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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 includ (AG)

FINAL REPORT

TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

PEELING-AND-CORING-MACHINE OPERATOR ~~B-94.10~~ 529.886

~~B-545~~ S-92

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

U. S. DEPARTMENT OF LABOR

Washington [illegible], D. C.
November 1956

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STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR PEELING-AND-CORING-MACHINE OPERATOR 529.886

S-92

Summary

The General Aptitude Test Battery, B-1002A, was administered to a sample of 54 women employed as Peeling-and-Coring-Machine Operator 529.886 at the C. H. Musselman Company, Biglerville, Pennsylvania. The criterion consisted of rank order supervisory ratings converted to linear scores. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data and their combined selective efficiency, Aptitudes F - Finger Dexterity, and M - Manual Dexterity were selected for inclusion in the test norms.

GATB Norms for Peeling-and-Coring-Machine Operator 529.886 - S-92

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Peeling-and-Coring-Machine Operator 529.886.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for S-92

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
F	CB-1-O CB-1-P	80	F	Part 11 Part 12	75
M	CB-1-M CB-1-N	75	M	Part 9 Part 10	75

Effectiveness of Norms

The data in Table V indicate that 12 of the 18 poor workers, or 67 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 67 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 29 of the 35 workers who made qualifying test scores, or 83 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 Peeling-and-Coring-Machine Operator 529.886.

II. Sample

The General Aptitude Test Battery, B-1002A, was administered on January 20 and 24, 1956 to a sample of 56 women employed as Peeling-and-Coring-Machine Operators 529.886 by the C. H. Musselman Company, Biglerville, Pennsylvania. There were 400 women employed in this occupation at this company. Practically all of the women on this job were housewives who worked seasonally and most of them were over 45 years of age. The women volunteered to take the test on their own time and were not paid by the company. On the basis of age and education, 64 women were selected to be tested. Of the 64 women selected, 56 were present for testing. Two of the 56 women tested were excluded from the sample because they were not presently employed on the job and could not be rated. Thus the final sample for this study includes 54 women.

There are no age, education or experience requirements for this job. Applicants are usually friends or relatives of those already on the job. The training period consists of one week of on-the-job training under the supervision of the Forelady.

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

TABLE II

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

Peeling-and-Coring-Machine Operator 529.886
N = 54

	M	σ	Range	r
Age (years)	37.4	6.4	23 - 47	-.062
Education (years)	8.5	1.7	4 - 12	-.085
Experience (months)	96.7	54.1	12 - 180	.287*

* Significant at the .05 level

Two workers had less than six years of education, one had five years and the other four years. However, these two workers were retained in the sample because their test scores were not different from those of others in the sample. There are no significant correlations between age or education and the criterion. The significant correlation between experience and the criterion, which is not high in magnitude, may indicate a slight bias on the part of the supervisors in favor of those workers with the most experience, or it may reflect a true relationship between job proficiency and length of experience. Since the criterion consists of subjective ratings, it was not feasible to correct the criterion statistically to nullify the influence of experience. The data indicate that the sample is suitable for test development purposes with respect to age, education and experience.

III. Job Description

Job Title: Peeling-and-Coring-Machine Operator .529.886

Job Summary: Performs any one or all of the following duties in the peeling and coring of apples: Loads machine by reaching into bin containing graded apples, and placing apples, stem sides up, into revolving cups of the Peeling-and-Coring Machine. Picks up from the work table apples which have been ejected by machine and inspects apples for bruises and rot. Removes bad spots with paring knife, allowing waste to fall into special receptacles. Places trimmed apple on vertical rod from which apple drops on to automatic knives for slicing.

IV. Experimental Battery

Parts 3, 5, 7, 8, 9, 10, 11 and 12 of the GATB, B-1002A, were administered to the sample group.

The testing situation was unusual in that the women in the sample had been laid off until spring and had volunteered to take the test on their own time and without compensation from the company. On the morning of January 20, a severe snow storm hampered Employment Service testing personnel in their efforts to get to the plant, which is located in a rural area. The weather also delayed a number of examinees. This loss of time, coupled with the difficulty encountered with some of the women in the use of the separate answer sheet, made it necessary to curtail the testing by omitting those portions of the GATB which the aptitudinal analysis had indicated would not be important for this occupation. This emergency decision was made because the testing personnel had only a limited amount of time to complete the testing and they realized that it would be impossible to administer the entire GATB within the available time period. It is likely that the omission of those portions of the GATB did not affect the outcome of this study.

