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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

DOFFER (textile) 6-19.166

B-617 S-337

U. S. Employment Service
in Cooperation with
Georgia and North Carolina State Employment Services

GATB# 2543

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

DOFFER (textile) 6-19.166

B- 617 S-337

Summary

The General Aptitude Test Battery was administered to two samples of Doffers 6-19.166 for the purpose of validating and cross-validating occupational norms. The date of criterion data collection, criterion type and the number in each final sample are shown below:

Sample	Year	Criterion	N
Validation (North Carolina)	1964	Supervisory ratings	57
Cross-Validation (Georgia)	1959	Piece rate earnings	32

GATB Norms for Doffer 6-19.166, B-617 S-337

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
P	CB-1- A CB-1- L	70	P	Part 5 Part 7	70
F	CB-1- O CB-1- P	65	F	Part 11 Part 12	60
M	CB-1- M CB-1- N	65	M	Part 9 Part 10	65

Effectiveness of Norms

Validation Sample

The data in Table IV-A 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, 75 percent would have been good students. 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 25 percent would have been poor workers.

Cross-Validation Sample

The data in Table IV-B indicate that only 66 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, 75 percent would have been good workers. 34 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 25 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 Doffer 6-19.166.

II. Sample

Validation Sample (North Carolina)

The GATB, B-1002B, was administered in October 1964 to a sample of 57 men employed as Doffer 6-19.166 at Cannon Mills, Kannapolis, North Carolina. A total of 448 men are employed as Doffer 6-19.166 at this company. The men included in the sample were selected by management and represented a cross-section of workers performing in the high, middle and low ranges. Three of the workers included in the sample had less than a sixth grade education. Since these three workers experienced no difficulty in taking the GATB, they were included in the final experimental sample. The on-the-job training period consists of one month.

TABLE I-A

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

N = 57	M	σ	Range	r
Age (years)	36.6	12.3	17-61	.083
Education (years)	8.3	2.1	1-13	.018
Experience (months)	176.3	138.0	3-576	.158

Cross-Validation Sample (Georgia)

The GATB, B-1002A, was administered during the period September-October 1959 to a sample of 42 men employed as Doffer 6-19.166 at Swift Manufacturing Company, Columbus, Georgia. Of the total of 69 men employed as Doffer 6-19.166 at this company, only 42 volunteered to take the GATB. Of the 42 tested workers, 10 were eliminated from the final sample: four because criterion ratings were not available and six because of a lack of education. The final sample consisted of 32 men. Workers at this plant are selected on the basis of personal interviews and reference checks. The on-the-job training period consists of six weeks. All workers in the sample had at least eight weeks on-the-job experience.

TABLE I-B

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

N = 32	M	σ	Range	r
Age (years)	27.8	10.1	17-51	.068
Education (years)	8.5	1.7	6-12	-.183
Experience (months)	81.4	89.0	2-360	.186

III. Job Description

Job Title: Doffer (textile) 6-19.166

Job Summary: Doffs bobbins from spindles on ring spinning frames: Pushes bobbin box to spinning frame to be doffed. Pulls lever or presses button; depresses pedal to stop frame and lower ring rail below bobbins; winds yarn onto base of spindles to retain yarn in travelers, yarn guides, and drawing rollers preparatory to doffing frame. Pulls latch to hold ring rail in doffing position. Inserts and turns crank in socket to reset builder motion that distributes yarn uniformly onto bobbins. Raises yarn guides sections and bobbin separators to doffing position and marks yarn on bobbins with colored chalk to identify yarn according to yarn size. Removes full bobbins from spindles with one hand while placing empty bobbins on spindles with other hand to doff frame. Places full bobbins into bobbin box. Returns yarn guides and bobbin separators to winding position, pulls lever, or presses button to start spinning frame and pumps pedal to wind yarn onto base of bobbins, securing yarn to bobbins. Pieces-up broken ends after starting spinning frame by breaking length of yarn from supply bobbin, raising bobbin on spindle, wrapping yarn end around spindle, threading yarn through traveler and yarn guide, and inserting end between feed rollers of drawing rolls. Trucks bobbin box to storage area and pushes box onto platform of handtruck for conveying bobbins to spooling area.

