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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)

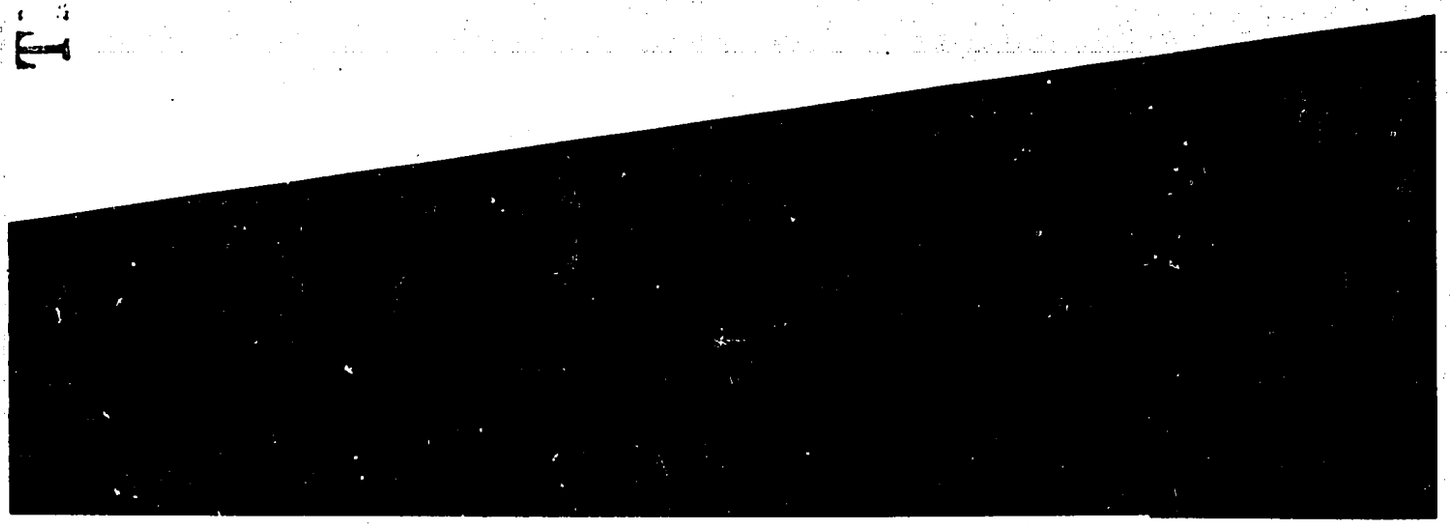
August 1969 United States Training and Employment Service Technical Report S-442

Development of USTES Aptitude Test Battery

for

Tricot-Knitting-Machine Operator

(knit goods) 685.885



U.S. DEPARTMENT OF LABOR
MANPOWER ADMINISTRATION

Technical Report on Development of USTES Aptitude Test Battery

For . . . . .

Tricot-Knitting-Machine Operator (knit goods) 685.885

S-442

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

Manpower Administration
U. S. Department of Labor

August 1969

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 #2752

DEVELOPMENT OF USTES APTITUDE TEST BATTERY

for

Tricot-Knitting-Machine Operator (knit goods) 685.885-034
S-442

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Tricot-Knitting-Machine Operator (knit goods) 685.885-034. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
P - Form Perception	70
F - Finger Dexterity	70
M - Manual Dexterity	85

RESEARCH SUMMARY

Sample: 51 (25 males and 26 females) workers employed as Tricot-Knitting Machine Operators in North Carolina and Tennessee.

This study was conducted prior to the requirement of providing minority group information. Therefore, minority group composition is unknown.

Criterion: Supervisory Ratings

Design: Concurrent (criterion data were collected subsequent to test data, however the workers had completed their training period and their proficiency was known at the time of testing).

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 = .28 ($P/2 < .025$)

Effectiveness of Norms: Only 69% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 81% would have been good workers. 31% of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 19% 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	69%	81%
Poor Workers	31%	19%

SAMPLE DESCRIPTION

Size: N = 51

Occupational Status: Employed workers.

Work Setting: Workers were employed at Burlington Industries Plants in Asheboro and Burlington, North Carolina, J. P. Stevens Company in Wallace, North Carolina, and Southern Silk Mills in Spring City, Tennessee.

Employer Selection Requirements:

Education: A minimum 8th grade education was preferred but not required.

Previous Experience: Previous experience was not required although many of the Tricot-Knitting-Machine Operators were selected from workers employed in other jobs in the plant.

Tests: None used

Other: Personal Interview

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 study had at least six months total job experience.

TABLE 2

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

	Mean	SD	Range	r
Age (years)	33.3	8.1	20-52	-.249
Education (years)	9.1	2.3	6-13	.354*
Experience (months)	72.0	45.8	14-180	-.067

*Significant at the .05 level

EXPERIMENTAL TEST BATTERY

GATB, B-1001 (excluding Part E) was administered to the North Carolina sample group (N=34). All 12 tests of the GATB, B-1002A were administered to the sample group of Tennessee (N=17). The B-1001 scores were converted to B-1002 scores.

