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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)

April 1969 United States Training and Employment Service Technical Report S-434

S-434

Development of USTES Aptitude Test Battery

for

Packager, Machine

(any ind.) 920.885

U.S. DEPARTMENT OF LABOR
MANPOWER ADMINISTRATION

Technical Report on Development of USTES Aptitude Test Battery

For . . . . . .

Packager, Machine (any ind.) 920.885

S-434

(Developed in Cooperation with the
Wisconsin State Employment Service)

Manpower Administration
U. S. Department of Labor

April 1969

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 Study No. #2742

DEVELOPMENT OF USTES APTITUDE TEST BATTERY

For

Packager, Machine (any ind.) 920.885-110

S-434

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Packager, Machine (any ind.) 920.885-110. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB, Scores
S - Spatial Aptitude	85
F - Finger Dexterity	70
M - Manual Dexterity	95

RESEARCH SUMMARY

Sample:

85 male workers employed as Packagers, Machine at the American Can Company, Green Bay, Wisconsin. The sample was composed of one minority group member, an American Indian, and 84 non-minority group members.

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, standard deviations and selective efficiencies.

Concurrent Validity:

Phi Coefficient = .43 ($P/2 < .0005$)

Effectiveness of Norms:

Only 74% of the nontest-selected workers used for this study were good workers; if the workers had been test selected with the above norms, 89% would have been good workers. 26% of the nontest-selected workers used for this study were poor workers; if the workers had been test selected with the above norms only 11% 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	74%	89%
Poor Workers	26%	11%

SAMPLE DESCRIPTION

Size:

N = 85

Occupational Status:

Employed Workers

Work Setting:

Workers were employed by the American Can Company of Green Bay, Wisconsin.

Employer Selection Requirements:

Education: None except ability to speak, read and write English.

Previous Experience: None

Tests: None

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 the workers in this sample had at least 2 months of job 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)	31.5	8.2	18- 58	.001
Education (years)	11.2	1.4	7- 13	-.033
Experience (months)	74.3	67.3	2-228	.128

Experimental Test Battery

All 12 tests of the GATB, B-1002B, were administered in April 1968.

CRITERION

The criterion data consisted of supervisory ratings of job proficiency made at approximately the same time as the test data were collected.

The immediate supervisor rated each worker twice with a two week interval between ratings.

Rating Scale:

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

Reliability:

A reliability coefficient of .72 was obtained between the initial ratings and re-ratings, indicating a fairly significant relationship. The final criterion score consisted of the combined score of the two ratings.

Criterion Score Distribution:

Possible Range:	18-90
Actual Range:	36-87
Mean:	63.1
Standard Deviation:	8.5

Criterion Dichotomy:

The criterion distribution was dichotomized into low and high groups by placing 26% of the sampe 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 58.

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, Q, K, and F which do not have a significant correlation with the criterion were considered for inclusion in the norms because the qualitative analysis indicated that Aptitudes G and S, were important for the job duties and Aptitudes K and F were considered of critical importance to the job duties. In addition the

sample had a relatively high mean score on Aptitudes S and Q and relatively low standard deviation on Aptitudes G and Q. With employed workers a relatively high mean score or a relatively low standard deviation may indicate that some sample pre-selection has taken place. Tables 3, 4, and 5 show the results of the qualitative and statistical analysis.

TABLE 3

Qualitative Analysis

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

Aptitudes	Rationale
G - General Learning Ability	Required in making judgments as to when machine is in need of adjustment.
S - Spatial Ability	Required in making adjustments to the machine by inspecting the improper sealing and/or wrapping of the packages.
K - Motor Coordination	Required in packing wrapped packages in shipping containers and in replenishing packaging supplies.
F - Finger Dexterity	Required in using small hand tools to make adjustments to machine.
M - Manual Dexterity	Required in packing wrapped packages in shipping containers and in replenishing packaging supplies.

TABLE 4

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB; N=85.

	Mean	SD	Range	r
G - General Learning Ability	96.4	12.4	67-125	.111
V - Verbal Aptitude	91.3	12.3	68-127	.034
N - Numerical Aptitude	97.7	13.9	61-133	.064
S - Spatial Aptitude	101.8	15.5	65-150	.198
P - Form Perception	102.6	17.2	68-137	.091
Q - Clerical Perception	105.7	13.3	66-136	.036
K - Motor Coordination	97.4	15.6	58-148	.200
F - Finger Dexterity	92.4	17.8	51-129	.095
M - Manual Dexterity	108.2	16.7	60-150	.240*

*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	X
Irrelevant									
Relatively High Mean				X	X	X			X
Relatively Low Standard Dev.	X	X	X			X			
Significant Correlation with Criterion									X
Aptitudes to be Considered for Trial Norms	G			S		Q	K*	F*	M

*considered to be important enough, on the basis of job analysis, to be included for consideration.

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, Q, K, F and M at trial cutting scores were able to differentiate between 74% of the sample considered to be good workers and 26% 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 two-aptitude trial norms, minimum cutting scores of slightly higher than one standard deviation below the mean will eliminate about one-third of the sample; for four-aptitude trial norms cutting scores slightly lower than one standard deviation below the mean will eliminate about one-third of the sample. The Phi Coefficient and Chi Square test were used as a basis for comparing trial norms. The optimum differentiation for the occupation of Packager, Machine (any ind.) 920.885-110 was provided by the norms of S-85, F-70 and M-95. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .43 (statistically significant at the .0005 level).

