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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

TABLE WORKER 8-53.01

B-244
or
S-28

U. S. Employment Service in
Cooperation with
New Jersey State Employment Service

U. S. DEPARTMENT OF LABOR
Bureau of Employment Security
Washington 25, D. C.
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STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR TABLE WORKER 8-53.01

B-244 or S-28

Summary

The General Aptitude Test Battery was administered to 63 women, 35 of whom were employed as Table Workers and Machine Tenders 8-53.01, 13 as Machine Operators 6-53.149, and 15 as Senior Operators, in the Packaging Department of the Schering Corporation, Union, New Jersey. The purpose of the study was to develop GATB norms for the occupation of Table Worker 8-53.01. Seventeen workers were eliminated from the sample, reducing the final sample to 46. The criterion used in this study was supervisory ratings.

On the basis of mean scores, correlations with the criterion, job analysis data and their combined selective efficiency, the following aptitudes were found to be significant for the job of Table Worker: Aiming (A), Motor Speed (T), Finger Dexterity (F), and Manual Dexterity (M).

GATB Norms for Table Worker 8-53.01 - B-244 or S-28

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Table Worker 8-53.01.

TABLE I

Minimum Acceptable Score on B-1001 and B-1002 for B-244 or S-28

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
A	CB-1-C CB-1-K	85	K	Part 8	95
T	CB-1-G CB-1-K	90	F	Part 11 Part 12	90
F	CB-1-O CB-1-P	95	M	Part 9 Part 10	90
M	CB-1-M CB-1-N	95			

Effectiveness of Norms

The data in Table IV indicate that 10 of the 17 poor workers, or 59 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 59 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 23 of the 30 workers who made qualifying test scores, or 77 percent, were good workers.

TECHNICAL REPORT

I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the GATB for the occupation of Table Worker 8-53.01.

II. Sample

The experimental sample consisted of 35 Table Workers and Machine Tenders, 13 Machine Operators, and 15 Senior Operators (a total of 63 female workers) in the Packaging Department of the Schering Corporation in Union, New Jersey. This represented almost 100 percent of the plant population engaged in these occupations. The duties of the jobs of Table Worker and Machine Tender are interchangeable. The job of Machine Operator is a promotion from Table Worker and/or Machine Tender, and promotion is based almost entirely upon proficiency in the latter occupation. All of the Machine Operators were former Table Workers or Machine Tenders. It is a valid assumption that the Machine Operators are superior Table Workers. The position of Senior Operator is promotional from Machine Operator, with promotion based upon job performance, seniority, and supervisory ability as determined subjectively by the department foreman or Production Manager. It cannot be assumed that the Senior Operators are superior Machine Operators, since the factors of supervisory ability and seniority, rather than production proficiency, are predominant in determining promotion. In view of this, the Senior Operators were eliminated from the sample. The elimination of two 55 year old Table Workers because of age reduced the final sample to 46.

The Minnesota Manual Dexterity Test, and another apparatus test developed by the Personnel Manager were used by the company as selection aids when hiring Table Workers. No norms had been developed, but an arbitrary cut-off score had been established. A maximum age limit of 35 years and a minimum educational requirement of six years were included in the hiring specifications. Age and educational requirements were waived in lieu of previous experience in the occupation.

Table II shows the means, standard deviations, Pearson product-moment correlations with the criterion, ranges, and the standard errors of correlation for age, education, and experience.

TABLE II

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

Table Worker 8-53.01
N = 46

	M	σ	Range	r	σ_r
Age (years)	25.8	7.8	18-48	.276	.136
Education (years)	10.4	1.7	6-12	-.287	.135
*Experience (months)	15.9	20.9	1-84	.266	.137

*N = 33 since previous experience of the Machine Operators as Table Workers was not available.

The data in Table II indicate that this sample is suitable for test development purposes with respect to age, education and experience. None of the three variables shows significant correlation with the criterion.

III. Job Description

Job Title: Table Worker 8-53.01

Job Summary: Packages tablets, ampules, bottles and tubes of pharmaceuticals by hand in individual or nested cardboard containers; encloses appropriate printed inserts; closes and seals lids with gummed paper. Prepares small bottles for filling by air-cleaning bottles and inserting cotton in mouths of bottles before and after filling; caps bottles by hand. Pastes labels on bottles and packages, and packs individual containers into larger packages and cartons.

Work Performed:

NOTE: Each element of this job is performed by an individual worker. However, the workers are interchangeable and rotate among the various job elements.

1. Prepares for work: Dons a short-sleeved uniform and a peaked cap made of net-like material, as a measure of safety and cleanliness. Receives assignment from Forelady and takes a position at a bench in close proximity to five or six other workers. Receives verbal instructions from Line Leader as to the type of product to be packaged, product order number, batch number and quantity. Prepares a daily time report in writing, containing worker's name, date and data on type and quantity of product packaged, and submits report to the Line Leader at the end of each day.

