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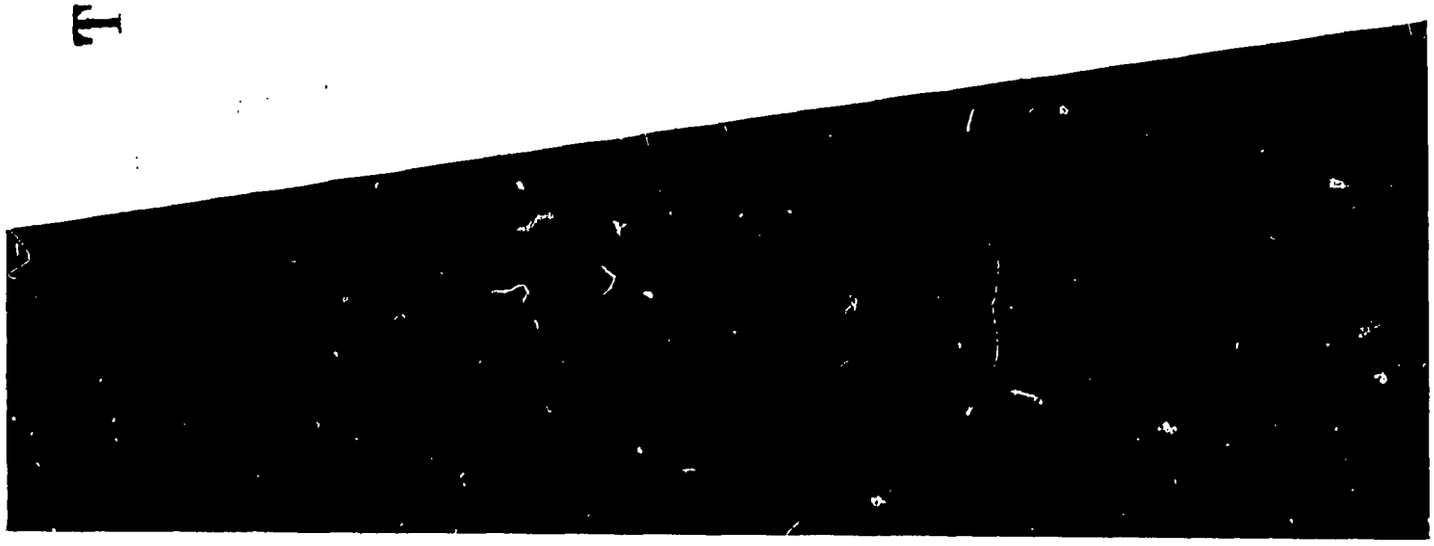
ABSTRACT

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 and a personnel evaluation form are also included. (AG)

January 1967 United States Employment Service Technical Report S-389

Development of USES Aptitude Test Battery for Bench Carpenter

(any ind.) 760.884



U.S. DEPARTMENT OF LABOR
W. Willard Wirtz, Secretary
MANPOWER ADMINISTRATION
BUREAU OF EMPLOYMENT SECURITY
Washington, D.C. 20210

Technical Report on Development of USES Aptitude Test Battery

For

BENCH CARPENTER (any ind.) 760.884

S-389

U.S. Employment Service
in Cooperation with
Pennsylvania State Employment Service

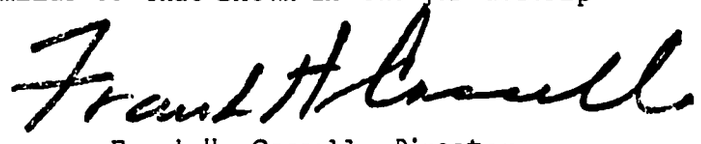
January 1967

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.



Frank H. Cassell, Director
U. S. Employment Service

DEVELOPMENT OF USES APTITUDE TEST BATTERY

For

BENCH CARPENTER (any ind.) 760.884
S-389

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Bench Carpenter 760.884. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB, B-1002 Scores
S - Spatial Aptitude	75
Q - Clerical Perception	90
F - Finger Dexterity	75

RESEARCH SUMMARY

Sample

48 male trainees in Manpower and Development Training (MDTA) courses conducted at the Milton Area Joint High School located in Milton, Pennsylvania and at the Williamsport Technical Institute located in Williamsport, Pennsylvania.

Criterion

Instructor ratings

Design

Longitudinal (tests were administered at the beginning of training and criterion data were collected at the end of training).

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.