CRITERION

The criterion for the North Carolina sample consisted of independent supervisory ratings on the SP-21 Descriptive Rating Scale. The criterion for the Tennessee sample consisted of independent supervisory ratings on the same scale with the exception of Items F and H relating to the number of job duties performed efficiently and the number of suggestions made for doing things in better ways. These were eliminated after conferring with the raters. The score from the descriptive rating for each individual in the Tennessee sample was multiplied by 1.286 in order that the criterion scores obtained from the seven items of the Tennessee rating scale would be equivalent to the scores from the nine items of the North Carolina scale.

Rating Scale: Descriptive Rating Scale-Form SP-21.

Reliability: Bi-serial correlations were computed between the sum of the specific descriptive rating scale items and the overall item (worker's "all-around" ability to do his job) with the following results:

North Carolina sample N=34, r_{bis} =.94

Tennessee sample N=17, r_{bis} =1.0

Both these correlations are regarded as significant since they are more than twice the size of their respective standard errors.

Criterion Distribution:		
	Possible Range	9-45
	Actual Range	18-41.1
	Mean	32.2
	Standard Deviation	5.1

Criterion Dichotomy: The criterion distribution was dichotomized by the analyst into low and high groups by placing 31% 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 30.9.

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 F and M which do not have high correlations 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 to inspect fabric for knitting flaws and yarn breaks.
K - Motor Coordination	Necessary in working with threading hook, lease rods, and in threading and tying warp threads and yarn.
F - Finger Dexterity	Necessary in threading yarn, inserting lease rods, and tying warp threads and yarn.
M - Manual Dexterity	Necessary to position warp beams, manipulate levers and wheels to operate the knitting machine.

TABLE 4

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

N = 51

Aptitudes	Mean	SD	Range	r
G - General Learning Ability	81.2	15.1	51-120	.359**
V - Verbal Aptitude	80.4	14.8	56-109	.354*
N - Numerical Aptitude	80.3	17.9	40-114	.215
S - Spatial Aptitude	86.1	15.3	60-124	.266
P - Form Perception	84.0	17.5	43-119	.362**
Q - Clerical Perception	80.2	16.2	47-123	.348*
K - Motor Coordination	89.5	19.3	41-128	.365**
F - Finger Dexterity	90.5	16.4	60-138	.252
M - Manual Dexterity	92.2	17.6	51-136	.142

*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
Irrelevant									
Relatively High Mean							X	X	X
Relatively Low Standard Dev.		X							
Significant Correlation with Criterion	X	X			X	X	X		
Aptitudes to be Considered for Trial Norms	G	V			P	Q	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 G, V, P, Q, K, F and M at trial cutting scores were able to differentiate between the 69% of the sample considered good workers and 31% 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 Tricot-Knitting-Machine Operator was provided by the norms of P-70, F-70, and M-85. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .28 (statistically significant at the .025 level.

TABLE 6

Concurrent Validity of Test Norms P-70, F-70, and M-85

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	10	25	35
Poor Workers	10	6	16
Total	20	31	51

Phi Coefficient (ϕ) = .28 Chi Square (X^2_y) = 4.1
Significance Level = $P/2 < .025$

DETERMINATION OF OCCUPATIONAL APTITUDE NORMS

The data for this study met the requirements for incorporating the occupation studied into OAP-32 which is shown in Section II of the Manual for the General Aptitude Test Battery. A Phi Coefficient of .26 is obtained with the OAP-32 norms of P-75, F-80, and M-80.

SP-2i
Rev. 2/61

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

NORTH CAROLINA

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 one 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 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.

FACT SHEET

Job Title: Tricot-Knitting-Machine Operator (knit goods) 685.885-034

Job Summary: Operates a Tricot Knitting Machine to produce knitted material such as mesh, jersey, voile, and curtain material.

Work Performed:

Operates battery of warp-knitting machines to knit tricot fabrics. Patrols machine alley and inspects cloth for defects, such as holes, yarn breaks and discolorations. Repairs end breaks, trims collars and ties in butterflies. Stops and starts machines, notifies supervisor when unable to determine cause of defects. Watches warp beams for yardage markers, removes each as it appears and records time. Also records frequency and location of breaks, number of racks per piece, numbers. Attaches new warp to corresponding threads of old warp by hand weaving new threads over and under lease rods, threading yarns through guides with hook, and tying warp ends with fingers. Cuts excess thread from knots using scissors.

Effectiveness of Norms:

Only 69% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the S-442 norms, 81% would have been good workers. 31% of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the S-442 norms, only 19% would have been poor workers.

Applicability of S-442 Norms:

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

GPO 883-370