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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)

FINAL REPORT

TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

SCRAPPER (paper goods) ~~8-42.01~~ 794.887

~~B-330~~
S-83

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

U. S. DEPARTMENT OF LABOR

Washington 25, D. C.
April 1956

GATB #845
March 1950
March 1955

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR SCRAPPER (paper goods) 794.887

S-83

Summary

The General Aptitude Test Battery, B-1001, was administered for a longitudinal design test development study to 53 male applicants who were subsequently hired by the Marathon Corporation, Menasha, Wisconsin, for the occupation of Scrapper (paper goods) 794.887 during the period of March 1950 through March 1955. The criterion consisted of supervisory ratings which were expressed in broad categories. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data and their combined selective efficiency, Aptitudes P-Form Perception and M-Manual Dexterity were selected for inclusion in the test norms.

GATB Norms for Scrapper (paper goods) 794.887

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Scrapper (paper goods) - 794.887

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for - S-83

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
P	CB-1-A CB-1-L	95	P	Part 5 Part 7	95
M	CB-1-M CB-1-N	90	M	Part 9 Part 10	85

Effectiveness of Norms

The data in Table IV indicate that 9 of the 15 poor workers, or 60 percent of them did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 60 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 32 of the 38 workers who made qualifying test scores, or 84 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 General Aptitude Test Battery for the occupation of Scrapper (paper goods) 794.887

II. Sample

The General Aptitude Test Battery, B-1001, was administered during the period of March 1950 through March 1955 to 54 male applicants who were subsequently employed as Scrapper (paper goods) 794.887 at the Marathon Corporation, Menasha, Wisconsin. All of these men were hired without regard to test scores. One applicant was eliminated from the sample for failure to report for the apparatus testing. This resulted in a final sample of 53 workers.

One month of experience was considered to be the average length of time for a valid job performance rating to be obtained. All of the men in the sample were considered to be experienced workers. Although there were no age or education requirements, the company preferred to hire workers between the ages of 18-25 who had at least some high school education. However, these restrictions were not adhered to in a tight labor market. Hiring was done by means of a personal interview and a check of references. Each employee was required to pass a physical examination and a color vision test which was administered by the company.

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

Scrapper (paper goods) 794.887
N = 53

	M	σ	Range	$_c r$
Age (years)	23.7	4.1	19-40	.199
Education (years)	10.8	1.9	7-14	.086
Experience (months)	29.4	10.6	2-51	.349*

*Significant at the .05 level

The correlations between age and education and the criterion are not significant. However, the correlation between experience and the criterion is significant at

the .05 level. The criterion was not corrected to nullify the influence of experience because the ratings were expressed in broad categories and the statistical correction technique used for this purpose was not applicable. The data indicate that this sample is suitable for test development purposes with respect to age, education, and experience.

III. Job Description

Job Title: Scrapper (paper goods) 794.687

Job Summary: Removes waste material from stacks of carton stock which have been scored and cut on miehle press. Inspects cartons for defects, discards defective cartons, sorts cartons, and places stacks of cartons on floor skids for further processing.

Work Performed: Removes waste materials and inspects cartons: Adjusts jogger mechanism at discharge end of press to assure proper stacking of scored and cut sheets. Lifts stacks of sheets from bed at discharge end of press and places on steel top table, working alone or in cooperation with another Scrapper. Pounds off waste material around edges and in center of stack of sheets with special stripping hammer and pulls loose waste from stack by hand, exercising caution to avoid striking useable portions of cartons with hammer. Inspects cartons for defects, discards defective products and notifies Press Feeder or Foreman when defective products are coming off press.

Sorts cartons: Sorts stripped stacks of cartons according to style of carton, brand name or marker appearing on product and jogs into orderly stacks on table. May brush remaining fine waste from stacks with wire brush. Piles stacks of cartons on floor skids in orderly fashion.

Maintains work area: Pushes waste material down chute in floor under table, using broom, and places defective cartons in box for further sorting. May pull loaded skids away from stripping area when Stock Carriers are busy. Keeps work area neat and clean.

IV. Experimental Battery

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

V. Criterion

The criterion data were collected during the period of June 1 through June 3, 1955. The criterion consisted of supervisory ratings made by the department supervisor, the three shift foremen, and five assistant foremen. Each rater divided the workers under his supervision into three categories, above average, average, and below average, and also ranked the workers in the order of ability. This resulted in a varying number of ratings for each worker. For the final composite broad category criterion, each worker was placed in the category of the mode of his ratings. For statistical purposes these broad category ratings were converted to quantitative scores. The above average group with 14 workers, the average group with 24 workers and the below average group with 15 workers received scores of 62, 50, and 38, respectively.

