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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)

November 1970

U.S. Training and Employment Service
Technical Report
S-458

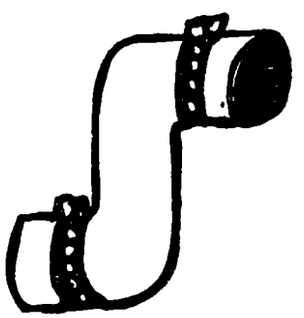
Development of USTES

APTITUDE TEST BATTERY FOR

HOSE MAKER

(rubber goods)
752.781

U.S. DEPARTMENT OF LABOR
Manpower Administration



Technical Report on Development of USTES Aptitude Test Battery

For .....

HOSE MAKER (rubber goods) 752.781-010

S-458

(Developed in Cooperation with
the North Carolina State Employment Service)

Manpower Administration
U.S. Department of Labor

November 1970

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 #2774

DEVELOPMENT OF USTES APTITUDE TEST BATTERY

for

Hose Maker (rubber goods) 752.781-010

S-458

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Hose Maker (rubber goods) 752.781-010. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
P - Form Perception	75
Q - Clerical Perception	100
M - Manual Dexterity	90

RESEARCH SUMMARY

Sample:

57 females employed as Hose Makers by the Dayco Rubber Company in Hazelwood, North Carolina. Four individuals were Negroes, all other individuals were non-minority group members.

Criterion:

Production Records

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 = .30 ($P/2 < .025$)

Effectiveness of Norms:

Only 67% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 76% would have been good workers. 33% of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 24% 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:	67%	76%
Poor Workers:	33%	24%

SAMPLE DESCRIPTION

Size:

N=57

Occupational Status:

Employed Workers

Work Setting:

Workers were employed at Dayco Rubber Company in Hazelwood, North Carolina.

Employer Selection Requirements:

Education: Completion of 10th grade preferred.

Previous Experience: None required.

Tests: None required.

Other: Personal interview by member of personnel department and supervisor of the section and physical examination.

Principal Activities:

The job duties for each worker are comparable to those shown in the job description in the Appendix.

Minimum Experience:

All workers in this study had four or more months experience on the job.

TABLE 2

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

	Mean	SD	Range	r
Age (years)	28.9	7.7	18-53	.113
Education (years)	11.3	1.2	7-13	.120
Experience (months)	40.9	48.7	4-203	-.003

EXPERIMENTAL TEST BATTERY

All twelve tests of the GATB, B-1002B, were administered during December 1968.

CRITERION

The final criterion consisted of production records adjusted for experience. Records of daily production for a three month period were obtained. Analysis of this criterion revealed a positive signficant correlation between production and experience, and age and production. A scatterplot revealed that there was no relationship between production and experience up to 10 months but a positive relationship did exist after 11 months. Due to this, analysis of regression were computed separately on the data for those workers with up to 10 months experience and those with 11 months or more. Therefore, a separate equation was derived for each group. To determine the final criterion score for each worker, the expected production was computed using the appropriate equation; the deviation of the expected production from the actual production for one month was determined and twenty points added to each score to eliminate negative numbers.

Reliability:

To determine the reliability of the production records, a comparison of the average production of the odd numbered weeks was compared to the even numbered weeks. The coefficient obtained from thecomparison is .984.

Criterion Distribution:

Range:	0-46
Mean:	20.0
Standard Deviation:	9.0

Criterion Dichotomy:

The criterion distributution was dichotomized into low and high groups by placing 33% 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". The criterion critical score is 16.

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were selected for tryout in the norms on the basis of a qualitative analysis of test and criterion data. Aptitudes P, K, and M which did not have high correlations with the criterion were considered for inclusion in the trial norms because the qualitative analysis indicated that the aptitudes were important for job duties and the sample had a relatively high mean score for these aptitudes. Aptitude Q was considered for inclusion in the trial norms since the sample had a relatively high mean score and a relatively low standard deviation for this aptitude. 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
G - General Learning Ability	Necessary to coordinate various tasks to maximize utilization of time.
P - Form Perception	Necessary in watching and inspecting for errors during and after process.
K - Motor Coordination	Necessary to align fabric and strips, mark tubing to specified lengths and cut wire at specified lengths on mandrel.
M - Manual Dexterity	Necessary in pulling and manipulating tubing, wire, strips, and mandrel.

