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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)

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November 1972

U.S. Employment Service
Technical Report

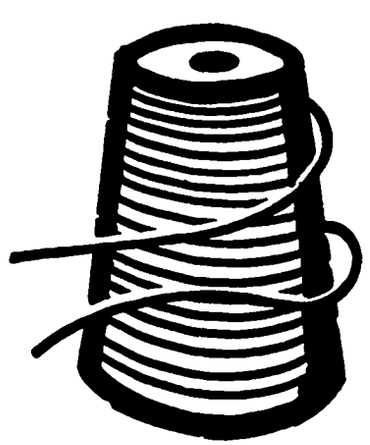
Development of USES

APTITUDE TEST BATTERY FOR

COVERING-MACHINE OPERATOR

(textile)
681.885

U.S. DEPARTMENT OF LABOR
Manpower Administration



Technical Report on Development of USES Aptitude Test Battery

For

Covering-Machine Operator (textile) 681.885-030

S-465

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

Manpower Administration
U. S. Department of Labor

November, 1972

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 and 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 #2893

Development of USES Aptitude Test Battery

For

Covering-Machine Operator (textile) 681.885-030

S-465

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Covering-Machine Operator (textile) 681.885-030.

The following norms were established on the basis of a job analysis and statistical analyses of aptitude mean scores, standard deviations, aptitude-criterion correlations and selective efficiencies.

GATB Aptitude	Cutting Score
P - Form Perception	80
F - Finger Dexterity	95
M - Manual Dexterity	95

RESEARCH SUMMARY

Sample:

Validation Study: The total number of workers was 65. Of these 31 were Blacks, and 34 were nonminority group members. All were females.

Criterion:

Supervisory Ratings

Design:

Validation Study: Concurrent (test and criterion data were collected about the same time),

Concurrent Validity:

Phi coefficient for total sample = .38 (P/2 <.005) (N=65)
Phi coefficient for minority subsample = .44 (P/2 <.01) (N=31)
Phi coefficient for nonminority subsample = .24 (P/2 <.10) (N=34)

Effectiveness of Norms for Total Sample:

Only 62% of the nontest-selected individuals used for this study were good performers; if they had been test-selected with the above norms, 80% would have been good performers. 38% of the nontest-selected individuals used for this study were poor performers; if they had been test-selected with the above norms, only 20% would have been poor performers. The effectiveness of the norms is shown in Table 1.

TABLE 1

Effectiveness of Norms for Total Sample

	Without Tests	With Tests
Good Performers	62%	80%
Poor Performers	38%	20%

Comparison of Minority and Nonminority Groups

No differential validity for this battery was found. (See phi coefficients above.) Of the minority workers, 19% did not meet the established norms and were good workers; 18% of the nonminority workers did not meet the established norms and were good workers. The difference is not statistically significant.

Geographic Distribution:

	Total	Minority	Non-Minority	States Represented
North South West	65	31	34	North Carolina

VALIDATION SAMPLE DESCRIPTION

Size:

N = 65

Sex Composition:

All were females.

Minority Group Composition:

31 were Blacks, and 34 were nonminority group members.

Occupational Status:

Employed workers.

Work Setting:

Workers were employed at Sheerspan Products, Inc. in Burlington, North Carolina and Spanco Industries, Inc. in Sanford, North Carolina.

Selection Requirements:

Education: No requirement

Previous Experience: No requirement

Tests: None used

Other: Personal interview and a check of work background were used for selection.

Principal Activities:

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

Minimum Experience:

All individuals in the sample had at least one month of job experience in the plant.

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	Mean Minority	Mean Non-minority
Age (years)	29.0	7.2	18-61	.032	28.7	29.3
Education (years)	10.7	1.6	6-14	-.016	11.4	10.1
Plant Experience (months)	9.5	6.0	1-31	.267*	10.3	8.7

*Significant at the .01 level

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002B, were administered during 1970-71.

CRITERION

The criterion data consisted of a rating by the worker's first-line supervisor and a rating by the worker's quality control supervisor at Sheerspan Products, Inc. The workers at Spanco, Inc. were rated twice by their first-line supervisor with a time interval of at least two weeks between ratings. Criterion data were collected during 1970-71.

Rating Scale:

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

Since sample members' test scores are confidential, supervisors were not aware of the individual's test performance at the time the ratings were completed.

Reliability:

A correlation coefficient of .81 was obtained between the two ratings, indicating satisfactory reliability. The final criterion score consisted of the combined scores for the two ratings.