2. Packages small bottles of liquid hormones by performing one of the following tasks:

   a. Positions small oblong card boxes, supplied by the Line Leader, within easy reaching distance of sitting position. Reaches forward, grasps a single box, removes the cover and places the open box, with the cover to the right of it, on a moving conveyor belt preparatory to insertion of bottles in box by another Table Worker.

   b. Reaches forward with left hand, takes a capped and labeled bottle from the moving conveyor belt, which was deposited there by the Labeling Machine Tender, and visually inspects it for defective cap or a torn label. Places bottle in the nearest open oblong box and encloses a printed descriptive circular.

   c. Picks up a box containing a bottle and circular with left hand as it moves by on a conveyor belt and, with right hand, places the box cover over it. Places the covered box in a metal track which guides it to another Labeling Machine Tender where a label is glued to the cover of the box.

d. Picks up a printed flat cardboard folding box, of a size large enough to contain six individual boxes, from a pile previously supplied by the Line Leader, shapes it into rectangular form with both hands, folds in the side flaps and secures the bottom flap by folding and inserting the end tab into the completed box. Secures six filled individual labeled boxes deposited on the moving conveyor belt by the Labeling Machine Tender and inserts them into the pre-shaped box. Folds in the top side flaps and closes the top by inserting the end tab into the box.

e. Reaches forward and picks up a flat corrugated shipping carton, large enough to accommodate 72 half-doze size boxes (described in d above), previously supplied by the Line Leader, and shapes it with both hands into rectangular form by folding the bottom flaps. Inserts 72 boxes, each containing a half-dozen of the individual boxes, arranging them neatly in layers so that they fill the shipping carton completely. Folds in the top flap and, with wetted slips of gummed paper taken from a device containing a large roll of it, proceeds to secure the side flaps and top and bottom in such a manner that the package, now weighing approximately 30 lbs., is ready for shipment.

3. Packages penicillin tablets by performing one of the following tasks:

a. Prepares a small cardboard box as in 2a above.

b. Reaches forward and selects two cellophane foil strips containing two tablets each from a supply previously deposited there by the Line Leader. Visually inspects each strip to make sure that it contains the required number and type of tablets. Inserts the two strips into the open box and permits it to continue on the conveyor belt to the two adjoining Table Workers who likewise insert two strips each into the box until it contains six strips in all.

c. Selects a printed circular from a supply previously deposited there by the Line Leader, inserts into the filled box, puts the cover on, and replaces it on the conveyor belt which carries the box to the Machine Operator to be labeled.

d. Reaches forward for a printed rectangular cardboard sleeve of a size to slide over the filled box and examines it for indicated strength, batch number, and expiration date. Slides the sleeve over the box and replaces it on the conveyor belt.

e. Repeats process as in 2e with a smaller corrugated shipping carton.

4. Packages ampules by performing one of the following tasks:

a. Reaches forward to a supply of small oblong cardboard containers previously placed there by the Line Leader and selects one. Selects one ampule from a stock and visually inspects it to see if the batch number coincides with that on the daily time report and whether the printing is legible. Squeezes the edges of the cardboard container with the thumb and index finger of the left hand to create an opening and inserts the ampule into it. Prefolds side flaps, but leaves top and bottom lid open to be sealed by a machine at a later operation. Assembles them in groups of five and feeds them to a Carton Sealing Machine Operator.

b. Selects a cardboard carton of a size large enough to accommodate 50 individual ampules, boxes and shapes it into form, sealing the end lid with gummed tape. Fills the carton with filled ampule boxes received from the sealing machine, placing them neatly in layers until carton contains exactly 50 ampules. Inserts a printed circular and a small metal ampule file, used to remove the ends of the ampules, into the carton and seals the flaps and top lid with gummed tape.

c. Places 36 cartons in a large corrugated shipping carton, proceeding as in 2e.

5. Packages Baravit bulk laxative in granular form by performing one of the following tasks:

a. Prepares a folding printed cardboard box by shaping it into form and seals one end of it with gummed tape. Inserts a rectangular shaped glassine bag into the box and passes it to a filler.

b. Receives the box filled with granular pharmaceuticals and folds the open end of the bag over so that contents do not spill out. Encloses a printed instruction sheet and closes the top lid of the box, securing it with gummed tape.

c. Prepares a corrugated shipping carton of a size to accommodate 24 individual boxes and proceeds as in 2e.

