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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

PAPER SORTER AND COUNTER 6-41.940

B-360 or S-104

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

U. S. DEPARTMENT OF LABOR
Bureau of Employment Security
Washington 25, D. C.
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GATB #2130
Summer 1956

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR PAPER SORTER AND COUNTER 6-41.940

B-360 or S-104

Summary

The General Aptitude Test Battery, B-1002A, was administered to a sample of 59 women employed as Paper Sorters and Counters 6-41.940 at the Whiting-Plover Paper Company, Stevens Point, the Flambeau Paper Company, Park Falls, the Bergstrom Paper Company, Neenah, and the Neenah Paper Company, Neenah, Wisconsin. The criterion consisted of broad category supervisory ratings. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data and their combined selective efficiency, Aptitudes P-Form Perception, K-Motor Coordination, F-Finger Dexterity and M-Manual Dexterity were selected for inclusion in the test norms.

GATB Norms for Paper Sorter and Counter 6-41.940 - B-360 or S-104

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Paper Sorter and Counter 6-41.940.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for B-360 or S-104

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
P	CB-1-A CB-1-L	80	P	Part 5 Part 7	80
T	CB-1-G CB-1-K	85	K	Part 8	90
F	CB-1-O CB-1-P	80	F	Part 11 Part 12	75
M	CB-1-M CB-1-N	80	M	Part 9 Part 10	80

Effectiveness of Norms

The data in Table IV indicate that 13 of the 16 poor workers, or 81 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 81 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 35 of the 38 workers who made qualifying test scores, or 92 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 Paper Sorter and Counter 6-41.940.

II. Sample

The General Aptitude Test Battery, B-1002A, was administered on October 5, 1955 to twenty-seven women employed by the Whiting-Plover Paper Company, Stevens Point, Wisconsin; on May 22, 1956 to nine women employed by the Flambeau Paper Company, Park Falls, Wisconsin; on July 10 and 11, 1956 to nineteen women employed by the Bergstrom Paper Company, Neenah, Wisconsin; on July 18 and 19, 1956 to eleven women employed by the Neenah Paper Company, Neenah, Wisconsin. The total sample consisted of all workers employed as Paper Sorters and Counters 6-41.940 at these plants. Of the 66 workers tested, 7 were excluded from the final sample; 5 because they were over 55 years of age and two because they had less than a sixth grade education.

There is no experience requirement for this occupation. The minimum age requirement is 18 years. An eighth grade education is preferred, but this has not been a strict hiring requirement. The selection of applicants is made on the basis of a personal interview and a check of references.

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

Paper Sorter and Counter 6-41.940
N = 59

	M	σ	Range	$_{c}r$
Age (years)	30.3	10.5	18-52	-.243
Education (years)	10.3	1.9	6-13	-.044
Experience (months)	52.3	60.8	1-288	.130

There are no significant correlations between age, education or experience and the criterion. The data in Table II indicate that the sample is suitable for test development purposes with respect to age, education and experience.

III. Job Description

Job Title: Paper Sorter and Counter 6-41.940

Job Summary: Sorts, inspects and counts 8-1/2 x 11 to 40 x 60 inch paper. Sorts stacks of paper placed on work bench by sorter tender. Places wooden stick under right edge of paper stack being sorted to assist in picking up sheets with fingers. Picks up sheets, one or two at a time, inspects top sheet for defects and flips sheets upside down onto stack to left of first stack. Inspects bottom of sheet just exposed and depresses lever on tally counter to record number of sheets inspected. Places ream marker in stack when tally counter bell rings. Jogs inspected stack of paper occasionally with wooden paddle to keep paper in alignment. Also places wooden wedges under end and sides of stack to aid in keeping stack straight. Continues inspecting and sorting sheets until center stack is depleted. May help sorter tender line up inspected reams on wooden pallet after removal from sorting bench. Makes out daily report of kinds and amounts of paper sorted. Keeps work bench and work space clean.

IV. Experimental Battery

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

V. Criterion

The criterion consists of supervisory ratings expressed in three broad categories. The ratings for each of the four sub-samples were prepared as follows:

At the Whiting-Plover Paper Company, the foreman of the department prepared two sets of independent broad category ratings for each of the employees in this sub-sample. The first ratings indicated that most of the less experienced workers were rated "below average." Since it was believed that the foreman showed less bias in his preparation of the second ratings, this set of ratings was chosen as the final criterion for this sub-sample.

The workers at the Bergstrom Paper Company were rated independently by the consulting engineer, the finishing room superintendent and the assistant superintendent. For the final criterion each worker was placed in the category of the majority of her broad category ratings.

At the Neenah Paper Company, the department supervisor prepared two sets of independent broad category ratings. These ratings were combined as follows: workers rated above average twice were placed in the high group; workers rated below average twice were placed in the

low group; all other workers, including those rated average twice, one who was rated average and above average, and one who was rated average and below average, were placed in the middle group.

