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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

MERCHANDISE PACKER (any ind.) 9-68.30

B-431 S-165

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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STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR MERCHANDISE PACKER 9-68.30

B-431

Summary

The General Aptitude Test Battery, B-1002A, was administered to a sample of 77 women employed as Merchandise Packer 9-68.30 by the General Merchandise Corporation, Milwaukee, Wisconsin. The criterion consisted of combined supervisory ratings based on a descriptive rating scale. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes N-Numerical Aptitude, Q-Clerical Perception, F-Finger Dexterity, and M-Manual Dexterity were selected for inclusion in the test norms.

GATB Norms for Merchandise Packer 9-68.30 - B-431

Table I shows, for B-1001 and B-4002, the minimum acceptable score for each aptitude included in the test norms for Merchandise Packer 9-68.30.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for B-431

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
N	CB-1-D CB-1-I	75	N	Part 2 Part 6	70
Q	CB-1-B	85	Q	Part 1	85
F	CB-1-O CB-1-P	75	F	Part 11 Part 12	70
M	CB-1-M CB-1-N	90	M	Part 9 Part 10	85

Effectiveness

The data in Table IV indicate that 21 of the 28 poor workers, or 75 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 75 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 41 of the 48 workers who made qualifying test scores, or 85 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 Merchandise Packer 9-68.30.

II. Sample

The General Aptitude Test Battery, B-1002A, was administered August 5, 6, and 7, 1958 to a sample of 87 women who had been employed as Merchandise Packer 9-68.30, on a seasonal basis during the 1957 season at the General Merchandise Corporation, Milwaukee, Wisconsin. All the workers who indicated that they planned to return for the 1958 season were tested. The selection of workers was made on the basis of a personal interview and a check of references. Two weeks was the average time required for a worker to reach standard production. All the workers in the sample had at least two months of experience. Of the 87 women tested, 10 were eliminated from the sample because they did not return for the 1958 season and they could not be rated by the foremen then in charge. Therefore, the final sample consisted of 77 women.

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

Merchandise Packer 9-68.30

N = 77

	M	σ	Range	r
Age (years)	35.3	8.1	20-56	.146
Education (years)	10.2	1.6	7-12	-.073
Experience (months)	8.2	4.3	2-34	.233*

*Significant at the .05 level

There are no significant correlations between age or education and the criterion. The correlation of .233 between experience and the criterion is significant at the .05 level. This may indicate that those workers who were recalled season after season were better workers, and/or that the supervisors who made the ratings were biased in favor of those workers. The data in the above table indicate that the sample is suitable for test development purposes.

III. Job Description

Job Title: Merchandise Packer 9-68.30

Job Summary: Packs an assortment of pre-assembled merchandise in cardboard cartons or other containers preparatory to shipment. Receives merchandise in tote box. Lifts box from conveyor onto workbench, scans contents and selects appropriate type and size of container for packing. Arranges items in carton, fitting pieces to prevent breakage and embeds them in resilient packing material as excelsior, shredded or crushed paper. Cuts down and folds cartons to size when necessary. Closes and seals carton with gummed tape or wraps cartons in paper when necessary to cover printing on carton. Staples invoices and identifying data to outside of container and affixes gummed labels as needed for mailing instructions. Lifts completed package and empty tote box to conveyor. Keeps working area clear and in working order.

IV. Experimental Battery

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

V. Criterion

The criterion used for this study consisted of supervisory ratings made on a descriptive rating scale. The scale consisted of six items covering important aspects of job performance. Each item had five alternative statements regarding the degree of adequacy of performance - "1" indicating poor performance and "5" indicating excellent performance. The score on the scale for each rating was equal to the sum of the numbers checked for all six items. Ratings were made by the first line supervisor for the 77 workers and each worker was re-rated about two months later. However, there was a change in the supervisory personnel shortly after the first ratings were obtained and only a small number of workers were re-rated by the same supervisor. A product-moment correlation between the two sets of ratings was computed. The obtained correlation was .43 which is significant at the .01 level. The final criterion consisted of a combination of the two sets of ratings. The distribution of the combined ratings ranged from 23 to 46 with a mean criterion score of 37.1 and a standard deviation of 5.7.

VI. Statistical and Qualitative Analyses

A. Statistical Analysis:

Table III 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 III

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

Merchandise Packer 9-68.30

N = 77

Aptitudes	M	σ	r
G-Intelligence	87.6	14.4	.396**
V-Verbal Aptitude	90.3	13.8	.307**
N-Numerical Aptitude	87.8	15.5	.362**
S-Spatial Aptitude	86.9	15.3	.340**
P-Form Perception	90.1	14.1	.427**
Q-Clerical Perception	#98.5	13.0	.418**
K-Motor Coordination	#97.1	14.6	.329**
F-Finger Dexterity	#93.4	17.8	.269*
M-Manual Dexterity	#98.1	19.3	.477**

**Significant at the .01 level
*Significant at the .05 level
#Relatively high mean score

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

For a sample of 77 cases, correlations of .296 and .224 are significant at the .01 level and the .05 level of confidence, respectively. All the aptitudes except Aptitude F correlate significantly with the criterion at the .01 level and Aptitude F correlates significantly with the criterion at the .05 level.

