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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)

June 1968 United States Employment Service Technical Report S-418

Development of USES Aptitude Test Battery for Multi-Moulding Unit Operator (dental equip.) 712.884

Heater Operator (dental equip.) 712.884

U.S. DEPARTMENT OF LABOR
MANPOWER ADMINISTRATION

Technical Report on Development of USES Aptitude Test Battery

For . . . .

Multi-Moulding Unit Operator (dental equip.) 712.884

Heater Operator (dental equip.) 712.884

S-418

(Developed in Cooperation with the
Pennsylvania State Employment Service)

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June 1968

FOREWORD

The United States Employment Service General Aptitude Test Battery (GATB) was first published in 1947. Since that time the GATB has been included in a continuing program of research to validate the tests against success in many different occupations. Because of its extensive research base the GATB has come to be recognized as the best validated multiple aptitude test battery in existence for use in vocational guidance.

The GATB consists of 12 tests which measure 9 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, with a standard deviation of 20.

Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, in combination, predict job performance. For any given occupation, cutting scores are set only for those aptitudes which contribute to the prediction of performance of the job duties of the experimental sample. It is important to recognize that another job might have the same job title but the job content might not be similar. The GATB norms described in this report are appropriate for use only for jobs with content similar to that shown in the job description included in this report.

Charles E. Odell

Charles E. Odell, Director
U. S. Employment Service

GATB Study #2702

DEVELOPMENT OF USES APTITUDE TEST BATTERY

For

Multi-Moulding Unit Operator (dental equip.) 712.884-045

Heater Operator (dental equip.) 712.884-036

S-418

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupations of Multi-Moulding Unit Operator (dental equip.) 712.884-045 and Heater Operator (dental equip.) 712.884-036. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
P - Form Perception	70
Q - Clerical Perception	95
M - Manual Dexterity	75

RESEARCH SUMMARY

Sample

66 (14 male and 52 female) workers employed as Multi-Moulding Unit Operators and Heater Operators in Pennsylvania.

Criterion

Supervisory ratings

Design

Concurrent (test and criterion data were collected at approximately the same time.)

Minimum aptitude requirements were determined on the basis of a job analysis and statistical analyses of aptitude mean scores, standard deviations, aptitude-criterion correlations and selective efficiencies.

Concurrent Validity

Phi Coefficient = .35 (P/2 less than .005)

Effectiveness of Norms

Only 76% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the S-418 norms, 86% would have been good workers. Twenty-four percent of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the S-418 norms, only 14% would have been poor workers. The effectiveness of the norms is shown graphically in Table 1:

TABLE 1

Effectiveness of Norms

	Without Tests	With Tests
Good Workers	76%	86%
Poor Workers	24%	14%

SAMPLE DESCRIPTION

Size

N = 66

Occupational Status

Employed workers

Work Setting

Workers were employed at Dentist's Supply Company of New York, York Pennsylvania.

Employer Selection Requirements

Education: None

Previous Experience: None

Tests: None

Other: Interview

Principal Activities

The job duties of each worker are comparable to those shown in the job descriptions in the Appendix.

Minimum Experience

All workers in the sample had at least nine months total job experience.

TABLE 2

Means, Standard Deviations (SD), Ranges and Biserial Correlations with the Criterion (r_{bis}) for age, Education and Experience

	Mean	SD	Range	r_{bis}
Age (years)	34.7	11.3	19-51	-.198
Education (years)	10.8	1.6	7-12	.004
Experience (months)	84.9	118.2	9-366	-.171

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002B, were administered during November 1966.

CRITERION

The criterion data consisted of supervisory ratings of job proficiency made at approximately the same time as test data were collected. The supervisors rated workers into one of two categories, good or poor.

Reliability

Since only one rating was obtained, no measure of criterion reliability is available.

Criterion Dichotomy

The criterion distribution was dichotomized by the company supervisor into high and low groups by placing 24% of the sample in the low group to correspond with the percentage of workers considered unsatisfactory or marginal. Workers in the high criterion group were designated as good workers and those in the low group as "poor workers."

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were selected for tryout in the norms on the basis of a qualitative analysis of job duties involved and a statistical analysis of test and criterion data. Tables 3, 4 and 5 show the results of the qualitative and statistical analyses.