Criterion Distribution:

	Total Sample	Minority Sample	Nonminority Sample
Possible Range:	12-60	12-60	12-60
Actual Range:	15-58	15-58	33-58
Mean:	44.3	42.7	45.7
Standard Deviation:	8.0	7.8	8.0

Criterion Dichotomy:

The criterion distribution was dichotomized into low and high groups by placing 42% of the sample in the low group to correspond with the percentage of individuals considered unsatisfactory or marginal. Workers in the high criterion group were designated as "good performers" and those in the low group as "poor performers." The criterion critical score is 42.

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were chosen for tryout in the norms on the basis of qualitative and statistical results shown in Tables 3 and 4. Aptitudes not judged irrelevant are selected for trial norms when significantly correlated with a criterion or when judged to have critical importance, or when they meet any two of the following criteria: (1) judged important, (2) relatively high mean, (3) relatively low standard deviation. A relatively high mean or low standard deviation may indicate some sample preselection. Table 5 summarizes these factors and shows the aptitudes selected.

TABLE 3

Qualitative Analysis

(Based on the job analysis, the aptitudes indicated appear to be important to the work performed.)

Aptitude	Rationale
S - Spatial Aptitude	Necessary to observe product as it winds onto take-up spindles to determine defect in product.
P - Form Perception	Necessary in inspection of product and to determine if machinery is operating properly.
K - Motor Coordination	Necessary to rapidly and accurately thread spindles and piece together breaks.
F - Finger Dexterity	Necessary to accurately and rapidly draw nylon thread through machine guides.
M - Manual Dexterity	Necessary to thread machine, replenish supplies and in stopping spindles.

Aptitude P was rated critical and aptitudes G, V and [illegible]re rated irrelevant.

TABLE 4

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB: Total Sample, N = 65

Aptitude	Mean	SD	Range	r
G - General Learning Ability	79.7	14.2	59-128	.297*
V - Verbal Aptitude	84.2	10.4	63-125	.280*
N - Numerical Aptitude	80.1	17.3	50-121	.312*
S - Spatial Aptitude	88.1	17.7	61-143	.212
P - Form Perception	98.6	19.2	56-134	.217
Q - Clerical Perception	106.1	14.7	67-142	.109
K - Motor Coordination	106.2	15.1	72-132	.024
F - Finger Dexterity	102.7	22.9	63-194	.383**
M - Manual Dexterity	109.4	20.8	61-147	.162

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

TABLE 4a

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB. Minority Subsample, N = 31

Aptitude	Mean	SD	Range	r
G - General Learning Ability	73.6	9.6	61-100	.351
V - Verbal Aptitude	80.6	7.1	63-92	.526**
N - Numerical Aptitude	73.4	14.0	50-105	.247
S - Spatial Aptitude	85.1	14.7	65-130	.354
P - Form Perception	94.5	18.4	57-130	.240
Q - Clerical Perception	103.1	15.0	67-142	-.033
K - Motor Coordination	106.3	16.3	72-132	.087
F - Finger Dexterity	97.9	26.9	63-194	.488**
M - Manual Dexterity	106.6	20.9	61-145	.244

**Significant at the .01 level

TABLE 4b

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB: Nonminority Subsample, N = 34

Aptitude	Mean	SD	Range	r
G - General Learning Ability	85.3	15.4	59-128	.198
V - Verbal Aptitude	87.5	11.8	68-125	.087
N - Numerical Aptitude	86.1	17.7	53-121	.284
S - Spatial Aptitude	90.8	19.6	61-143	.078
P - Form Perception	102.4	19.1	56-134	.141
Q - Clerical Perception	108.8	13.8	77-141	.181
K - Motor Coordination	106.0	13.9	76-126	-.035
F - Finger Dexterity	107.1	17.3	69-144	.204
M - Manual Dexterity	111.9	20.3	68-147	.048

TABLE 5

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes G	V	N	S	P	Q	K	F	M
"Important" on Basis of Job Analysis				X	X*		X	X	X
"Irrelevant" on Basis of Job Analysis	X	X	X						
Relatively High Mean						X	X		X
Relatively Low Standard Deviation	X	X				X			
Significant Correlation with Criterion	X	X	X					X	
Aptitudes Selected for Trial Norms					P*	Q	K	F	M

*Critical

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, Q, K, F, and M at trial cutting scores were able to differentiate between the 62% of the sample considered to be good performers and the 38% of the sample considered to be poor performers. 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-80, F-95 and M-95 provided optimum differentiation for the occupation of Covering-Machine Operator (textile) 681.885-030.

The validity of these norms is shown in Table 6 and is indicated by a phi coefficient of .38 (statistically significant at the .005 level).