6. Packages bottles of tablets by performing one of the following tasks:

a. Selects a small bottle of a size to accommodate 1,000 tablets from a supply previously deposited there. Holds bottle upside down with the neck over a thin air jet. Releases a stream of air by stepping on a pedal and manipulates bottle so that all foreign matter and particles are removed. Inserts a strip of cotton into the bottle and pushes it to the bottom with a round stick. Hands the bottle to a Filling Machine Operator to be filled.

b. Inserts a strip of cotton into the neck of the bottle to keep the contents from spilling out when turned upside down. Holds the bottle in that position over a glue pad so that the mouth of the bottle receives a coat of glue.

c. Selects a metal or plastic threaded cap containing a waxed safety seal liner from a supply previously placed there. Receives the filled bottle from the Table Worker who deposited glue on the mouth of it and screws on the cap with the fingers of the right hand, tight enough so that the seal liner becomes glued to the mouth of the bottle. Passes bottle to another Table Worker to be labeled by a hand labeler.

d. Prepares a one-piece corrugated box by shaping it into form with the hands. Inserts filled bottle and seals carton by applying wetted gummed paper strips from a device containing a roll of such paper.

e. Selects an appropriate printed label and applies a coat of glue to the reverse side by pulling it over a small drum immersed in a glue container. Applies the label to the individual cartons, visually observing that it is on correctly.

f. Prepares a shipping carton of a size to accommodate 18 individual cartons by proceeding as in 2e.

7. Packages bottled Chlor Trimeton allergy tablets by performing one of the following tasks:

a. Receives filled, capped and labeled bottles, each containing 100 allergy tablets from a Punching Machine Operator. Holds bottle in left hand and with fingers of right hand smooths down the label so that it does not curl up. Inserts bottles in nested cardboard boxes that accommodate 12 bottles each, and have been previously placed there by Line Leader.

b. Selects a printed label from a supply nearby and applying a coat of glue by holding it over a drum immersed in a glue container places it on the front of the nested carton containing the filled bottles. Smooths the edges of the label down with the fingers of the right hand.

c. Prepares a shipping carton large enough to accommodate 16 nested cartons and proceeds as in 2e.

8. Packages tubes containing pharmaceutical creams by performing one of the following tasks:

a. Receives filled tubes of pharmaceuticals in cream form from a Filling Machine Tender. Checks the weight of the tubes by placing approximately each fiftieth tube on a small balancing scale and advises the Machine Tender and Line Leader if the weight of the contents has changed. Discards tubes with incorrect weight and keeps closer check on tubes until proper weight and package quality is restored. Places each tube into the original nested box from which it was removed to be filled. Closes the top lid of the carton and secures it in place with gummed cellulose tape when it is filled with six dozen tubes.

b. Prepares a shipping carton and proceeds as in 2e.

9. Packages 1 oz. to 16 oz. bottles containing liquid pharmaceuticals by performing one of the following tasks:

a. Receives filled, capped and labeled bottles containing liquid pharmaceuticals from Filling Machine Operator and visually inspects each for defective label or cap. Inserts bottles in individual folding or shipping cartons.

b. Inserts an eye dropper in instances when the bottles being packaged contain pharmaceuticals for the treatment of eye disorders.

c. Prepares a shipping carton and proceeds as in 2e.

10. Packages Saraka in cardboard boxes by performing one of the following tasks:

a. Prepares a printed folding box, large enough to contain 24 oz. of a granular bulk laxative, by folding down the flaps and bottom lid. Places formed box with top lid open on a moving conveyor or belt which moves it to a Filling Machine Operator.

b. Receives filled boxes from Machine Tender and spot checks for weight of contents by placing a box on an indicating scale from time to time. Advises the Machine Tender and Line Leader if weight of contents is to be corrected. Closes top lid of box and places it on a moving conveyor belt which feeds it through a gluing and sealing machine.

c. Prepares a shipping carton large enough to accommodate one dozen individual boxes and proceeds as in 2e.

IV. Experimental Battery

All of the tests of the GATB, B-1001, were administered to the sample.

V. Criterion

Workers in each group were ranked according to job proficiency by a conference of supervisors consisting of the General Foreman, the Production Manager, and the Personnel Manager. In varying degrees, each of these had knowledge of the relative efficiency of each of the workers. Then the forelady of the Table Workers and Machine Tenders made an independent ranking of all the Table Workers (N = 33) based on job proficiency, and the forelady of the Machine Operators made an independent ranking of the 13 Machine Operators. Linear values were assigned each of the rankings and product-moment correlations were calculated. The ranking of the forelady of the Table Workers correlated .807 with the combined ranking of the supervisors. A correlation of .885 was found between the two rankings of the Machine Operators. Both correlations indicate high reliability of the rankings. Since the forseladies are more closely associated with the workers, it was assumed that they were in a better position to evaluate relative performance of the workers, and therefore the rankings of the foreladies were used for validation purposes.

