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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 is also included. (AG)

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TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

TRANSFER KNITTER (hosiery) 6-14.063

B-386 or S-125

CE 001 153

U. S. Employment Service in
Cooperation with
North Carolina State Employment Service

U. S. DEPARTMENT OF LABOR
Bureau of Employment Security
Washington 25, D. C.
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GATB #862
Spring 1957

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR TRANSFER KNITTER 6-14.063

B-386 or S-125

Summary

The General Aptitude Test Battery, B-1001, was administered to a sample of 52 women employed as Transfer Knitters 6-14.063 at the Peerless Hosiery Company, North Wilkesboro, North Carolina. The criterion consisted of broad category supervisory ratings. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes S-Spatial Aptitude, F-Finger Dexterity, and M-Manual Dexterity were selected for inclusion in the test norms.

GATB Norms for Transfer Knitter 6-14.063 - B-386 or S-125

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Transfer Knitter 6-14.063.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for B-386 or S-125

Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
S	CB-1-F CB-1-H	75	S	Part 3	70
F	CB-1-O CB-1-P	95	F	Part 11 Part 12	90
M	CB-1-M CB-1-N	75	M	Part 9 Part 10	75

Effectiveness of Norms

The data in Table IV indicate that 9 of the 13 poor workers, or 69 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 69 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 34 of the 38 workers who made qualifying test scores, or 90 percent, were good workers.

TECHNICAL REPORT

I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Transfer Knitter 6-14.063.

II. Sample

The GATB, B-1001, was administered to 53 women employed as Transfer Knitters 6-14.063 at the Peerless Hosiery Plant, North Wilkesboro, North Carolina. Thirty-eight of the women were tested in May 1956. Curtailed production at the plant prevented completion of the testing at that time. However, 15 additional knitters were tested in May 1957. Of the 53 women tested, one woman was eliminated from the sample because of her age and education. Thus, the final sample consisted of 52 women. Company officials stated that a period of six months is usually required for a worker to reach average production. All workers in this sample had at least six months' experience.

Table II shows the means, standard deviations, ranges, and Pearson product-moment correlations (corrected for broad categories) with the criterion for age, education, and experience.

TABLE II

Means (M), Standard Deviations (σ), Ranges, and Pearson Product-Moment Correlations (Corrected for Broad Categories) with the Criterion ($_{c}r$) for Age, Education, and Experience

Transfer Knitter 6-14.063
N = 52

	M	σ	Range	$_{c}r$
Age (years)	27.5	6.9	19-43	.168
Education (years)	10.5	2.0	6-12	-.051
Experience (months)	66.1	53.8	9-276	.259

There are no significant correlations between age, education, or experience and the criterion. The data in Table II indicate that the sample is suitable for test development purposes with respect to age, education, and experience.

III. Job Description

Job Title: Transfer Knitter 6-14.063

Job Summary: Transfers ribbed top of anklet to knitting machine by using a transfer ring and operates the machine to knit the remainder of the sock to the ribbed top.

Work Performed: Mounts ribbed top of anklet on a transfer ring, placing each loop at the end of the ribbed top over a corresponding quill point of the transfer ring. Ravels away the excess material extending beyond the row of loops.

Removes transfer ring from stand and places it on knitting machine so that each needle of machine rests in the groove of a quill point of the ring.

Transfers loops from quill points to shanks of needles above needle latches by pulling shanks through openings inside needle ring. Removes transfer ring and places it in holder.

Places a marble-sized steel ball weight on lapped-over ribbed top. Lowers top of machine cylinder over needles. Flips a latch to start the machine that knits the sock to the ribbed top.

Removes finished socks from machine when it stops automatically. Bundles and ties knitted socks in units of 24. Places work ticket with each five bundles.

Replaces depleted cones of yarn.. Notifies repairman of machine defects.

Tends four knitting machines. Works on both 70 gauge and 54 gauge styles.

IV. Experimental Battery

All the tests of the GATB, B-1001, were administered to the sample group.

V. Criterion

The criterion consists of supervisory ratings expressed in three broad categories: above average, average, and below average. The initial ratings were made in May 1956 on 38 workers by two first line supervisors, each rating 19 workers. These ratings were reviewed by the second line supervisor, the superintendent. The 15 workers who were tested in May 1957 were rated by one foreman. These ratings were reviewed by the superintendent. New ratings were obtained for all 53 workers in conference with the two foremen and the superintendent, considering past performance since date of hiring as to quality and quantity of work. This was to reconcile a few differences in the previous ratings. For computational purposes, the qualitative ratings were converted to quantitative scores of 59, 48, and 37 for the above average, average, and below average groups, respectively.

Production records were also obtained. These records were in average number of dozen socks knitted per hour converted to average hourly earnings. Some workers were on 70 gauge while others were on 54 gauge. The pay differential was $32.75 per 100 dozen on the 70 gauge and $28.73 per 100 dozen on the 54 gauge. The workers who had worked on both 70 and 54 gauge appeared to earn higher wages while on the 54 gauge. Also, it was felt that there was a difference in rate of production while working on the different styles, sizes, and lengths of the hose. In view of these differences in the production records consisting of average hourly earnings, the broad category supervisory ratings were used for validation purposes.