TABLE 6

Validity of Test Norms

P-80, F-95 and M-95 when Applied to Total Sample
N=65

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Performers	12	28	40
Poor Performers	18	7	25
Total	30	35	65

Phi coefficient = .38
Significance level = P/2 <.005

Chi square (Yates' corrected) = 9.3

TABLE 6a

Validity of Test Norms
P-80, F-95 and M-95 when Applied to Minority Sample
N=31

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Performers	6	12	18
Poor Performers	11	2	13
Total	17	14	31

Phi coefficient = .44
Significance level = P/2 <.01

Chi square (Yates' corrected) = 6.1

TABLE 6b

Validity of Test Norms
P-80, F-95 and M-95 when Applied to Nonminority Sample
N=34

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Performers	6	16	22
Poor Performers	7	5	12
Total	13	21	34

Phi coefficient = .24
Significance level = P/2 <.10

Chi square (Yates' corrected) = 2.0

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

Although the specific norms established for this occupation did not meet all the requirements for incorporation into OAP-56, which is shown in the 1970 edition of Section II of the GATB Manual, this occupation was entered into the OAP as a "double asterisk" occupation. A phi coefficient of .22 is obtained with OAP-56 norms of P-75, F-80 and M-80.

APPENDIX

SP-21
Rev. 5/67

UNITED STATES EMPLOYMENT SERVICE

DESCRIPTIVE RATING SCALE
(For Aptitude Test Development Studies)

RATING SCALE FOR Covering-Machine Operator 681.885 SCORE _____
D.O.T. Title and Code

Directions: Please read the "Suggestions to Raters" and then fill in the items listed below. In making your ratings, only one box should be checked for each question.

SUGGESTIONS TO RATERS

We are asking you to rate the job performance of the people who work for you. These ratings will serve as a "yardstick" against which we can compare the test scores in this study. The ratings must give a true picture of each worker or this study will have very little value. You should try to give the most accurate ratings possible for each worker.

These ratings are strictly *confidential* and won't affect your workers in any way. Neither the ratings nor test scores of any workers will be shown to anybody in your company. We are interested only in "testing the tests." Ratings are needed only for those workers who are in the test study.

Workers who have not completed their training period, or who have not been on the job or under your supervision long enough for you to know how well they can perform this work should not be rated. Please inform the test technician about this if you are asked to rate any such workers.

In making ratings, don't let general impressions or some outstanding trait affect your judgment. Try to forget your personal feelings about the worker. Rate him only on the way he does his work. Here are some more points which might help you:

1. Please read all directions and the rating scale *thoroughly* before rating.
2. For each question compare your workers with "workers-in-general" in this job. That is, compare your workers with other workers on this job that you have known. This is very important in small plants where there are only a few workers. We want the ratings to be based on the same standard in all the plants.
3. A suggested method is to rate all workers on one question at a time. The questions ask about different abilities of the workers. A worker may be good in one ability and poor in another; for example, a very slow worker may be accurate. So rate all workers on the first question, then rate all workers on the second question, and so on.
4. Practice and experience usually improve a worker's skill. However, one worker with six months' experience may be a faster worker than another with six years' experience. Don't rate one worker as poorer than another because he has not been on the job as long.
5. Rate the workers according to the work they have done over a period of several weeks or months. Don't rate just on the basis of one "good" day, or one "bad" day or some single incident. Think in terms of each worker's usual or typical performance.
6. Rate only the abilities listed on the rating sheet. Do not let factors such as cooperativeness, ability to get along with others, promptness and honesty influence your ratings. Although these aspects of a worker are important, they are of no value for this study as a "yardstick" against which to compare aptitude test scores.

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 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.

G. 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 is usually superior.
5. ☐ An unusually competent worker. Performance almost always top notch.

Rated by..... Title..... Date.....

Company or organization..... Location.....
(City) (State)

FACT SHEET

Job Title: Covering-Machine Operator (textile) 681.885.030

Job Summary:

Tends machine that automatically twists two strands of nylon around spandex to produce elastic yarn for weaving webbing.

Work Performed:

Patrols battery of machines. Fingers slack in strands of yarn, to check for caking, elasticity, or break in nylon or spandex. Threads machines. Draws spandex through guides and hollow spindles using wire hook. Lifts roller, placing spandex through nip and wraps spandex around shaft. Grips each spindle with manual brake to locate and twists end of nylon around spandex. Strips defective yarn from take-up package, and laps end of yarn around take-up package. Replaces defective supply of nylon or spandex and ties end to ends in machine.

Effectiveness of Norms:

Only 62% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the S-465 norms, 80% would have been good workers. 38% of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the S-465 norms, only 20% would have been poor workers.

Effectiveness of Norms with Minority Group Workers:

Only 58% of the nontest-selected minority group workers in this study were good workers; if the minority group workers had been test-selected with the S-465 norms, 86% would have been good workers. 42% of the nontest-selected

minority group workers in this study were poor workers; if the minority group workers had been selected with the S-465 norms, only 14% would have been poor workers.

Applicability of S-465 Norms:

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