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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 perormance 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
FORMING-PRESS OPERATOR 6-88.627

B-278
or
S-44

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STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR FORMING-PRESS OPERATOR 6-88.627 B-278 or S-44

Summary

The General Aptitude Test Battery, B-1002, was administered to 52 women employed as Forming-Press Operators 6-88.627 by the Thompson Metal Products Company, Plant #2, Madison, Florida. The criterion used was independent supervisory ratings by two line supervisors, verified by independent ratings of the plant manager. The following aptitudes, selected on the basis of mean scores, job analysis data and correlations with the criterion, were included in the test norms for this occupation: Form Perception (P) and Manual Dexterity (M).

GATB Norms for Forming-Press Operator 6-88.627 B-278 or S-44

Table I shows for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Forming-Press Operator 6-88.627.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for Forming-Press Operator 6-88.627

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
P	CB-1-A CB-1-L	75	P	Part 5 Part 7	75
M	CB-1-M CB-1-N	95	M	Part 9 Part 10	90

Effectiveness of Norms

The data in Table V indicate that 10 of the 17 poor workers, or 59% of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 59% of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 28 of the 35 workers who made qualifying test scores, or 80%, 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 Forming-Press Operator 6-88.627.

II. Sample

The total sample tested in June 1953 consisted of 65 female Forming-Press Operators 6-88.627, employed by Thompson Metal Products Company in their #2 plant, located in Madison, Florida. Thirteen of the 65 workers were excluded from the final sample; 12 because of inexperience and one because of low education. This resulted in a final sample of 52. The company prefers to hire women between the ages of 18 and 35 years of age, with not less than a sixth grade education. No experience is required. Final selection of prospective employees is made on the basis of a personal interview and medical examination. Two months is considered the training time necessary to learn the job.

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

TABLE II

Means (M), Standard Deviations (σ), Ranges,
Pearson Product-Moment Correlations (Corrected for Broad Categories)
With the Criterion ($_{c}r$), and the
Standard Errors of Correlation ($\sigma_{c}r$)
For Age, Education, and Experience

Forming-Press Operator 6-88.627
N = 52

	M	σ	Range	$_{c}r$	$\sigma_{c}r$
Age (Years)	25.5	4.6	18-35	-.12	.14
Education (Years)	10.2	1.7	6-12	.15	.14
Experience (Months)	9.8	7.0	3-42	.54	.04

The data in Table II show that there is no significant correlation between age or education and the criterion. The correlation between experience and the criterion is significant at the .01 level. No attempt was made to correct the criterion to nullify the influence of experience because the criterion was based on broad category ratings, to which the statistical correction technique for nullifying the effects of experience is not applicable.

III. Job Description

Job Title: Forming-Press Operator 6-88.627

Job Summary

Operates an electrical, hand-fed forming press to form, trim, skive, cut, strike, punch, perforate, or notch stainless steel stock to make automobile trim.

Work Performed

Loads Forming Press manually. Accurately places stainless steel stock in correct position on lower die according to stops or jibs. Depresses foot pedal or pushes two hand knobs or a series of levers causing the upper die to descend and exert pressure on metal stock in lower die and thus perform desired operation. Observes operation and removes metal stock manually from lower die after upper die has automatically reverted to up position. Visually inspects work performed for accuracy, periodically. Stacks trim on work table or places on slide which conveys trim to next operator for further processing. Periodically cleans wax from dies, using a hard finish cloth.

The following aptitudes measured by the GATB appear to be related to job performance on the basis of the job analysis:

Form Perception (P) - required in visually inspecting items to determine variations in width and length of stock.

Motor Coordination (K) - required to position stock on lower die correctly and rapidly.

Finger Dexterity (F) - required to adjust blank in press properly.

Manual Dexterity (M) - required to move objects from own work bench to machine, remove from machine and stack on next operator's work bench.

IV. Experimental Battery

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

V. Criterion

The criterion consisted of two independent ratings by line supervisors verified by independent ratings by the plant manager. Differences were adjusted in a round table discussion and the results expressed in broad categories. Supervisory personnel were well informed in regard to reasons for providing a valid criterion and the necessity of honest evaluations of each employee's work performance. Great care was exercised by the supervisory personnel in arriving at the final ratings and the criterion is considered a valid measurement of success on the job. In the final criterion the high, middle and low groups included 18, 17 and 17 workers, respectively. The broad category ratings were converted to quantitative values of 61, 50 and 39 for computational purposes.

VI. Statistical and Qualitative Analysis

The aptitudes included in the final norms were selected on the basis of mean scores, job analysis data, and correlations with the criterion. Table III shows the means, standard deviations, Pearson product-moment correlations (corrected for broad categories) with the criterion, and standard errors of correlation for the aptitudes of the GATB. Table IV shows the means, standard deviations, standardized means, standardized standard deviations, Pearson product-moment correlations (corrected for broad categories) with the criterion, and standard errors of the correlation for the tests of the GATB.

