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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

ASSEMBLER (rubber goods) ~~6-61.688~~ 753.887

~~B-503~~

5-22 6

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

March 1963

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GATB # 2378

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

Assembler (rubber goods) 6-61.688

B-503

Summary

The General Aptitude Test Battery, B-1002A, was administered to a final sample of 50 women employed as Assemblers, 6-61.688 by the Rubber Corporation of California. 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 Q-Clerical Perception, K-Motor Coordination, and M-Manual Dexterity were selected for inclusion in the final test norms.

GATB Norms for Assembler 6-61.688, B-503.

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
Q	CB-1-B	70	Q	Part 1	75
T	CB-1-G CB-1-K	70	K	Part 8	75
M	CB-1-M CB-1-N	90	M	Part 9 Part 10	85

Effectiveness of Norms

The data in Table IV indicate that 8 of the 17 poor workers, or 47 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 47 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 37 workers who made qualifying test scores, or 76 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 6-61.688.

II. Sample

The General Aptitude Test Battery, was administered during the period February 15 to March 1, 1961 to a sample of 72 women employed as Assembler 6-61.688 by The Rubber Corporation of California, Garden Grove, California. Of the 72 workers tested, twenty-two were eliminated from the sample; fourteen because they were performing noncomparable work, six because length of supervision made it impossible to obtain valid ratings, and two because of language difficulty. Therefore, the final sample consisted of 50 women.

Job applicants are required to complete a standard employment form and have an oral interview with the Personnel Manager. There are no educational or experience requirements. On-the-job training is utilized and the average length of time in training is two months. All 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 = 50	M	σ	Range	r
Age (years)	33.6	8.5	20-49	-.292*
Education (years)	9.7	1.8	6-14	.075
Experience (months)	36.2	31.5	5-120	.141

*Significant at the .05 level

The significant correlation in Table I indicates that either (1) younger workers performed better on the job or (2) raters were biased in giving higher ratings to these workers.

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III. Job Description

Job Title: Assembler (rubber goods) 6-61.688

Job Summary: Assembles parts such as upper linings, lasts, insoles, outsoles, toe caps, and toe bumpers in the production of sneakers. Inserts fabric shoe upper between cement and feed rollers and applies cement to bottom edge of upper lining. Checks cart ticket for correct size of lasts and rolls selected cart in position at end of conveyor work table. Places several sets of lasts on work table and positions left and right upper onto appropriate last. Attaches last to jig holder and positions insole on last. Pulls up both side edges of upper and folds edges down over insole. Removes last from jig holder and dips insole of lasted shoe in latex. Slides lasted shoe on drain rack and across rubber wiper blade to remove excess latex and places lasted shoe into drying oven. Unloads drying oven and attaches lasted shoe to jig holder of conveyor line. Assembles parts such as binders, outsole, and toe bumper to lasted shoe. Removes lasted shoe from jig holder and with hand roller rolls edge of lasted shoe to remove air bubbles. Inspects finished shoe and rejects any defective shoe for rework. Trims finished shoe with hand shears and places it in holding rack.

Work Performed: Performs three or more of the following operations to assemble rubber sole sneakers:

1. Cements upper lining: Picks up fabric shoe upper from supply table and inserts bottom edge of upper between cement and feed rollers, with lining side against cement roller. Starts machine and guides edge through rollers to apply strip of cement to inside bottom edge of lining. Removes upper and places on spoke of wheel rack. Repeats operation, first on left upper, then right upper, places both on same spoke, rotates wheel and repeats entire operation. Cleans feed roller and fills well of machine with cement when necessary.

2. Positions upper over last: Checks cart ticket for correct size of lasts and rolls selected cart in position at end of conveyor work table. Selects left and right lasts from cart and places several sets of lasts on work table. Picks up left and right upper, one in each hand, from spoke of wheel rack, positions each down on appropriate last and places both lasts with uppers at top of work area for next worker. Repeats operation to position uppers on appropriate lasts and to replenish supply of lasts on work table as necessary.

3. Lasts shoes: Picks up last with upper, turns last over and inserts peg of jig holder into center hole of last. Adjusts upper in position on last and holds upper in place at toe with left hand. Picks up insole from work table with right hand, places insole inside bottom edge of upper and positions insole on last. Pulls up both side edges of upper and folds edges down over insole. Picks up hand roller and runs roller over folded edges to remove air bubbles. Removes last from jig holder, places aside for next worker and repeats entire operation.

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4. Dips lasted shoe in latex: Picks up lasted shoe from work table, dips in latex vat, first standing shoe on toe and then turns shoe down flat on insole. Holds momentarily to absorb latex, removes from vat and sets on drain rack above vat. Repeats operation on next lasted shoe. Checks dip depth with gauge and adjusts latex feed line when necessary.

5. Loads drying oven: Slides lasted shoe on drain rack and across rubber wiper blade to remove excess latex. Turns around and sets shoe on shelf of reel drying oven. Repeats operation, coordinating movements with speed of oven to fill each shelf with eight shoes as it comes in view.

6. Unloads drying oven: Picks up lasted shoe from shelf of drying oven and, holding with both hands, pushes and rolls bottom edges of toe on work bed of oven to secure toe of insole to upper. Turns to conveyor line at side, inserts both pegs of jig holder attached to conveyor line into holes of last and swings last up to position shoe with toe up and insole facing away from worker. Repeats operation, coordinating movements with speed of oven.

7. Attaches toe cap to lasted shoes: Folds back one of the fabric pages that separates prepared sheets of toe caps, picks up sheet of caps and places on work bed of conveyor line. Pulls off single toe cap strip from perforated sheet and holding strip taut by both ends, positions adhesive side on toe of shoe, folding ends back over to adhere to insole. Turns lasted shoe and jig down with insole facing worker. Repeats operation, coordinating movements with speed of conveyor line.

