DOCUMENT RESUME

ED 063 407 TM 001 734

TITLE	Process Artist (print. & pub.) 972.281--Technical Report on Development of USTES Aptitude Test Battery.
INSTITUTION	Manpower Administration (DOL), Washington, D.C. U.S. Training and Employment Service.
REPORT NO	TR-S-222R
PUB DATE	Jun 70
NOTE	18p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	*Aptitude Tests; *Artists; *Cutting Scores; Evaluation Criteria; Job Applicants; *Job Skills; Norms; Occupational Guidance; *Personnel Evaluation; Printing; Test Reliability; Test Validity
IDENTIFIERS	GATB; *General Aptitude Test Battery; Process Artist

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)

S-222 R

June 1970

U.S. Training and
Employment Service
Technical Report
S-222 R

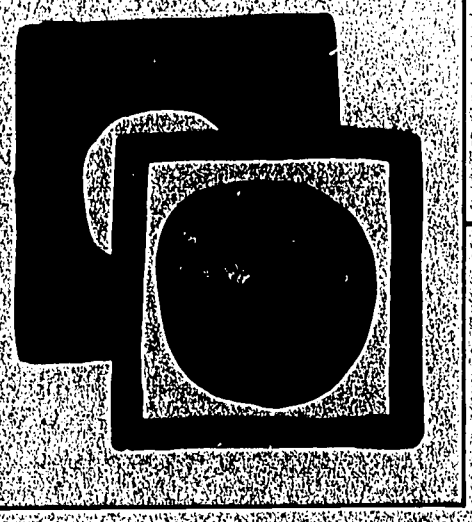
Development of USTES

APTITUDE TEST
BATTERY FOR

PROCESS ARTIST

(print & pub.)
972.281

U.S. DEPARTMENT OF LABOR
Manpower Administration



Technical Report on Development of USTES Aptitude Test Battery

For . . .

Process Artist (print. & pub.) 972.281
S-222R

(Developed in Cooperation with the
Wisconsin State Employment Service)

U.S. Department of Labor
Manpower Administration

June 1970

FOREWARD

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 #2372

DEVELOPMENT OF USTES APTITUDE TEST BATTERY

For
Process Artist (print. & pub.) 972.281-010

S-222R

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

GATB Aptitudes	Minimum Acceptable GATB Scores
S - Spatial Aptitude	90
Q - Clerical Perception	95
K - Motor Coordination	80

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

RESEARCH SUMMARY

Sample: 66 male workers employed as Process Artists in Wisconsin.

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 = .24 ($P/2 < .025$)

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. Thirty-three 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 1

Effectiveness of Norms

	Without Tests	With Tests
Good Workers	67%	76%
Poor Workers	33%	24%

SAMPLE DESCRIPTION

Size: N = 66

Occupational Status: Employed workers.

Work Setting: Workers were employed by companies in Wisconsin.

Name of Company

Gugler Lithographic Company
W. A. Krueger Company
Lithoplate Company
Milprint, Incorporated
Milwaukee Offset Service Corporation
Mueller Color Plate Company
E. F. Schmidt Company

Employer Selection Requirements:

Education: None required. High school education with courses in chemistry and art desirable.

Previous Experience: None required

Tests: None used

Other Personal interview and reference check

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 the final sample had at least 31 months job experience. (Two and one-half years of the formal five-year apprenticeship constitutes basic training in this occupation.)

TABLE 2

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

N = 66

	Mean	SD	Range	r
Age (years)	37.1	8.6	22-56	.134
Education (years)	12.3	1.6	7-16	.006
Experience (months)	158.5	108.7	31-480	.204

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002A, and Plates 2-15 of the Dvorine. Pseudoisochromatic Plates were administerd to the sample group 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 test 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 .86 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	20-79
	Mean	55.2
	Standard Deviation	11.6

Criterion Dichotomy: The criterion distribution 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 52.