TABLE 3

Qualitative Analysis
(Based on the job analysis, the aptitudes indicated appear to be important to the work performed)

Aptitude	Rationale
P - Form Perception	Checks moulds prior to capping to be sure that proper components match.
K - Motor Coordination	Places component parts of each mould on their respective tracks for the washing operation.
F - Finger Dexterity	Places enamel in moulds with fingers.
M - Manual Dexterity	Uses tools and operates machines in manufacture of plastic and porcelain teeth.

TABLE 4

Means, Standard Deviations (SD), Ranges and Biserial Correlations with the Criterion (r_{bis}) for the Aptitudes of the GATB

Aptitudes	Mean	SD	Range	r_{bis}
G - General Learning Ability	87.6	15.3	54-147	.084
V - Verbal Aptitude	89.8	13.3	68-139	.220
N - Numerical Aptitude	92.1	16.3	52-137	.087
S - Spatial Aptitude	88.1	17.6	51-137	.009
P - Form Perception	100.8	21.0	57-148	.423*
Q - Clerical Perception	106.6	15.8	66-150	.149*
K - Motor Coordination	99.0	18.8	55-146	.333*
F - Finger Dexterity	90.6	23.4	55-133	.346*
M - Manual Dexterity	104.8	22.8	54-166	.529*

*Significant

TABLE 5

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important					X		X	X	X
Irrelevant		O							
Relatively High Mean					X	X			X
Relatively Low Standard Dev.		X							
Significant Correlation with Criterion					X	X	X	X	X
Aptitudes to be Considered for Trial Norms					P	Q	K	F	M

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of a comparison of the degree to which trial norms consisting of various combinations of aptitudes P, Q, K, F and M at trial cutting scores were able to differentiate between the 76% of the sample considered good workers and the 24% of the sample considered poor workers. Trial cutting scores at five-point intervals approximately one standard deviation below the mean are tried because this will eliminate about one-third of the sample with three aptitude norms. For two aptitude trial norms, minimum cutting scores slightly higher than one standard deviation below the mean will eliminate about one-third of the sample; for four-aptitude trial norms cutting scores slightly lower than one standard deviation below the mean will eliminate about one-third of the sample. The Phi Coefficient was used as a basis for comparing trial norms. The optimum differentiation for the occupations of Multi-Moulding Unit Operator (dental equip.) 712.884-045 and Heater Operator (dental equip.) 712.884-036 was provided by the norms of P-70, Q-95 and M-75. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .35 (statistically significant at the .005 level).

TABLE 6

Concurrent Validity of Test Norms, P-70, Q-95, and M-75

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	8	42	50
Poor Workers	9	7	16
Total	17	49	66

Phi Coefficient = .35 Chi Square (X^2_y) = 8.3
Significance Level = P/2 less than .005

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study did not meet the requirements for incorporating the occupation studied into any of the 36 OAP's included in Section II of the Manual for the General Aptitude Test Battery. The data for this sample will be considered for future groupings in the development of new occupational aptitude patterns.

FACT SHEET

Job Title

Multi-Moulding Unit Operator (dental equip.) 712.884-045

Work Performed

Places enamel in moulds with fingers. Applies stain with a small brush to the neck and incisal areas and applies insert stain to face after enamel has been partially cured. Places body material in moulds after stain has been processed.

Caps and uncaps moulds and polymerizes moulding material in heating presses. Operates cooling presses to lower mould temperature for easier handling. Ejects teeth from mould. Accumulates clustered teeth in preparation for heat-treating.

Job Title

Heater Operator (dental equip.) 712.884-036

Work Performed

Ejects the moulded teeth from the moulds after the teeth have been biscuited in the automatic heaters. Removes the top of the mould and knocks teeth out by striking the mould with a wooden mallet after the mould is automatically ejected from the platens.

Places the component parts of each mould on their respective tracks for the washing operation.

May be required to uncap the mould after the veneer has been baked in the heater. Places the bottom part of the mould with the veneer in place on a cooling plate for the Tooth Moulder to apply the body material.

May be required to cap moulds prior to the heating cycle after the Tooth Moulders have placed the material in the tooth cavities.

Effectiveness of Norms:

Only 76% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the S-418 norms, 86% would have been good workers. 24% of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the S-418 norms, only 14% would have been poor workers.

Applicability of S-418 Norms

The aptitude test battery is applicable to jobs which include a majority of job duties described above.

GPO 864-554

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