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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)

June 1970

U.S. Training and
Employment Service
Technical Report
S-224 R

Development of USTES

APTITUDE TEST BATTERY FOR

TRANSFERRER

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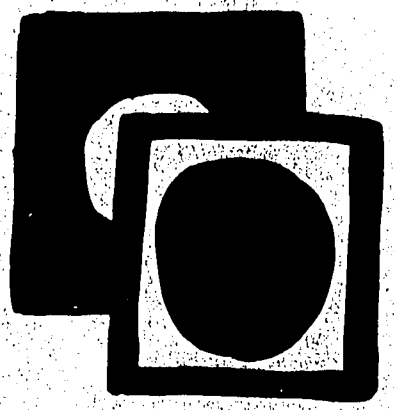
U.S. DEPARTMENT OF LABOR
Manpower Administration



Technical Report on Development of USTES Aptitude Test Battery

For . . . . . .

Transferrer (print. & pub.)I 972.381
S-224R

(Developed in Cooperation with the
Wisconsin State Employment Service)

U.S. DEPARTMENT OF LABOR
Manpower Administration

June 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 # 2371

Development of USTES Aptitude Test Battery

For

Transferrer (print. & pub.)I 972.381-014

S-224R

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Transferrer (print. & pub.)I 972.381-014. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
S - Spatial Aptitude	100
Q - Clerical Perception	90

In addition, 6 correct responses on plates 1-6 of the AOH-R-R Pseudoisochromatic Plates has been established as a color discrimination norm.

Sample:

53 men employed as Lithographic Platemakers in various companies in the Milwaukee area. This study was conducted prior to the requirement of providing minority group information. Therefore, minority group status 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, aptitude-criterion correlations and selective efficiencies.

Concurrent Validity:

Phi Coefficient = .30 ($P/2 < .005$)

Effectiveness of Norms:

Only 64% 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. Thirty-six 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 24% would have been poor workers. The effectiveness of the norms is shown graphically in Table 1:

TABLE I

Effectiveness of Norms

	Without Tests	With Tests
Good Workers	64%	76%
Poor Workers	36%	23%

SAMPLE DESCRIPTION

Size:

N = 53

Occupational Status:

Employed Workers

Work Setting:

Workers were employed by the following companies affiliated with the Graphic Arts Association in Milwaukee, Wisconsin:

Dosie and Johnson Company
Gugler Lithographic Company
Inland Press
W. A. Krueger Company
The Krus Company
Lithoplate Company
Mandel - Mulitone Company
Milprint, Incorporated
Milwaukee Color Plate Company
Milwaukee Graphic Plate Corporation
Milwaukee Offset Service Corporation
Moebius Printing Company
Phillipp Litho Company
O. L. Schilffarth Company
B. F. Schmidt Company

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)	36.0	8.2	23-54	.267
Education (years)	11.8	1.3	8-16	.101
Experience (months)	162.8	101.6	30-426	.336*

*Significant at the .05 level

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002A, and the Dvorine Pseudoisochromatic Plates 2-15 were administered during the period November 1960 to May 1961.

CRITERION

The criterion data consisted of supervisory ratings of job proficiency made at approximately the same time as the tests were administered with a time interval of three to five weeks between the two ratings. The immediate supervisor rated each worker.

Rating Scale:

Form SP-21 "Descriptive Rating Scale" was used. The scale (see Appendix) consists of nine items covering different aspects of job performance. Each item has five alternative responses corresponding to different degrees of job proficiency.

Reliability:

A reliability coefficient of .93 was obtained between the initial ratings and the re-ratings, indicating a significant relationship. The final criterion score consists of the combined scores of the two ratings.

Criterion Score Distribution:

Possible Range:	18-90
Actual Range:	34-86
Mean:	60.7
Standard Deviation:	12.0

Criterion Dichotomy:

The criterion distribution was dichotomized into low and high groups by placing 36% 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 57.

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. Aptitudes G and Q which do not have high correlations with the criterion were considered for inclusion in the norms because the qualitative analysis indicated that the aptitudes might be important for the job duties and the sample had relatively low standard deviations on these aptitudes. In addition, the sample also had a relatively high mean score on Aptitude G. 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 performance)

Aptitudes	Rationale
G - General Learning Ability	Required to learn proper processing procedures of images and to interpret the requirements of each job order.
S - Spatial Aptitude	Required to visualize completed image from work order, to determine the proper thickness of coating to be applied on the plate, and to visualize how the plate is to be run on the press.
P - Form Perception	Required to determine if grain of plate is appropriate, if plate is free of scratches, blemishes, kinks and pits, and to locate broken lines, missing portions and inked non-printing areas.
Q - Clerical Aptitude	Required in avoiding errors in reading orders, formulas, timers, and graduates and in copying figures.
F - Finger Dexterity	Required in handling beakers and stirrers.
M - Manual Dexterity	Required in use of hands and arms in manipulating plate while clamping in placing and removing.