Predictive Validity

Phi Coefficient = .44 (P/2 less than .005)

Effectiveness of Norms

Only 67% of the non-test-selected trainees used for this study were good trainees; if the trainees had been test-selected with the above norms, 85% would have been good trainees. 33% of the non-test-selected trainees used for this study were poor trainees; if the trainees had been test-selected with the above norms, only 15% would have been poor trainees. The effectiveness of the norms is shown graphically in Table 1:

TABLE 1

Effectiveness of Norms

	Without Tests	With Tests
Good Workers	67%	85%
Poor Workers	33%	15%

SAMPLE DESCRIPTION

Size

N = 48

Status

Trainees

Setting

Trainees were enrolled in the Manpower and Development Training courses conducted at Milton Area Joint High School, Milton Pennsylvania and the Williamsport Technical Institute located in Williamsport, Pennsylvania

School Selection Requirements

Education: None

Previous Experience: None

Physical Requirements: Must be able to stand, stoop, stretch and reach constantly. Must be able to lift up to 60 pounds at frequent intervals. Must have adequate hearing and good vision.

Principal Activities

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

Minimum Experience

All individuals in the sample were MDTA trainees.

Course Outline

	Subject	Hours
1.	Shop Safety	20
2.	Hand Tools	120
3.	Blueprint Reading Shop Drawing and Layout	90
4.	Related Math	96
5.	Identification of Lumber	30
6.	Bench Work	286
7.	Holding Devices	25
8.	Portable Power Tools	118
9.	Production Jigs	60
10.	Assembly, Gluing, Clamping	280
11.	Stock Billing	36
12.	Wood Shop	115
13.	Production	90
14.	Hand and Power Sanding	20
	Total	1386

TABLE 2

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

	Mean	SD	Range	r
Age (years)	33.7	12.3	18 - 59	-.212
Education (years)	10.5	1.7	7 - 12	.236

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002, Form B, were administered at the beginning of training in 1963 and 1965.

CRITERION

The criterion data consisted of instructors' ratings on each trainee at the completion of training.

Rating Scale

Descriptive rating scale for trainees

Reliability

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

Criterion Score Distribution

Possible Range: 8 - 40
Actual Range: 8 - 39
Mean: 23.1
Standard Deviation: 9.2

Criterion Dichotomy

The criterion distribution was dichotomized into low and high groups by placing 33% of the sample in the low criterion group to correspond with the percentage of trainees considered unsatisfactory or marginal. Trainees in the high criterion group were designated as "good trainees" and those in the low group as "poor trainees." The criterion critical score was 20.

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 the importance of this aptitude for the job duties and the sample had a relatively high mean score for Aptitude M. Tables 3, 4 and 5 show the results of the qualitative and statistical analyses.

TABLE 3

Qualitative Analysis
(Based on the job description and course outline, the aptitudes indicated appear to be important to the work performed

Aptitude	Rationale
G - General Learning Ability	Must use judgment in selecting appropriate tools for various cutting and fitting jobs.
N - Numerical Aptitude	Must have knowledge of related math and works to tolerance of 1/32 inch.
S - Spatial Aptitude	Visualizes parts and completed pieces from blueprints.
P - Form Perception	Must be able to recognize differences in wood grain and inspect surfaces for defects.
M - Manual Dexterity	Must use hand and power tools

TABLE 4

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

Aptitude	Mean	SD	Range	r
G - General Learning Ability	93.3	18.3	63-147	.448**
V - Verbal Aptitude	90.1	14.5	65-127	.273
N - Numerical Aptitude	89.1	18.5	51-127	.479**
S - Spatial Aptitude	101.3	21.5	55-153	.394**
P - Form Perception	94.3	23.1	53-141	.386**
Q - Clerical Perception	94.8	12.2	67-123	.425**
K - Motor Coordination	89.1	25.8	25-148	.164
F - Finger Dexterity	92.8	23.3	25-136	.341*
M - Manual Dexterity	99.4	25.8	38-153	.151

* Significant at the .05 level
**Significant at the .01 level

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				X
Irrelevant		O							
Relatively High Mean				X	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		N	S	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, N, S, P, Q, F and M at trial cutting scores were able to differentiate between the 67% of the sample considered good workers and 33% 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 slightly more than one standard deviation below the mean will eliminate about one third of the sample; for four aptitude norms, cutting scores 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. Norms of S-75, Q-90, and F-75 provided the highest degree of differentiation. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .44 (statistically significant at the .005 level).

TABLE 6

Predictive Validity of Test Norms

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	9	23	32
Poor Workers	12	4	16
Total	21	27	48

Phi Coefficient (ϕ) = .44 Chi Square (x^2) = 9.5
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 of occupations in the development of new occupational aptitude patterns.

A-P-P-E-N-D-I-X

RATING TRAINEES

DESCRIPTIVE RATING SCALE

(For Aptitude Test Development Studies)

Score_____

RATING SCALE FOR_____
(DOT Title and Code for Training Course)

Directions: Please read "RATING TRAINEES - SUGGESTIONS TO RATERS" and then complete this rating scale. In making your ratings, only one box should be checked for each question.

Name of trainee (print)_____
(Last) (First)

Sex: Male_____ Female_____

A. How much aptitude or facility does he have for the vocational training? (Trainee's adeptness or knack for performing the work easily and well.)