Since the job of Machine Operator is promotional from Table Worker and based upon superior performance as a Table Worker, it was assumed, for statistical analysis, that the two samples could be grouped and considered as a single sample, with the Machine Operators assigned the highest criterion scores. The ranks were converted to linear scores and correlations were then calculated by the product-moment method.

VI. Statistical and Qualitative Analysis

Table III shows means, standard deviations, Pearson product-moment correlations with the criterion, and standard errors of correlation for the aptitudes of the GATB.

The means and standard deviations of the aptitudes are comparable to general population norms with a mean of 100 and a standard deviation of 20.

TABLE III

Means (M), Standard Deviations (σ),
Pearson Product-Moment Correlations with the Criterion (r)
and Standard Errors of Correlation (σ_r)
for the Aptitudes of the GATB

Table Worker 8-53.01
N = 46

Aptitude	M	σ	r	σ_r
G - Intelligence	91.4	12.5	-.186	.142
V - Verbal Aptitude	93.3	12.7	-.276	.136
N - Numerical Aptitude	91.3	13.9	-.136	.145
S - Spatial Aptitude	88.2	17.3	-.027	.147
P - Form Perception	101.7	19.8	-.140	.145
Q - Clerical Perception	100.0	14.3	-.028	.147
A - Aiming	99.6	13.7	.099	.146
T - Motor Speed	102.5	13.7	.112	.146
F - Finger Dexterity	118.0	20.5	.162	.144
M - Manual Dexterity	112.6	17.0	.319*	.132

*Significant at the .05 level.

The statistical results were analyzed in conjunction with the job analysis data. On the basis of job analysis data the following aptitudes appear to be important for the occupation of Table Worker:

Eye-Hand Coordination (A) - is required for selecting items to be packaged (products, inserts, containers) from moving conveyor belt.

Motor Speed (T) - is required in feeding empty boxes and bottles into filling-machines and in feeding boxes into gluing and sealing machines.

Finger Dexterity (F) - is required for fingering small bottles, printed inserts and other items in the packaging process; in folding in flaps and tabs of cardboard containers; in opening ampule containers; and in screwing metal and plastic caps on bottles.

Manual Dexterity (M) - is required in placing open containers on conveyor belt, removing packages from conveyor and in packaging smaller containers into larger packages.

Clerical Perception (Q) - is required in checking batch numbers, order numbers and expiration dates.

Form Perception (P) - is required in selecting containers of proper size and shape.

When N = 46, correlations of .288 and .372 are required for significance at the .05 and .01 levels respectively. Aptitude M shows the only significant correlation with the criterion. The validity coefficient obtained for Aptitude M is significant at the .05 level.

Aptitudes F and M have the highest mean scores for this sample. Aptitudes P, Q, A and T also show relatively high means.

Since there was statistical and qualitative evidence showing the importance of Aptitudes A, T, F, and M, these aptitudes were selected for inclusion in the test norms. Although there was some evidence indicative of the importance of Aptitudes P and Q, these indications were not strong enough to warrant the inclusion of Aptitudes P and Q in the final test norms. Cutting scores were set at one standard deviation unit below the mean of each aptitude and rounded to the nearest five-point score levels. This resulted in cutting scores of 85, 90, 95 and 95 for Aptitudes A, T, F and M, respectively.

VII. Concurrent Validity of Norms

In order to compute the tetrachoric correlation coefficient between the test norms and the criterion, and to apply the Chi Square test of significance of the relationship between the test norms and the criterion, the criterion was dichotomized. Approximately one-third of the sample was placed in the low criterion group.

Table IV shows the selective efficiency of the norms for this sample. Workers who were placed in the high criterion group were designated as "good workers" and those who were placed in the low criterion group were designated as "poor workers."

TABLE IV

Relationship Between Test Norms Consisting of Aptitudes A, T, F, and M with Critical Scores of 85, 90, 95, and 95 Respectively and the Criterion for

Table Worker 8-53.01
N = 46

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	6	23	29
Poor Workers	10	7	17
Total	16	30	46

$r_{tet} = .59$ $\quad X^2 = 5.292$

$\sigma_{r_{tet}} = .24$ $\quad p/2 < .025$

The data in Table IV show a significant relationship between the test norms and the criterion for this sample.

VIII. Conclusions

On the basis of mean scores, correlations with the criterion, job analysis data and their combined selective efficiency, it is recommended that Aptitudes A, T, F and M with critical scores of 85, 90, 95 and 95, respectively, be used as B-1001 test norms for Table Worker 8-53.01. Equivalent B-1002 test norms consist of K - 95, F - 90 and M - 90.