On the basis of job analysis data, Aptitude V-Verbal Aptitude was rated "irrelevant" for successfully performing the duties of this job.

TABLE 4

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB and Dvorine Pseudoiosochromatic Plates; N = 53

	Mean	SD	Range	r
G - General Learning Ability	107.1	12.9	73-137	.194
V - Verbal Aptitude	105.4	12.3	80-135	.084
N - Numerical Aptitude	101.7	14.0	68-145	.071
S - Spatial Aptitude	108.0	18.1	74-153	.307*
P - Form Perception	102.0	14.6	73-151	.000
Q - Clerical Perception	100.8	12.2	84-147	-.022
K - Motor Coordination	101.2	14.0	72-140	-.206
F - Finger Dexterity	97.8	18.8	56-125	-.322*
M - Manual Dexterity	103.5	18.0	53-145	-.263
Dvorine Pseudoisochromatic Plates	13.6	1.7	2-14	.191

*Significant at the .05 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	X
Irrelevant		X							
Relatively High Mean	X	X		X					
Relatively Low Standard Dev	X	X				X	X		
Significant Correlation with Criterion				X					
Aptitudes to be Considered for Trial Norms	G			S		Q			

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of the degree to which trial norms consisting of various combinations of aptitudes G, S and Q at trial cutting scores were able to differentiate between the 64% of the sample considered to be good workers and the 36% of the sample considered to be 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 S-100 and Q-90 provided optimum differentiation for the occupation of Transferrer (print. & pub.)I 972.381-014. 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
S-100 and Q-90

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	8	26	34
Poor Workers	11	8	19
Total	19	34	53

Phi Coefficient = .30 Chi Square (X^2_y) = 4.8

Significance Level = $P/2 < .025$

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study met the requirements for incorporating the occupation studied into OAP-41 which is shown in the 1970 edition of Section II of the Manual for the General Aptitude Test Battery. A phi coefficient of .24 is obtained with the OAP-41 norms of S-95, Q-85, and K-75.

SP-21
Rev. 2/61

DESCRIPTIVE RATING SCALE
(For Aptitude Test Development Studies)

Score____

RATING SCALE FOR _____
D. O. T. Title and Code

Directions: Please read Form SP-20, "Suggestions to Raters", and then fill in the items listed below. In making your ratings, only <u>one</u> box should be checked for each question.

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

Sex: Male_____ Female_____

Company Job Title: _____

How often do you see this worker in a work situation?

☐ See him at work all the time.

☐ See him at work several times a day.

☐ See him at work several times a week.

☐ Seldom see him in work situation.

How long have you worked with him?

☐ Under one month.

☐ One to two months.

☐ Three to five months.

☐ Six months or more.

A. How much work can he get done? (Worker's <u>ability</u> to make efficient use of his time and to work at high speed.)

☐ 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.

B. How good is the quality of his work? (Worker's ability to do high-grade work which meets quality standards.)

☐ 1. Performance is inferior and almost never meets minimum quality standards.

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

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

☐ 4. Performance is usually superior in quality.

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

C. How accurate is he in his work? (Worker's ability to avoid making mistakes.)

☐ 1. Makes very many mistakes. Work needs constant checking.

☐ 2. Makes frequent mistakes. Work needs more checking than is desirable.

☐ 3. Makes mistakes occasionally. Work needs only normal checking.

☐ 4. Makes few mistakes. Work seldom needs checking.

☐ 5. Rarely makes a mistake. Work almost never needs checking.

D. How much does he know about his job? (Worker's understanding of the principles, equipment, materials and methods that have to do directly or indirectly with his work.)

☐ 1. Has very limited knowledge. Does not know enough to do his job adequately.

☐ 2. Has little knowledge. Knows enough to "get by."

☐ 3. Has moderate amount of knowledge. Knows enough to do fair work.

☐ 4. Has broad knowledge. Knows enough to do good work.

☐ 5. Has complete knowledge. Knows his job thoroughly.

