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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)

S-459

December 1970

U.S. Training and
Employment Service
Technical Report

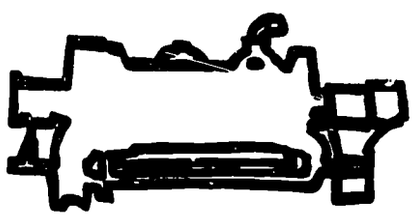
Development of USTES

APTITUDE TEST
BATTERY FOR

V-BELT WRAPPER

(rubber goods)
690.885

U.S DEPARTMENT OF LABOR
Manpower Administration



Technical Report on Development of USTES Aptitude Test Battery for . . . .

V-Belt Wrapper (rubber goods) 690.885-438

S-459

(Developed in Cooperation with the Missouri and North Carolina State Employment Services)

U.S. Department of Labor
Manpower Administration

December 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 # 2825

DEVELOPMENT OF USTES APTITUDE TEST BATTERY

for

V-Belt Wrapper (rubber goods) 690.885-438
S-459

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of V-Belt Wrapper (rubber goods) 690.885. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
P - Form Perception	80
K - Motor Coordination	90
F - Finger Dexterity	90

RESEARCH SUMMARY

Sample: 69 females employed as V-Belt Wrappers in North Carolina and Missouri. The sample was composed of one Negro and 68 non-minority group members.

Criterion: Supervisory Ratings adjusted for experience.

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 = .46 $P/2 < .0005$)

Effectiveness of Norms: Only 68% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 83% would have been good workers. 32% of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 17% 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	68%	83%
Poor Workers	32%	17%

SAMPLE DESCRIPTION

Size: N = 69 (North Carolina N=28 Missouri N=41)

Occupational Status: Employed workers.

Work Setting: Workers were employed at Dayco Rubber Company in Hazelwood, North Carolina and Springday Company at Springfield, Missouri.

Employer Selection Requirements:

Education: Completion of 10th grade preferred in North Carolina, no educational requirement in Missouri.

Previous Experience: None.

Tests: None used in North Carolina. 2 individuals given PTI-Verbal, 19 others given PTI-Numerical, and 12 others given Wonderlic in Missouri. No minimum score was required.

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 North Carolina had 6 or more months experience. All workers in Missouri had 7 or more months experience.

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)	31.4	7.6	18-48	.022
Education (years)	11.1	1.2	8-12	-.060
Experience (months)	49.7	44.0	6-219	-.001

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002B were administered to the sample group in December 1968 and March 1969.

CRITERION

Two supervisory ratings were collected in North Carolina and Missouri. The first North Carolina ratings were completed on 5 workers by the first line supervisor and 23 workers by the second line supervisor. The second ratings were made on 12 workers by the same second line supervisor and 7 other workers by their first line supervisor. No second ratings could be obtained on the remaining 9 workers. Since the criterion reliability coefficient between first and second ratings for 19 workers was r_{xy}=.718, the scores on the first were doubled for the 9 workers. The first and second supervisory ratings for the 41 workers in the Missouri sample were made by 6 first line supervisors. A criterion reliability coefficient of .852 was obtained for these ratings. First and second ratings were then combined for the final criterion. Since the mean of combined ratings from North Carolina (49) was 7 points lower than the mean of combined ratings from Missouri (56), workers within each sample were ranked according to their ratings and the ranks converted to linear scores in order to merge the two samples to form the final criterion. Since a high correlation between this criterion and experience did exist (r_{xy}=.438), the criterion was adjusted for experience. Realizing that linear scores should be adjusted for experience with caution, the criterion was carefully investigated. The North Carolina and Missouri samples were separated and the regression equation of criterion on experience was determined for each. When it was found that the slopes of the two regression lines of first plus second ratings on experience were not significantly different, it was felt that the regression equation of merged linear scores on experience for the total sample was appropriate.

Rating Scale: Form SP-21, "Descriptive Rating Scale" was used. This scale (see Appendix) consists of 7 items covering different aspects of job performance. Each item has 5 alternatives corresponding to different aspects of job proficiency.