☐ 1. Has great difficulty doing the work. Not at all suited for the training.

☐ 2. Usually has some difficulty doing the work. Not too well suited for the training.

☐ 3. Does the work without too much difficulty. Fairly well suited for the training.

☐ 4. Usually does the work without difficulty. Well suited for the training.

☐ 5. Does the work with great ease. Exceptionally well suited for the training.

B. How much ability does he have for maintaining adequate production in the vocational activity for which he was trained?

☐ 1. Capable of very low work output. Can perform only at an unsatisfactory pace.

☐ 2. Capable of low work output. Can perform at a slow pace.

☐ 3. Capable of fair work output. Can perform at an acceptable but not a fast pace.

☐ 4. Capable of high work output. Can perform at a fast pace.

☐ 5. Capable of very high work output. Can perform at an unusually fast pace.

C. How good was the quality of his work during the vocational training?

☐ 1. Performance was inferior and almost never met minimum quality standards.

☐ 2. Performance was usually acceptable but somewhat inferior in quality. The grade of his work could stand improvement.

☐ 3. Performance was acceptable but usually not superior in quality.

☐ 4. Performance was usually superior in quality.

☐ 5. Performance was almost always of the highest quality.

D. How quickly did he learn the instructional units of the vocational training?

☐ 1. Learned the work very slowly. Needed careful and repeated instructions.

☐ 2. Learned the work somewhat slower than most.

☐ 3. Learned most of the work in the usual amount of time.

☐ 4. Learned most of the work quickly.

☐ 5. Learned all of the work very rapidly. Needed only the minimum amount of training or instructions for even the difficult aspects.

E. How much ability does he have for using the equipment of the vocational training?

☐ 1. Has very limited ability. Cannot use the equipment adequately.

☐ 2. Has little ability. Can use the equipment to "get by."

☐ 3. Has a moderate amount of ability. Can use the equipment to do fair work.

☐ 4. Has high ability. Can use the equipment to do good work.

☐ 5. Has very high ability. Can use the equipment to do excellent work.

F. How large a variety of job duties can he perform efficiently?

☐ 1. Cannot perform different operations adequately.

☐ 2. Can perform a limited number of different operations efficiently.

☐ 3. Can perform several different operations with reasonable efficiency.

☐ 4. Can perform many different operations efficiently.

☐ 5. Can perform an unusually large variety of different operations efficiently.

G. How resourceful is he in coping with work situations that are different or out of the ordinary?

/__/ 1. Almost never is able to figure out what to do. Needs help on even minor problems.

/__/ 2. Often has difficulty handling new situations. Needs help on all but simple problems.

/__/ 3. Sometimes knows what to do, sometimes doesn't. Can deal with problems that are not too complex.

/__/ 4. Usually able to handle new situations. Needs help on only complex problems.

/__/ 5. Practically always figures out what to do himself. Rarely needs help, even on complex problems.

H. Considering all the factors already rated, and only these factors, how acceptable was his performance during vocational training?

/__/ 1. Performance was unsatisfactory.

/__/ 2. Performance was not completely satisfactory.

/__/ 3. Performance was satisfactory.

/__/ 4. Performance was good.

/__/ 5. Performance was outstanding.

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FACT SHEET

Job Title

Bench Carpenter (any ind.) 760.884

Job Summary

Assembles pre-cut and pre-fabricated wooden parts using various woodworking tools. Performs bench and hand operations necessary to the assembly process. May work on an assembly line responsible for only one phase of assembly process or may be responsible for the complete assembly of the article from the component parts.

Work Performed

Cuts, shapes and fits pre-fabricated component parts in order to assemble them into the completed unit. Uses saws, hammers, chisels, planes, drills and other woodworking tools to shape and adjust parts so they will make a perfect fit. Applies glue, dowels, screws or similar devices to fasten parts together. Assembles wooden parts according to directions on blueprints, shop drawings and written instructions. May be required to do own layout. Performs some hand sanding to joints or parts to be fitted. May apply some hardware during assembling process or to assembled article. Occasionally uses simple power tools such as saws, planers, routers, etc. to expedite work.

Performance Requirements

Must be capable of exercising independent judgment with respect to appropriate tool to use for various cutting and fitting jobs. Must be able to adjust to a variety of types of jobs as work assignments vary. Must be thoroughly familiar with shop safety practices and constantly on the alert to observe them. Must have knowledge of various types of lumber, veneer and plywoods. Must be able to read rules and scales; works to tolerance of 1/32 inch. Must be able to work with others in assembly line operations. Must be familiar with common woodworking tools and be able to sharpen own hand tools. Must be able to make shop drawings and layout of average job.

(This sheet is printed in duplicate. One copy should remain as part of the Appendix in order to complete the technical report. The other copy can be removed by employment service personnel who wish to set up separate fact sheet files.)

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