VI. Statistical and Qualitative Analysis

A. Statistical Analysis:

Table III shows the means, standard deviations, and Pearson product-moment correlations (corrected for broad categories) with the criterion for the aptitudes of the GATB. The means and standard deviations of the aptitudes are comparable to general working population norms with a mean of 100 and a standard deviation of 20.

TABLE III

Means (M), Standard Deviations (σ), and Pearson Product-Moment Correlations (Corrected for Broad Categories) with the Criterion ($_{o}r$) for the Aptitudes of the GATB

Transfer Knitter 6-14.063
N = 52

Aptitudes	M	σ	$_{o}r$
G-Intelligence	89.3	14.4	.258
V-Verbal Aptitude	85.6	12.8	.073
N-Numerical Aptitude	86.5	16.7	.255
S-Spatial Aptitude	95.8	18.0	.305*
P-Form Perception	99.9	14.2	.059
Q-Clerical Perception	86.7	14.1	.096
A-Aiming	94.3	15.3	.255
T-Motor Speed	90.2	16.7	.264
F-Finger Dexterity	107.7	16.9	.450**
M-Manual Dexterity	101.0	18.2	.392**

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

The highest mean scores were obtained for Aptitudes P, F, and M. All of the aptitudes have standard deviations of less than 20. Aptitude V has the lowest standard deviation.

For a sample of 52 cases, correlations of .354 and .273 are significant at the .01 level and the .05 level of confidence, respectively. Aptitudes F and M correlate significantly with the criterion at the .01 level. Aptitude S correlates significantly with the criterion at the .05 level.

B. Qualitative Analysis:

The job analysis indicated that the following aptitudes measured by the GATB appear to be important for this occupation:

Spatial Aptitude (S) - required to accurately judge spacing in placing transfer rings exactly in grooves of quill-points and in placing knitted loops over points.

Form Perception (P) - required to perceive defects while handling the rib top or finished sock.

Aiming (A) - required to place loops accurately over quill-points and to place transfer ring on machine so that each needle of machine rests in the groove of a quill-point of the ring.

Finger Dexterity (F) - required to place loops over quill-points of transfer ring, to ravel away excess material, and to use loop hook accurately and speedily in picking up stray stitches.

Manual Dexterity (M) - required to handle rib tops readily in placing them on transfer ring, to transfer top quickly from transfer ring to knitting machine, and to handle finished socks.

C. Selection of Test Norms:

On the basis of the qualitative and quantitative evidence cited above, Aptitudes S, P, F, and M were considered further for inclusion in the test norms. These aptitudes appeared to be important on the basis of job analysis data. Aptitude S correlates significantly with the criterion at the .05 level and Aptitudes F and M correlate significantly with the criterion at the .01 level; in addition, Aptitudes P, F, and M show the highest mean scores for the sample. Although Aptitude Q shows the lowest standard deviation for the sample, it was not considered further for inclusion in the norms because there was no other qualitative or quantitative evidence of significance.

Several sets of norms, consisting of various combinations of Aptitudes S, P, F, and M with appropriate cutting scores were selected as trial norms. The relationship between each of these sets of trial norms and the dichotomized criterion was determined by means of the tetrachoric correlation technique. A comparison of the results showed that norms consisting of S-75, F-95, and M-75 had the best selective efficiency for this sample. The cutting scores for Aptitudes S, F, and M are each within 10 points of one standard deviation below the sample mean.

VII. Concurrent Validity of Norms

For the purpose of computing the tetrachoric correlation coefficient between the test norms and the criterion and applying the Chi Square test, the criterion was dichotomized by placing those workers who were rated "above average" and "average" into the high criterion group and those workers rated "below average" into the low criterion group. This placed 13 of the 52 workers, or 25 percent of them, into the low criterion group.

Table IV shows the relationship between test norms consisting of Aptitudes S, F, and M with critical scores of 75, 95, and 75, respectively, and the dichotomized criterion for Transfer Knitter 6-14.063. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV

Relationship between Test Norms Consisting of Aptitudes S, F, and M with Critical Scores of 75, 95, and 75, Respectively, and the Criterion for Transfer Knitter 6-14.063

N = 52

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	5	34	39
Poor Workers	9	4	13
Total	14	38	52

$r_{tet} = .80$ $\quad X^2 = 13.033$

$\sigma_{r_{tet}} = .25$ $\quad P/2 < .0005$

The data in the above table indicate a significant relationship between the test norms and the criterion for this sample.

VIII. Conclusions

On the basis of mean scores, correlations with the criterion, job analysis data and their combined selective efficiency, Aptitudes S, F, and M with minimum scores of 75, 95, and 75, respectively, are recommended as B-1001 norms for the occupation of Transfer Knitter 6-14.063. The equivalent B-1002 norms consist of S-70, F-90, and M-75.

IX. Determination of Occupational Aptitude Pattern

When the specific test norms for an occupation include three aptitudes, only those occupational aptitude patterns which include the same three aptitudes with cutting scores that are within 10 points of the cutting scores established for the specific norms are considered for that occupation. None of the existing 23 occupational aptitude patterns meet these requirements for this study. Therefore, none of the existing OAP's is recommended for the occupation of Transfer Knitter 6-14.063. However, the data for this sample will be considered for future groupings of occupations in the development of new OAP's.