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, S, P, and K which do not have high correlations with the criterion, were considered for inclsuion in the norms because the qualitative analysis indicated that the aptitudes might be important for the job duties and the sample had relatively high mean scores on these aptitudes. Aptitude Q which does not have a high correlation with the criterion was considered for inclusion in the norms because the qualitative analyses indicated that it might be important for job duties and the sample had a relatively low standard deviation on 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 performance)

Aptitude	Rationale
G - General Learning Ability	Required to learn the properties and uses of dyes, chemicals and colors in order to make the necessary corrections on positivesand negatives.
S - Spatial Aptitude	Required to visualize completed plate before making corrections in colors and tone values.
P - Form Perception	Required to detect flaws and deviations when comparing positives and negatives with original copy, and in observing that the coatings cover the correct parts.
Q - Clerical Aptitude	Required to avoid errors in reading numbers and applying formulas in mixing dyes and etching solutions.
K - Motor Coordination	Required in accurately manipulating various hand tools for covering and etching.
F - Finger Dexterity	Required to manipulate brushes and hand tools.

On the basis of the job analysis data, 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

N = 66

Aptitudes	Mean	SD	Range	r
G - General Learning Ability	106.0	14.4	72-141	.179
V - Verbal Aptitude	102.4	15.0	72-137	.064
N - Numerical Aptitude	97.5	15.3	59-139	.126
S - Spatial Aptitude	114.7	17.6	74-163	.156
P - Form Perception	111.9	15.5	83-151	.141
Q - Clerical Perception	105.2	13.7	81-166	.053
K - Motor Coordination	105.5	17.8	66-146	.078
F - Finger Dexterity	98.7	18.0	55-141	.074
M - Manuel Dexterity	99.7	19.2	54-148	.148
Dvorine Pseudo-Isochromatic Plates	13.8	0.8	8-14	.232

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		X		
Relatively Low Standard Dev.	X					X			
Significant Correlation with Criterion									
Aptitudes to be Considered for Trial Norms	G			S	P	Q	K		

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, P, Q and K at trial cutting scores were able to differentiate between the 67% of the sample considered to be good workers and the 33% 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-90, Q-95 and K-80 provided optimum differentiation for the occupation of Process Artist (print. & pub.) 972.281-010. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .24 (statistically significant at the .025 level).

Concurrent Validity of Test Norms S-90, Q-95, and K-80

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	10	34	44
Poor Workers	11	11	22
Total	21	45	66

Phi Coefficient = .24 Chi Square (χ^2_{xy}) = 3.8

Significance Level = P/2 < .025

DETERMINATION OF OCCUPATIONAL APTITUTE 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, K-75.

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 ability 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 <u>only</u> 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-222 -R

FACT SHEET

Job Title

Process Artist (print & pub.) 972.281-010

Job Summary

Collates and/or corrects tone or color value of positives and continuous tone negatives used to make lithographic plates.

Work Performed

Compares positives and negatives with original copy to determine corrections necessary for reproduction. Must know how to use a densitometer. Examines positives and negatives with magnifying glass (works at light table equipped with translucent top above lights) and determines amount of correction required. With color chart as a guide, visualizes resultant colors after corrections are completed. Makes color or tone corrections with dyes, masks (transparent, plastic sheets of various colors), or by increasing or decreasing density of silver deposits on negatives or positives. Mixes dyes and etching solutions ("hypo" and ferrous cyanide or iodine and cyanide) used to intensify or reduce tone values. Applies staging solution with brush on positives and negatives to form a protective coating over areas which do not need correcting. Etches unprotected areas with appropriate solution which dissolves or bleaches silver deposits. Applies powdered graphite on negatives with "stump" (may also be used on ground glass positives or negatives) to increase density. Makes straight or curved line corrections with drafting instruments. Occasionally increases color or tone of positives, using Ben Day process or back etched contact negatives where increased tone values are required and stipples half-tone dots by hand. Uses the contact frame to increase or bump tone values.

Submits corrected positives and negatives to Stripper for layout.

Note: Approximately 90-95 percent of the artist's time is spent on color work, and 5-10 percent on black and white work. Comparatively little correction is required on black and white work.

Effectiveness of Norms

Only 67% of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the S-222R norms, 76% would have been good workers. Thirty-three percent of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the S-222R norms, only 24% would have been poor workers.

Applicability of S-222R Norms

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

GPO 898.794

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