8. Attaches insole binder: Folds back one of the fabric pages that separates prepared sheets of binders and pulls off single binder from perforated sheet. Positions one end on back of heel and centered on upper and insole seam. Rotates shoe with one hand and guides binder along upper and insole seam around shoe to heel overlapping ends. Swings jig and shoe up to position heel to left and insole up for processing by automatic pressure rollers attached to conveyor line. Repeats operation on next shoe, coordinating movements with speed of conveyor line.

9. Unloads and loads conveyor line: Removes lasted shoe from jig holder of conveyor line, turns around and sets shoe on work table. Picks up lasted shoe from outsole press, attaches last to jig holder of conveyor line and swings toe of shoe down with sole facing worker. Repeats operation on next lasted shoe.

10. Attaches outsole: Picks up lasted shoe from work table and turns insole up. Picks up adhesive coated outsole from supply rack, alines heel with heel of insole and sets in place. Turns shoe, alines toe of outside with toe of insole and with slight pressure, sets in place. Places shoe back on work table and repeats operation.

11. Presses outsole to lasted shoe: Picks up lasted shoe with outsole from work table and positions with sole down on sponge pad in bed of press. Trips treadle and at end of cycle, removes shoe and sets aside for loader to attach lasted shoe back on conveyor line. Repeats operation on next lasted shoe.

12. Attaches friction tape to outsole: Folds back one of the fabric pages that separates prepared sheets of 1/2 inch friction tape and pulls off single tape from perforated sheet. Positions one end on back of heel and centered on outsole seam. Rotates shoe with one hand and guides friction tape along outsole seam around shoe to heel overlapping ends.

13. Attaches outsole binder: Folds back one of the fabric pages that separates prepared sheets of binders and pulls off single binder from perforated sheet. Positions one end on back of heel at center and one edge even with bottom edge of outsole, the other overlapping first binder. Rotates shoe with one hand and with fingers of other hand, guides binder around edge of outsole. Matches ends at heel, cuts binder to fit with hand shears and presses end in place. Swings jig up to position shoe with toe up and sole facing away from worker.

14. Attaches toe bumper: Picks up prepared toe bumper from supply table and holds with adhesive side down. Positions on toe of shoe, aligning edge with bottom edge of sole and presses in place. Turns jig and shoe to position heel to left, sole up, for processing by automatic pressure rollers. Repeats operation on next shoe, coordinating movements with speed of conveyor line.

15. Hand rolls edge: Swings lasted shoe down and removes from jig holder of conveyor line. Picks up hand roller and runs roller around edge to remove any air bubbles. Sets shoe aside on work table for next worker and repeats operation.

16. Inspects and trims: Visually inspects finished shoe and sets aside any defective shoe for rework. Picks up hand shears, trims excess binding or material from acceptable shoe and places in holding rack by inserting pegs of jig holder on rack bar into holes of last. Repeats operation on next shoe. Notifies floor boy to remove full rack and replace with empty rack when necessary.

IV. Experimental Battery

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

V. Criterion

The criterion consisted of supervisory ratings made on an adaptation of Descriptive Rating Scale developed by the United States Employment Service. The first-line supervisors prepared ratings and reratings for each worker with a time interval of two weeks between the first (April 4, 1961) and second ratings (April 18, 1961). The rating scale consisted of six items with five alternatives for each item. The alternatives indicated the degree of job performance attained. Weights of one through five were assigned to each alternative so that the minimum possible score was six and the maximum thirty. The coefficient of reliability between the two ratings was .847, indicating a high significant relationship. The final criterion score consisted of the sum of the two ratings. The distribution of final criterion scores ranged from 24 to 59 with a mean of 44.02 and a standard deviation of 7.501.

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:

Form Perception (P) - required to visually inspect finished shoe and set aside defective shoe ; and to visually inspect all materials for flaws and defects.

Motor Coordination (K) - required to coordinate movements with speed of oven, conveyer line and outside press.

Finger Dexterity (F) and Manual Dexterity (M) - required for rapid and coordinated use of hands and fingers to position lasts on conveyor line, to turn and position work, and to assemble parts to form shoe.

On the basis of the job analysis data, V-Verbal 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 = 50

Aptitudes	M	σ	r
G-Intelligence	84.9	11.2	.101
V-Verbal Aptitude	90.6	12.6	-.038
N-Numerical Aptitude	82.0	14.9	.153
S-Spatial Aptitude	85.4	12.8	.101
P-Form Perception	92.0	16.6	.256
Q-Clerical Perception	94.7	13.4	.081
K-Motor Coordination	99.4	14.9	.163
F-Finger Dexterity	88.3	18.0	.074
M-Manual Dexterity	98.0	17.5	.211

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									
Aptitudes to be Considered for Trial Norms						Q	K		M

Trial norms consisting of various combinations of Aptitudes Q, K 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 Q-75, K-75 and M-85 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 34 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 Q, K and M with critical scores of 75, 75 and 85, respectively, and the dichotomized criterion for Assembler 6-61.688. 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 6-61.688
(Q-75, K-75, M-85)

N = 50	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	5	28	33
Poor Workers	8	9	17
Total	13	37	50

Phi Coefficient = .35
χ^2 = 5.950
P/2 < .01

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 Q, K and M with minimum scores of 75, 75 and 85, respectively, have been established as B-1002 norms for Assembler 6-61.688. The equivalent B-1001 norms consist of Q-70, T-70 and M-90.

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.