Criterion Distribution:

Actual Range	7-75
Mean	40.0
SD	15.7

Criterion Dichotomy: The criterion distribution was dichotomized on analyst judgment into low and high groups by placing 32% of the sample in the low criterion 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 32.

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 P and K which do not have a high correlation with the criterion were considered for inclusion in the norms because the qualitative analysis indicated they were important for the job duties and the sample had a relatively high mean score on these aptitudes. 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
P - Form Perception	Necessary in determining the completion of the wrapping.
K - Motor Coordination	Necessary in placing v-belt on pulley and starting fabric in crimping device, and cutting fabric after wrapping.
F - Finger Dexterity	Necessary in putting v-belt on pulley and placing fabric on belt.
M - Manual Dexterity	Necessary in removing v-belt from rack, removing fabric from rolls, and cutting fabric after wrapping.

TABLE 4

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

N=69

Aptitudes	Mean	SD	Range	r
G - General Learning Ability	97.0	14.2	56-125	-.094
V - Verbal Aptitude	96.5	12.1	72-123	-.075
N - Numerical Aptitude	101.1	16.8	58-137	.067
S - Spatial Aptitude	98.2	17.0	58-143	-.159
P - Form Perception	110.2	19.9	63-152	.083
Q - Clerical Perception	115.1	15.8	77-151	.033
K - Motor Coordination	110.7	17.4	66-149	.157
F - Finger Dexterity	98.8	14.8	71-143	.261*
M - Manual Dexterity	104.7	15.0	73-152	.266*

*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
Irrelevant									
Relatively High Mean					X	X	X		
Relatively Low SD	X	X						X	
Significant Correlation with Criterion								X	X
Aptitudes to be Considered for Trial Norms					P		K	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 P, K, F and M at trial cutting scores were able to differentiate between the 68% of the sample considered good workers and 32% 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 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; 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. The Phi Coefficient was used as a basis for comparing trial norms. The optimum differentiation for the occupation of V-Belt Wrapper (rubber goods) 690.885-438 was provided by the norms of P-80, K-90, F-90 . The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .46, statistically significant at the .0005 level).

TABLE 6

Concurrent Validity of Test Norms P-80, K-90 and F-90

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	7	40	47
Poor Workers	14	8	22
Total	21	48	69

Phi Coefficient (ϕ) = .46 Chi Square (X^2_y) = 14.6
Significance Level = $P/2 < .0005$

DETERMINATION OF OCCUPATIONAL APTITUDE NORMS

The data for this study met the requirements for incorporating the occupation studied into OAP-54 which is shown in the 1970 edition of Section II of the Manual for the General Aptitude Test Battery. A Phi Coefficient of .38 is obtained with the OAP-54 norms of P-75, K-85 and F-90.

SP-21
Rev. 5/67

UNITED STATES EMPLOYMENT SERVICE

DESCRIPTIVE RATING SCALE
(For Aptitude Test Development Studies)

SCORE_____

RATING SCALE FOR_____
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.

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. 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)

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

FACT SHEET

Job Title: V-Belt Wrapper (rubber goods) 690.885-438

Job Summary: Tends machine that covers machine belt with rubberized fabric.

Work Performed: Positions belt on pulleys of machine and raises pulleys to hold belt taut. Positions end of rubberized fabric on guide roll and starts machine that rotates belt and draws fabric through crimping device to cover belt. Cuts end of fabric after one revolution of belt. Cuts fabric using scissors, and starts machine that rotates covered belt through machine to ensure cut fabric end is pressed onto belt. Pulls levers to disengage pulleys. Counts number of finished belts and marks to indicate shift. Adjusts machine using wrench to change pulleys, tension springs, guides, and other attachments.

Effectiveness of Norms: Only 68% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the S-459 norms, 83% would have been good workers. 32% of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the S-459 norms, only 17% would have been poor workers.

Applicability of S-459Norms: The aptitude test battery is applicable to jobs which include a majority of the job duties described above.

GPO 908.743

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