E. How much aptitude or facility does he have for this kind of work? (Worker's adeptness or knack for performing his job easily and well.)

☐ 1. Has great difficulty doing his job. Not at all suited to this kind of work.

☐ 2. Usually has some difficulty doing his job. Not too well suited to this kind of work.

☐ 3. Does his job without too much difficulty. Fairly well suited to this kind of work.

☐ 4. Usually does his job without difficulty. Well suited to this kind of work.

☐ 5. Does his job with great ease. Exceptionally well suited for this kind of work.

F. How large a variety of job duties can he perform efficiently? (Worker's ability to handle several different operations in his work.)

☐ 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 when something different comes up or something out of the ordinary occurs? (Worker's ability to apply what he already knows to a new situation.)

☐ 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. How many practical suggestions does he make for doing things in better ways? (Worker's ability to improve work methods.)

☐ 1. Sticks strictly with the routine. Contributes nothing in the way of practical suggestions.

☐ 2. Slow to see new ways to improve methods. Contributes few practical suggestions.

☐ 3. Neither quick nor slow to see new ways to improve methods. Contributes some practical suggestions.

☐ 4. Quick to see new ways to improve methods. Contributes more than his share of practical suggestions.

☐ 5. Extremely alert to see new ways to improve methods. Contributes an unusually large number of practical suggestions.

I. Considering all the factors already rated, and only these factors, how acceptable is his work? (Worker's "all-around" ability to do his job.)

☐ 1. Would be better off without him. Performance usually not acceptable.

☐ 2. Of limited value to the organization. Performance somewhat inferior.

☐ 3. A fairly proficient worker. Performance generally acceptable.

☐ 4. A valuable worker. Performance usually superior.

☐ 5. An unusually competent worker. Performance almost always top notch.

June 1970 S-224R

FACT SHEET

Job Title

Transferrer (print. & pub.)I **972.381-014**

Job Summary

Processes images onto plates to prepare plates for use on offset presses to produce charts, maps, circulars, posters, commercial and fine art, photographs, and typewritten copy or mimeograph matter.

Work Performed

Studies job order and interprets the requirements for each job in order to determine the (1) kind and type of plate to be made and the process to be used (deep-etch, surface or presensitized aluminum, zinc, or multimetal); (2) exposure time by examining the negative or positive; (3) need for special treatment such as staging, surprinting, and stepping; (4) alignment on the plate for best results and how the plate will be run on the press; and (5) the registration of the negatives or positives mask on the plate for multi-color runs.

Selects plates, considering type of copy and process to be used; determines if grain of plate is appropriate for the job. Inspects plate for scratches, blemishes, kinks, and pits and determines if clamp edges of plate are in good condition. Measure thickness of metal plate, using precision instruments such as micrometers. Prepares or purchases plate-making solutions (counter-etch, photo sensitive coatings, pre- and post treatment solutions, developing desensitizing etches, gum solutions, lacquers, developing ink). Mixes chemicals and uses the vacuum pump to bring the negative or positive into perfect contact with the plate. Checks the adequacy of contact with a powerful optical glass to determine whether the plate and flat are in bond. Exposes the plate to arc lights for a pre-determined time. (Length of exposure is determined by inspecting the density of the negative or positive and judging the sensitivity of the photo-sensitive coating.)

Uses alternate method (photo composing machine) of exposing plate when negatives or positives are small enough so that many exposures can be accommodated on one relatively large plate. Places negative or positive in chase (carrier). Makes all necessary adjustments and performs operations to expose plate, using mechanical equipment calibrated in units of 1/000 of an inch and basic drafting instruments such as compass, scales, triangles, rulers, dividers, etc.

Develops plates by applying water and/or chemicals, using cotton developing pads, appropriate to the type of plate being made. Selects and applies lacquers, developing inks, desensitizing etches, gum solutions, and asphaltum. Gums and rubs down plate to give it a protective film which will prevent the nonprinting surface from oxidizing. Applies asphaltum solution over gum to protect image. Places plate on drying rack.

Performs other duties, such as determining the acidity and alkalinity of solutions; filing flats and plates; requisitioning supplies and plates; and contacting the press room, photographer, stripper or plate grainer to ascertain type of press, negative imperfections, layout and defective plates or grains, etc.

Effectiveness of Norms

Only 64% of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the S-224R norms, 76% would have been good workers. Thirty-six percent of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the S-224R norms, only 24% would have been poor workers.

Applicability of S-224R Norms

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

GPO 898.741

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