IV. Experimental Battery

All the tests of the GATB, B-1002B, were administered to the Validation sample (North Carolina) and all tests of the GATB, B-1002A, were administered to the Cross-Validation sample (Georgia).

V. Criterion

Validation Sample (North Carolina)

The criterion data were collected in October 1964 and consisted of two sets of independent ratings made by the immediate supervisors on USES Form SP-21, "Descriptive Rating Scale." 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 .92 was obtained for the criterion. Therefore, the two sets of ratings were combined resulting in a distribution of final criterion scores of 39-85, with a mean of 65.0 and a standard deviation of 11.9.

Cross-Validation Sample (Georgia)

Two criteria were available for this sample: piece rate earnings and broad category supervisory ratings. Piece rate earnings consisted of hourly earnings for a one-week period and ranged from $1.31 to $1.54 per hour. The restricted range reflected the fact that all workers were performing at a satisfactory level. The broad category supervisory ratings consisted of ratings in three broad groupings (A, B and C). For computational purposes, the broad category ratings were converted to the following quantitative scores: A=61, B=50 and C=39.

The two criteria were correlated with each other and the correlation for each criterion with experience was obtained. A correlation coefficient of .395 was obtained between piece rate earnings and broad category ratings. A correlation coefficient of .186 was obtained between piece rate earnings and experience and .486 between broad category ratings and experience. Because it appeared that the broad category ratings were influenced by experience, the criterion which consisted of piece rate earnings was selected as the final criterion.

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:

Form Perception (P) - required to detect yarn breaks after starting spinning frame; to locate yarn end on supply bobbin; and to piece-up yarn breaks.

Motor Coordination (K) - required to remove full bobbins and to place empty bobbins on spindles with a high rate of speed and accuracy.

Finger Dexterity (F) - required to pull levers or press button, to start and stop frame, and to thread ends of yarn through traveler and guides.

Manaul Dexterity (M) - required to wind crank, to doff frame, to tie-up and thread broken yarn, and to remove and replace bobbins.

On the basis of the job analysis data, Verbal Aptitude (V) and Clerical Perception (Q) were 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 = 57

Aptitudes	M	σ	r
G-Intelligence	77.8	13.4	.215
V-Verbal Aptitude	80.1	10.7	.160
N-Numerical Aptitude	75.9	18.9	.254
S-Spatial Aptitude	82.4	15.1	.078
P-Form Perception	80.0	18.8	.270*
Q-Clerical Perception	88.0	14.7	.197
K-Motor Coordination	80.0	19.4	.148
F-Finger Dexterity	76.6	19.5	.325*
M-Manual Dexterity	89.0	19.9	.221

*Significant at the .05 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				X			
Relatively High Mean				X		X			X
Relatively Low Sigma	X	X				X			
Significant Correlation with Criterion					X			X	
Aptitudes to be Considered for Trial Norms					P			F	M

Trial norms consisting of various combinations of Aptitudes P, 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 P-70, F-60 and M-65 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 33 percent of the sample in the low criterion group because this percent was considered to be the unsatisfactory or marginal workers.

Table IV-A shows the relationship between test norms consisting of Aptitudes P, F and M with critical scores of 70, 60 and 65, respectively, and the dichotomized criterion for Doffer 6-19.166. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV-A

Validity of Test Norms for Doffer 6-19.166
(P-70, F-60, M-65)
Validation Sample (North Carolina)

N = 57	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	11	27	38
Poor Workers	10	9	19
Total	21	36	57

Phi Coefficient = .231
X^2 = 3.021
P/2 < .05

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

VIII. Cross-Validation of Norms

Table IV-B shows the relationship between test norms consisting of Aptitudes P, F and M with critical scores of 70, 60 and 65 respectively, and the dichotomized criterion for the cross-validation sample. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor" workers."

TABLE IV-B

Validity of Test Norms for Doffer 6-19.166
(P-70, F-60, M-65)
Cross-Validation Sample (Georgia)

N = 32	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	3	18	21
Poor Workers	5	6	11
Total	8	24	32

Phi Coefficient = .342
X^2 = 3.744
P/2 < .05

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

IX. Conclusions

On the basis of the results of this study, Aptitudes P, F and M with minimum scores of 70, 60, and 65, respectively, have been established as B-1002 norms for Doffer 6-19.166. The equivalent B-1001 norms consist of P-70, F-65 and M-65.

X. 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.