VI. Statistical and Qualitative 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 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 ($_cr$) for the Aptitudes of the GATB

Scrapper (paper goods) 794.887

N = 53

Aptitudes	M	σ	$_cr$
G-Intelligence	103.6	15.6	.156
V-Verbal Aptitude	96.4	16.1	.065
N-Numerical Aptitude	101.9	16.7	.160
S-Spatial Aptitude	109.1	15.4	.197
P-Form Perception	108.3	15.0	.382**
Q-Clerical Perception	91.1	13.7	.192
A-Aiming	101.3	18.3	.231
T-Motor Speed	92.5	18.1	.294*
F-Finger Dexterity	98.9	17.2	.375**
M-Manual Dexterity	106.1	22.3	.361**

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

The statistical results were interpreted in the light of the job analysis data. The job analysis indicated that the following aptitudes measured by the GATB appear to be important for this occupation:

Intelligence (G) - required to learn types and brands of stock being processed and to learn the sorting symbols.

Form Perception (P) - required in visually inspecting scored carton stock for defective scoring or coloring.

Manual Dexterity (M) - required in handling and sorting carton stock and in pounding with a hammer.

The highest mean scores were obtained in descending order of magnitude for Aptitudes S, P, and M, respectively. All of the aptitudes, except Aptitude M have standard deviations of less than 20, with Aptitude Q exhibiting the smallest standard deviation.

When N=53, correlations of .351 and .271 are significant at the .01 level and the .05 level, respectively. Aptitudes P, F, and M correlate significantly with the criterion at the .01 level and Aptitude T correlates significantly with the criterion at the .05 level of confidence.

Aptitudes P, T, F, and M were considered for inclusion in the test norms on the basis of the quantitative and qualitative factors cited above. Aptitudes P and M showed high mean scores, significant correlations with the criterion, and both aptitudes appeared to be important in terms of the job analysis data. Although Aptitudes T and F were not readily apparent in the job analysis, both of those aptitudes showed significant correlations with the criterion.

Tetrachoric correlations with the criterion were computed for several sets of trial norms consisting of various combinations of Aptitudes P, T, F, and M and appropriate cutting scores. However, the addition of Aptitude T or F tended to lower the selective efficiency of norms which included Aptitudes P and M. Therefore, Aptitudes T and F were excluded from the final test norms which included Aptitudes P and M. The cutting score for Aptitude P was set at one standard deviation unit below the mean and rounded to the nearest five-point score level. The cutting score for Aptitude M was set at one standard deviation unit below the mean, rounded to the nearest five-point score level and adjusted to the next higher five-point score level. Setting cutting scores at these levels yielded the best selective efficiency for the norms and resulted in critical scores of 95 and 90 for Aptitudes P and M, respectively.

Although Aptitude G appeared to be important on the basis of job analysis data, there was no substantial statistical evidence of significance which warranted its inclusion in the test norms. Although Aptitude S showed the highest mean score for the sample, there was no other statistical evidence of its significance and Aptitude S did not appear to be important in terms of the job analysis data. Therefore, neither Aptitude G nor S was included in the test norms.

VII. Predictive Validity of Norms

For the purpose of computing the tetrachoric correlation coefficient between the test norms and the criterion and applying the Chi Square test, the criterion was dichotomized with those workers rated as "above average" and "average" placed in the high criterion group, and with those rated as "below average" placed in the low criterion group. This placed 15 of the 53 workers, or 28 percent of the sample, in the low criterion group.

Table IV shows the relationship between the dichotomized criterion and test norms consisting of Aptitudes P and M with critical scores of 95 and 90, respectively and the criterion for Scrapper (paper goods) 794.887. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV

Relationship between Test Norms Consisting of Aptitudes P and M with Critical Scores of 95 and 90, Respectively and the Criterion for Scrapper (paper goods) 738.687

N = 53

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	6	32	38
Poor Workers	9	6	15
Total	15	38	53

$r_{tet} = .68$ $\quad X^2 = 8.295$

$\sigma_{r_{tet}} = .24$ $\quad P/2 < .005$

The data in the above table indicate 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, Aptitudes P and M with minimum scores of 95 and 90, respectively, are recommended as B-1001 norms for the occupation of Scrapper (paper goods) . The equivalent B-1002 norms consist of P-95 and M-85.

IX. Determination of Occupational Aptitude Pattern

When the specific test norms for an occupation include two aptitudes, only those occupational aptitude patterns which include the same two aptitudes with cutting scores that are within 10 points of the cutting scores established for the specific norms are considered for that occupation. The only one of the existing 17 occupational aptitude patterns which meets these criteria for this study is OAP-15, which consists of P-85, T-80, and M-85 for B-1001. The selective efficiency of OAP-15 for this sample was determined by means of the tetrachoric correlation technique. The relationship between OAP-15 and the criterion for this sample was not significant. Therefore, none of the existing 17 occupational aptitude patterns is recommended for Scrapper (paper goods) . However, the data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.