The plant foreman at the Flambeau Paper Company prepared two sets of independent broad category ratings, which were identical.

The broad category ratings of each sub-sample were combined for the final criterion. This placed 17 workers in the "above average" group, 26 workers in the "average" group and 16 workers in the "below average" group. For computational purposes the qualitative ratings were converted to quantitative scores of 62, 50 and 38 for the above average, average and below average groups, 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 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
Paper Sorter and Counter 6-41.940
N = 59

Aptitudes	M	σ	$_c r$
G-Intelligence	92.2	13.1	.248
V-Verbal Aptitude	90.2	10.8	.065
N-Numerical Aptitude	94.7	16.3	.348**
S-Spatial Aptitude	93.8	16.2	.193
P-Form Perception	100.3	17.0	.357**
Q-Clerical Perception	105.4	15.1	.424**
K-Motor Coordination	108.2	15.4	.281*
F-Finger Dexterity	97.3	18.1	.335**
M-Manual Dexterity	101.7	21.1	.215

** 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:

Form Perception (P) - required to inspect sheets of paper for defects and determine if they meet the company's standards for finished paper.

Motor Coordination (K), Finger Dexterity (F) and Manual Dexterity (M) - required to pick up sheets of paper, one or two at a time with fingers, and maintain a rapid working speed; also required to flip sheets over and to place inspected sheets in stacks.

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

For a sample of 59 cases, correlations of .334 and .257 are significant at the .01 level and the .05 level of confidence, respectively. Aptitudes N, P, Q and F correlate significantly with the criterion at the .01 level. Aptitude K correlates significantly with the criterion at the .05 level.

Aptitudes P, K, F and M were considered for inclusion in the test norms on the basis of the qualitative and quantitative factors cited above: all four of these aptitudes appeared to have some importance in terms of job analysis data; Aptitudes P, K and M have relatively high mean scores; and Aptitudes P, K and F have 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, K, F and M and appropriate cutting scores. The results obtained indicated that all four of these aptitudes should be included in the test norms.

The cutting scores for Aptitudes P, K, and F were set at one standard deviation below their respective mean scores and rounded to the lower adjacent five-point score levels. The cutting score for Aptitude M was set at one standard deviation below its mean score and rounded to the nearest five-point score level. Setting cutting scores at these levels yielded the best selective efficiency for the norms and resulted in scores of 80, 90, 75 and 80 for Aptitudes P, K, F and M, respectively.

Although Aptitudes V, N and Q have some evidence of significance statistically, these aptitudes were not considered further for inclusion in the test norms because they did not appear important on the basis of the job analysis data.

VII. Concurrent 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 by placing those workers who were rated "above average" and "average" into the high criterion group and those workers rated "below average" into the low criterion group. So constituted, the low criterion group includes 16 of the 59 workers, or 27 percent of the sample.

Table IV shows the relationship between test norms consisting of Aptitudes P, K, F and M with critical scores of 80, 90, 75 and 80, respectively, and the dichotomized criterion for Paper Sorter and Counter 6-41.940. 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, K, F and M with Critical Scores of 80, 90, 75 and 80, Respectively, and the Criterion for Paper Sorter and Counter 6-41.940

N = 59

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	8	35	43
Poor Workers	13	3	16
Total	21	38	59

$r_{tet} = .83$ $\quad X^2 = 17.323$

$\sigma_{r_{tet}} = .22$ $\quad P/2 \quad .0005$

The data in the above table indicate a high and 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, K, F and M with minimum scores of 80, 90, 75 and 80, respectively, are recommended as B-1002 norms for the occupation of Paper Sorter and Counter 6-41.940. The equivalent B-1001 norms consist of P-80, T-85, F-80 and M-80.

IX. Determination of Occupational Aptitude Pattern

When the specific test norms for an occupation include four aptitudes, only those occupational aptitude patterns which include three of those four aptitudes with cutting scores that are within 10 points of the cutting scores established for the specific norms are considered for that occupation. Three of the existing 22 occupational aptitude patterns meet these criteria for this study. These occupational aptitude patterns and their B-1002 norms are OAP-15, P-85, K-80, M-80; OAP-16, P-75 F-80, M-80; and OAP-17, K-85, F-80, M-80. The selective efficiency of each of these OAP's for this sample was

determined by means of the tetrachoric correlation technique. A significant relationship was obtained between OAP-15 and OAP-16 and the dichotomized criterion, and each of these OAP's screened out a proportion of the sample that was within the required range of .10 to .60. However, the highest tetrachoric correlation, .66 with a standard error of .23, was obtained for OAP-15. The proportion of the sample screened out by OAP-15 was .30. Therefore, it is recommended that OAP-15 be used in counseling for the occupation of Paper Sorter and Counter 6-41.940.