TABLE 4

Means, Standard Deviations (SD), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB N=57

Aptitudes	Mean	SD	Range	r
G - General Learning Ability	89.0	15.0	53-121	.182
V - Verbal Aptitude	92.1	14.8	65-133	.144
N - Numerical Aptitude	90.0	18.0	40-122	.226
S - Spatial Aptitude	92.0	15.1	61-124	.036
P - Form Perception	107.0	21.0	50-150	.203
Q - Clerical Perception	111.0	14.9	60-152	.241
K - Motor Coordination	105.1	16.6	47-142	.132
F - Finger Dexterity	90.1	16.5	58-131	-.016
M - Manual Dexterity	105.2	15.9	45-133	-.019

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		X							
Relatively High Mean					X	X	X		X
Relatively Low Standard Deviation		X		X		X			
Significant Correlation with Criterion									
Aptitudes to be Considered for Trial Norms					P	Q	K		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, K, Q, and M at trial cutting scores were able to differentiate between the 67% of the sample considered good workers and the 33% 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 four-aptitude trial norms cutting scores of slightly less than one standard deviation below the mean will eliminate about one third of the sample. 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. The phi coefficient was used as a basis for comparing trial norms. Norms of P-75, Q-100, and M-90 provide the optimum differentiation for the occupation of Hose Maker (rubber goods) 752.781-010. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .30 (statistically significant at the .025 level).

TABLE 6

Concurrent Validity of Test Norms P-75, Q-100, M-90

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	6	32	38
Poor Workers	9	10	19
Total	15	42	57

Phi Coefficient (ϕ) = .30 Chi Square (χ^2_y) = 5.0
Significance Level = P/2 < .025

DETERMINATION OF OCCUPATIONAL APTITUDE NORMS

The data for this study did not meet the requirements for incorporating the occupation studied into any of the 62 OAP's included in the 1970 edition of Section II of the Manual for the General Aptitude Test Battery. However, the occupation was placed as a dagger occupation in OAP-52 which has norms of P-80, Q-90 and M-80.

FACT SHEET

Job Title:

Hose Maker (rubber goods) 752.781-010

Job Summary:

Assembles rubber tubing, wire, and rubber strips on mandrel to fabricate industrial hose.

Work Performed:

Pulls base rubber tubing over mandrel extending from holder and coats tubing with adhesive, using rag. Removes mandrel from chuck and places mandrel on work table. Pulls strip of rubberized fabric from reel and wraps fabric around mandrel. Inserts end of mandrel into motor driven chuck and marks tubing to indicate where tubing will be built up, using crayon and following markings on table. Places coiled wire over end of mandrel, presses button to start rotation of mandrel, positions spacer between coils in wire that moves in traverse and spaces coils evenly the length of the mandrel. Wraps strips of adhesive rubber around ends of wire to hold wire in place. Cuts and removes sections of wire, using pliers, to indicate tips of hose. Removes strips of gummed rubber from package and wraps around sections of mandrel where wire is removed to build up hose tips. Removes mandrel from chuck and places in holder. Places end of outer tubing over end of mandrel, inserts air hose in opposite end of rubber tubing and presses lever that forces air into tubing to expand tubing and pushes outer tubing over coiled wire on mandrel. Pulls hose from mandrel and places tubing on table under cutter. Depresses pedal to activate cutter, and moves tubing to cut tubing into specified hose lengths. Places cut hose into basket for further processing. Maintains record of number of hose built.

Effectiveness of Norms:

Only 67% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected, 76% would have been good workers. 33% of the nontest-selected workers used for the study were poor workers; if the workers had been test-selected, only 24% would have been poor workers.

Applicability of S-458 Norms:

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

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