V. Criterion

The criterion consists of supervisory ratings in rank order. Rank order ratings were made by the three foreladies (Keefauver, Diehl and Tuckey). Each distribution of rank order ratings was converted to linear scores for computational purposes. Table III shows the intercorrelations of ratings made by the three foreladies.

TABLE III

Product-Moment Intercorrelations of Ratings
Made by Three Foreladies

N = 53

Rater	Keefauver	Tuckey
Tuckey	.587	--
Diehl	.611	.771

The intercorrelations indicate that the ratings made by the three foreladies show satisfactory agreement. Therefore, the linear scores based on the ratings made by the three foreladies were averaged in order to obtain the most reliable criterion. The reliability of these average ratings as predicted by the generalized Spearman-Brown Prophecy Formula is .85.

VI. Statistical and Qualitative Analysis

Table IV shows the means, standard deviations and Pearson product-moment correlations 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 IV

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

Peeling-and-Coring-Machine Operator 529.886
N = 54

Aptitudes	M	σ	r
S-Spatial Aptitude	82.7	19.3	.235
P-Form Perception	77.8	21.9	.268*
K-Motor Coordination	88.0	19.6	.081
F-Finger Dexterity	89.1	20.3	.382**
M-Manual Dexterity	89.6	19.5	.263

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

Finger Dexterity (F) - required in removing bad spots with paring knife.

Manual Dexterity (M) - required for reaching into bin containing graded apples, placing apples stem side up into cups of machine, and for picking up apples that have been ejected by machine.

The highest mean scores in decreasing order of magnitude were obtained for Aptitudes M, F and K, respectively. Aptitude S exhibits the smallest standard deviation. When N = 54, correlations of .348 and .268 are significant at the .01 level and the .05 level, respectively. Aptitude F correlates significantly with the criterion at the .01 level of confidence and Aptitude P correlates significantly with the criterion at the .05 level of confidence.

Aptitudes P, F and M were considered for inclusion in the test norms on the basis of the qualitative and quantitative factors cited above. Aptitudes F and M appeared to be important in terms of job analysis data and exhibited the highest mean scores. Aptitudes F and P show 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, F and M with appropriate cutting scores. The best selective efficiency was obtained for norms which included Aptitudes F and M. The addition of Aptitude P to these norms tended to lower the selective efficiency. Therefore, Aptitude P was not included in the test norms. The cutting scores for Aptitudes F and M were set at one standard deviation below their respective mean scores, rounded to the nearest five-point score levels and then adjusted to the next higher five-point score levels. Setting cutting scores at these levels resulted in good selective efficiency and screened out a proportion of the sample which approximated the proportion in the low criterion group. The resulting norms consist of Aptitudes F and M, each with a minimum score of 75. Although a slightly higher tetrachoric correlation with the criterion was obtained with norms consisting of F-75 and M-70, these norms screened out a lower proportion of the sample than the proportion in the low criterion group and it was believed that they would not be as selective as norms consisting of F-75 and M-75 in the screening of applicants.

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 so that one-third of the sample was placed in the low criterion group. Those workers who received an average linear score of 42 or more were placed in the high criterion group. Those workers who received an average linear score of 41 or less were placed in the low criterion group.

Table V shows the relationship between test norms consisting of Aptitudes F and M, each with a critical score of 75 and the dichotomized criterion for Peeling-and-Coring-Machine Operator 529.885. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE V

Relationship between Test Norms Consisting of Aptitudes F and M, Each with a Critical Score of 75 and the Criterion for Peeling-and-Coring-Machine Operator 529.886.

N = 54

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	7	29	36
Poor Workers	12	6	18
Total	19	35	54

$r_{tet} = .69$ $\quad X^2 = 9.755$

$\sigma_{r_{tet}} = .23$ $\quad P/2 < .005$

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 F and M each with a minimum score of 75, are recommended as B-1002 norms for the occupation of Peeling-and-Coring-Machine Operator 529.886. The equivalent B-1001 norms consist of F-80 and M-75.

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. Two of the existing 22 occupational aptitude patterns meet these criteria for this study. These occupational aptitude patterns and their B-1002 norms are OAP-16 (P-75, F-80, and M-80) and OAP-17 (K-85, F-80, and M-80). A significant relationship was obtained between each of these OAP's and the dichotomized criterion. However, the proportion of the sample screened out by OAP-17 was not within the required range of .10 to .60. For OAP-16, a tetrachoric correlation of .49 with a standard error of .22 was obtained. The proportion of the sample screened out by OAP-16 was .57, which is within the range of .10 to .60. Therefore, it is recommended that OAP-16 be used in counseling for the occupation of Peeling-and-Coring-Machine Operator 529.886