B. Qualitative Analysis:

The job analysis indicated that the following aptitudes measured by the GATB appear to be important for this occupation.

Numerical Aptitude (N) - required to make simple arithmetical calculations in measuring size and weight of parcel to conform to shipping regulations; to recheck items against invoices.

Finger Dexterity (F) and Manual Dexterity (M) - required to place merchandise into container and embed them with packing material; to cut down, fold and handle cartons, to close and seal cartons with paper and tape; and to attach invoices and labels to cartons.

C. Selection of Test Norms:

Based on the quantitative and qualitative evidence cited above, aptitudes G, N, S, P, Q, K, F, and M warranted further consideration for inclusion in the test norms. Table IV shows the quantitative and qualitative evidence for each of these aptitudes.

TABLE IV

Quantitative and Qualitative Evidence for Selecting Aptitudes For Further Consideration For Inclusion in the Test Norms

Evidence	Aptitudes							
	G	N	S	P	Q	K	F	M
Relatively High Mean Score					X	X	X	X
Significant Correlation with the Criterion	X	X	X	X	X	X	X	X
Importance indicated by the Qualitative Analysis		X					X	X

Although Aptitude V had a significant correlation with the criterion, it was eliminated from further consideration for inclusion in the norms because it was considered irrelevant on the basis of the job analysis data.

Various combinations of Aptitudes G, N, S, P, Q, K, F, and M, with appropriate cutting scores were selected as trial norms. The relationship between each set of trial norms and the criterion (dichotomized as indicated in section VII) was determined.

A comparison of the results showed that two sets of B-1002 norms with identical four-way tables had better selective efficiency than any other combination of aptitudes and cutting scores: (1) S-70, Q-85, F-70, and M-85 and (2) N-70, Q-85, F-70, and M-85. In such instances, one basis for selecting final norms is to find which set of norms is more suitable in terms of qualifying for incorporation into the OAP structure. Since neither set could be integrated into the existing OAP structure, those norms for which there was a greater amount of quantitative and qualitative evidence were selected as the final norms. Because Aptitudes Q, F, and M were common to each of the two sets of norms, a comparison of the evidence for only

Aptitudes N and S was necessary. Table IV indicates that Aptitude N was considered important on the basis of the qualitative analysis, and also correlated significantly with the criterion. Aptitude S correlated significantly with the criterion but was not considered important on the basis of the qualitative analysis. Therefore, since there was more evidence for Aptitude N than for Aptitude S, B-1002 norms consisting of N-70, Q-85, F-70, and M-85 were selected as the final norms.

In test development studies an attempt is made to develop a set of norms such that the cutting score for each aptitude included in the norms will be set at a five-point score level close to one standard deviation below the aptitude mean of the experimental sample. Adjustments of cutting scores from one standard deviation below the mean are made to effect better selective efficiency of the norms. In this study the aptitude cutting scores are each within 6 points of one standard deviation below the aptitude mean of the sample.

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 approximately one-third of the sample in the low criterion group. This was accomplished by using a combined descriptive rating scale score of 37 as the criterion critical score, and resulted in 28 of the 77 workers, or 36 percent of the sample, being placed in the low criterion group.

Table V shows the relationship between test norms consisting of Aptitudes N, Q, F, and M with critical scores of 70, 85, 70, and 85 respectively, and the dichotomized criterion for Merchandise Packer 9-68.30. 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 N, Q, F, and M with Critical Scores of 70, 85, 70, and 85 Respectively, and the Criterion for Merchandise Packer 9-68.30.

N = 77

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	8	41	49
Poor Workers	21	7	28
Total	29	48	77

$r_{tet} = .80$ $\quad X^2 = 23.688$

$\sigma_{r_{tet}} = .19$ $\quad P/2 < .0005$

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 mean scores, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes N, Q, F, and M with minimum scores of 70, 85, 70, and 85 respectively, have been established as B-1002 norms for the occupation of Merchandise Packer 9-68.30. The equivalent B-1001 norms consist of N-75, Q-85, F-75, and M-90.

IX. Determination of Occupational Aptitude Pattern

When the specific test norms for an occupation includes 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. Since none of the existing 23 occupational aptitude patterns meet these criteria, the selective efficiency of any existing occupational aptitude pattern was not determined for this sample. However, the data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.