattern

The specific norms established for this study did not meet the requirements for allocation to any of the existing 23 occupational aptitude patterns. The data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.