TABLE 6

Concurrent Validity of Trial Norms
S-85, F-70 and M-95

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	14	49	63
Poor Workers	16	6	22
Total	30	55	85

Phi Coefficient = .43 Chi Square (X^2_y) = 16.1
Significance Level = P/2 less than .0005

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study did not meet the requirements for incorporating the occupation studied into any of the 36 OAP's included in Section II of the Manual for the General Aptitude Test Battery. The data for this sample may be considered for future groupings of occupations in the development of new Occupational Aptitude Patterns.

SP-21
WSES-1004

Form Approved
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-8-

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

DESCRIPTIVE RATING SCALE
(For Aptitude Test Development Studies)

Score _____

RATING SCALE FOR _____
D. O. T. Title and Code

Directions: Please read the sheet "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 output. Can perform at a slow pace.
- ☐ 3. Capable of fair work output. Can perform at a 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. Very poor. Does work of unsatisfactory grade. Performance is inferior and almost never meets minimum quality standards.
- ☐ 2. Not too bad, but the grade of his work could stand improvement. Performance is usually acceptable but somewhat inferior in quality.
- ☐ 3. Fair. The grade of his work is mediocre. Performance is acceptable but usually not superior in quality.
- ☐ 4. Good, but the grade of his work is not outstanding. Performance is usually superior in quality.
- ☐ 5. Very good. Does work of outstanding grade. Performance is almost always of the highest quality.

C. How accurate is he in his work? (Worker's ability to avoid making mistakes.)

- ☐ 1. Very inaccurate. Makes very many mistakes. Work needs constant checking.
- ☐ 2. Inaccurate. Makes frequent mistakes. Work needs more checking than is desirable.
- ☐ 3. Fairly accurate. Makes mistakes occasionally. Work needs only normal checking.
- ☐ 4. Accurate. Makes few mistakes. Work seldom needs checking.
- ☐ 5. Highly accurate. 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. Very low aptitude. Has great difficulty doing his job. Not at all suited to this kind of work.
- ☐ 2. Low aptitude. Usually has some difficulty doing his job. Not too well suited to this kind of work.
- ☐ 3. Moderate aptitude. Does his job without too much difficulty. Fairly well suited to this kind of work.
- ☐ 4. High aptitude. Usually does his job without difficulty. Well suited to this kind of work.
- ☐ 5. Very high aptitude. Does his job with great ease. Unusually 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. A very limited variety. Cannot perform different operations adequately.
- ☐ 2. A small variety. Can perform few different operations efficiently.
- ☐ 3. A moderate variety. Can perform some different operations with reasonable efficiency.
- ☐ 4. A large variety. Can perform several different operations efficiently.
- ☐ 5. An unusually large variety. Can do very many 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. Very unresourceful. Almost never is able to figure out what to do. Needs help on even minor problems.
- ☐ 2. Unresourceful. Often has difficulty handling new situations. Needs help on all but simple problems.
- ☐ 3. Fairly resourceful. Sometimes knows what to do, sometimes doesn't. Can deal with problems that are not too complex.
- ☐ 4. Resourceful. Usually able to handle new situations. Needs help on only complex problems.
- ☐ 5. Very resourceful. Practically always figures out what to do himself. Rarely needs help, even on complex problems.

H. How often does he make practical suggestions for doing things in better ways? (Worker's ability to improve work methods.)

- ☐ 1. Never. Sticks strictly with the routine. Contributes nothing in the way of practical suggestions.
- ☐ 2. Very seldom. Slow to see new ways to improve methods. Contributes few practical suggestions.
- ☐ 3. Once in a while. Neither quick nor slow to see new ways to improve methods. Contributes some practical suggestions.
- ☐ 4. Frequently. Quick to see new ways to improve methods. Contributes more than his share of practical suggestions.
- ☐ 5. Very often. 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 satisfactory is his work? (Worker's "all-round" ability to do his job.)

- ☐ 1. Definitely unsatisfactory. Would be better off without him. Performance usually not acceptable.
- ☐ 2. Not completely satisfactory. Of limited value to the organization. Performance somewhat inferior.
- ☐ 3. Satisfactory. A fairly proficient worker. Performance generally acceptable.
- ☐ 4. Good. A valuable worker. Performance usually superior.
- ☐ 5. Outstanding. An unusually competent worker. Performance almost always top notch.

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FACT SHEET

Job Title: Packager, Machine (any ind.) 920.885-110

Job Summary:

Tends and adjusts a machine that wraps, seals and labels rolls of paper tissue or towelling for packaging.

Work Performed:

Starts machine and observes if rolls of tissue or towelling are entering the machine correctly from conveyor. Walks to ejection end of machine to inspect if packaged rolls are properly wrapped and sealed. Picks up 4 to 6 packages at a time of wrapped rolls, turns and places them in a cardboard shipping container. Repeats until container is full, folds flaps and pushes container onto conveyor. Tosses defective packages into reject box for possible salvage. Stops machine if wrapping or sealing is not up to company standards. Makes cellophane size adjustment by using small hand tools and by slowing or speeding up rate of cellophane entry under cutting knife. Sets tension on cellophane by adjusting set screws. Adjusts position of forming dies by using allen wrench to loosen lock screws in order to move sides of dies. Adjusts amount of heat to sealing unit by turning valve on electric heat unit. Restarts machine and inspects rolls for proper wrap and seal. Replaces empty roll of cellophane wrapping paper on spindle of machine with the assistance of hand pulley. Informs maintenance mechanic if machine requires major adjustment.

Effectiveness of Norms:

Only 74% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the S-434 norms, 89% would have been good workers. 26% of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with S-434 norms, only 11% would have been poor workers.

Applicability of the S-434 Norms:

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

GPO 881-892

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