The means and standard deviations of the aptitudes and standardized means and standard deviations of the tests 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 (Corrected for Broad Categories)
with the Criterion ($_{c}r$) and
Standard Errors of Correlation ($\sigma_{c}r$)
for the Aptitudes of the GATB

Forming-Press Operator 6-88.627
N = 52

Aptitudes	M	σ	$_{c}r$	$\sigma_{c}r$
G - Intelligence	86.4	13.4	.26	.13
V - Verbal Aptitude	89.9	13.5	.35	.12
N - Numerical Aptitude	86.6	15.0	.24	.13
S - Spatial Aptitude	85.3	14.7	.27	.13
P - Form Perception	90.8	15.8	.50	.10
Q - Clerical Perception	95.1	13.5	.31	.13
K - Motor Speed	95.0	16.9	.29	.13
F - Finger Dexterity	104.7	19.6	.28	.13
M - Manual Dexterity	109.2	15.8	.41	.12

TABLE IV

Means (M), Standard Deviations (σ), Standardized Means (M'), Standardized Standard Deviations (σ'), Pearson Product-Moment Correlations (Corrected for Broad Categories) with the Criterion ($_{o}r$), and Standard Errors of Correlation ($\sigma_{o}r$) for the Tests of the GATB

Forming-Press Operator 6-88.627

N = 52

Tests	M	σ	M'	σ'	$_{o}r$	$\sigma_{o}r$
1 - Name Comparison	42.3	12.1	95	14	.31	.13
2 - Computation	19.6	5.5	87	16	.31	.13
3 - Three-Dimensional Space	11.3	4.5	85	15	.27	.13
4 - Vocabulary	15.0	6.9	90	13	.34	.12
5 - Tool Matching	27.0	5.4	90	15	.46	.11
6 - Aritmetic Reasoning	8.7	2.7	89	13	.07	.14
7 - Form Matching	23.8	7.0	95	20	.40	.12
8 - Mark Making	66.9	8.7	95	17	.29	.13
9 - Place	93.7	7.3	109	17	.42	.11
10 - Turn	103.9	7.7	106	16	.20	.13
11 - Assemble	30.4	4.8	109	21	.22	.13
12 - Disassemble	28.4	2.9	94	16	.33	.12

Aptitudes with the highest mean scores are M and F with scores of 109.2 and 104.7, respectively. Aptitudes P and M are significantly correlated with the criterion at the .01 level, and Aptitudes V, Q, K and F show significant correlation at the .05 level.

On the basis of its high mean score, significant correlation with the criterion and job analysis data, Aptitude M was selected for inclusion in the test norms. On the basis of significant correlation with the criterion and job analysis data, Aptitude P was selected for inclusion in the test norms.

Although Aptitudes V and Q showed significant correlation with the criterion their importance to the job was not apparent in the job analysis. In view of this, Aptitudes V and Q were excluded from the test norms. Aptitudes K and F were excluded from the test norms because of their failure to discriminate effectively between good and poor workers when the criterion was dichotomized. Aptitudes K and F tended to lower the predictive efficiency when added to norms which included Aptitudes P and M.

The cutting score for Aptitude P was set at one sigma below the mean. For Aptitude M the cutting score was set at one sigma below the mean and rounded to an adjacent five-point score level. Setting cutting scores at these levels yielded the best selective efficiency for the norms, and resulted in critical scores of 75 and 90 for Aptitudes P and M, respectively.

For the purpose of computing the tetrachoric correlation coefficient and its standard error and applying the Chi Square test, the criterion was dichotomized by placing those workers who received ratings of High and Average into the high criterion group and those workers who received a rating of Low into the low criterion group.

Table V shows the relationship between test norms consisting of Aptitudes P and M with critical scores of 75 and 90, respectively, and the dichotomized criterion for Forming-Press Operator 6-88.627. 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 P and M with Critical Scores of 75 and 90, Respectively and Criterion for

Forming-Press Operator 6-88.627

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	7	28	35
Poor Workers	10	7	17
Total	17	35	52

$r_{tet} = .60$ $\qquad$ $X^2 = 6.173$

$\sigma_{r_{tet}} = .23$ $\qquad$ $\frac{p}{2} < .01$

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

VII. Conclusions

On the basis of job analysis, mean scores, correlation coefficients, and their combined predictive efficiency, Aptitudes P and M with minimum scores of 75 and 90, respectively, are recommended as norms for Forming-Press Operator 6-88.627. Equivalent B-1001 norms consist of P - 75 and M - 95.