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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)

January 1969 United States Training and Employment Service Technical Report S-430

Development of USTES Aptitude Test Battery

for

Plastic Trimmer

(dental equip.) 712.887

Inserter

(dental equip.) 712.884

U.S. DEPARTMENT OF LABOR

MANPOWER ADMINISTRATION

Technical Report on Development of USTES Aptitude Test Battery

For . . . . . .

Plastic Trimmer (dental equip.) 712.887
Inserter (dental equip.) 712.884

S-430

(Developed in Cooperation with the
Pennsylvania State Employment Service)

U. S. Department of Labor
Manpower Administration

January 1969

FOREWORD

The United States Training and 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.

GATB Study #2688

DEVELOPMENT OF USTES APTITUDE TEST BATTERY

For

Plastic Trimmer (dental equip.) 712.887-024

and

Inserter (dental equip.) 712.884-043
S-430

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupations of Plastic Trimmer (dental equip.) 712.887-024 and Inserter (dental equip.) 712.884-043. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
N - Numerical Aptitude	85
P - Form Perception	95
M - Manual Dexterity	85

RESEARCH SUMMARY

Sample:

100 female workers employed as Plastic Trimmers and Inserters in Pennsylvania. This study was conducted prior to the requirement of providing minority group information. Therefore, minority group composition is unknown.

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 = .46 ($P/2 < .0005$)

Effectiveness of Norms:

Only 60% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 80% would have been good workers. Forty percent of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 20% 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	60%	80%
Poor Workers	40%	20%

SAMPLE DESCRIPTION

Size:

N = 100

Occupational Status:

Employed workers

Work Setting:

Workers were employed at the 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 description in the Appendix.

Minimum experience:

All workers in the sample had at least six 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)	37.2	10.6	19-63	-.023
Education (years)	10.7	1.7	7-14	.102
Experience (months)	119.8	99.1	6-360	.038

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 into high and low groups by placing 40% 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. Aptitude M which does not have a high correlation with the criterion was considered for inclusion in the norms because the qualitative analysis indicated that the aptitude was important for the job duties and the sample had a relatively high mean score on the aptitude. A relatively high mean with employed workers may indicate some sample pre-selection. 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	Visually inspects teeth for defects. Examines mould to determine enamel material properly placed.
K - Motor Coordination	Places tool against tooth enamel material and draws tool down length of tooth, at the same time pressing level on tool to release material.
F - Finger Dexterity	Grasps tooth between thumb and first finger, presses and revolves tooth against wheel.
M - Manual Dexterity	Removes flashing on the carborundum wheel.

TABLE 4

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

Aptitude	Mean	SD	Range	r_{bis}
G - General Learning Ability	89.1	14.7	53-133	.393*
V - Verbal Ability	90.2	12.7	65-133	.302*
N - Numerical Aptitude	94.3	18.6	50-137	.435*
S - Spatial Aptitude	92.2	15.3	58-140	.203
P - Form Perception	108.2	19.7	65-164	.334*
Q - Clerical Perception	108.6	15.3	67-155	.272*
K - Motor Coordination	104.7	16.3	64-144	.072
F - Finger Dexterity	100.0	21.1	44-158	.310*
M - Manual Dexterity	107.4	21.3	55-156	.129

* 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									
Relatively High Mean					X	X			X
Relatively Low Standard Deviation	X	X							
Significant Correlation with Criterion	X	X	X		X	X		X	
Aptitudes to be Considered for Trial Norms	G	V	N		P	Q		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 G, V, N, P, Q, F and M at trial cutting scores were able to differentiate between the 60% of the sample considered good workers and the 40% of the sample considered poor workers. Trial cutting scores at five point intervals approximately one standard deviation below the mean were tried because this will eliminate about one-third of the sample with three-aptitude norms. For two-aptitude trial norms, minimum cutting scores of slightly more than one standard deviation below the mean will eliminate about one-third of the sample; for four aptitude trial norms, cutting scores of slightly less 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 Plastic Trimmer (dental equip.) 712.887-024 and Inserter (dental equip.) 712.884-043 was provided by norms of N-85, P-95 and M-85. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .46 (statistically significant at the .0005 level).

TABLE 6

Concurrent Validity of Test Norms, N-85, P-95, and M-85

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	13	47	60
Poor Workers	28	12	40
Total	41	59	100

Phi Coefficient (ϕ) = .46

Chi Square (χ^2_{ϕ}) = 21.2

Significance Level = $P/2 < .0005$

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 grouping of occupations in the development of new occupational aptitude patterns.

FACT SHEET

Job Title: Plastic Trimmer (dental equip.) 712.887-024

Job Summary: Trims parting line flash from plastic artificial teeth to enhance their appearance and conform to specifications, by pressing them against rapidly rotating carborundum wheel attached to shaft of small stationary electric motor.

Work Performed: Obtains box of teeth to be trimmed from supply table and places at work station. Checks abrasive wheel to determine condition and if defective, notifies supervisor.

Trims teeth according to specification: Picks up tooth from box and visually inspects for defects. Segregates defective teeth into boxes according to the type of defect. Grasps tooth between thumb and first finger and presses tooth against turning carborundum wheel. Revolves tooth against wheel. Inspects tooth visually to ascertain that flash has been removed as required.

Carries box of trimmed teeth to completed work table. Moves to supply table to obtain work supply. May trim gate from anterior plastic teeth.

Job Title: Inserter (dental equip.) 712.884-043

Job Summary: Places insert material on raw artificial tooth enamel material in mould, using insert tool, to give the effect of a natural tooth.

Work Performed: Receives tooth mould with tooth enamel in position from tooth moulder. Examines mould to determine if enamel material is properly placed, type of teeth being processed, and number and kind of inserts required.

Places insert material on tooth enamel material. Selects insert tool from container. Holds insert tool between thumb and first finger and places in supply of insert material. Presses lever on tool to permit measured amount of material to enter tool. Places tool against tooth enamel material at proper area and draws tool down length of tooth, at the same time pressing lever on tool to release insert material on tooth. Examines work visually to determine that insert has been properly executed. Slides mould on work table to next worker for further processing.

Occasionally adds liquid to insert material and kneads some to desired consistency.

May place decal material into specified areas of tooth after biscuited, using pencil like pointed eraser.

May place precious metal coils on coil posts in moulds of anterior teeth.

Effectiveness of Norms: Only 60% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the S-430 norms, 80% would have been good workers. Forty percent of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the S-430 norms, only 20% would have been poor workers.

Applicability of S-430 Norms: The aptitude test battery is applicable to jobs which include a majority of the duties described above.

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