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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)

June 1970

U.S. Training and
Employment Service
Technical Report
S-163 R

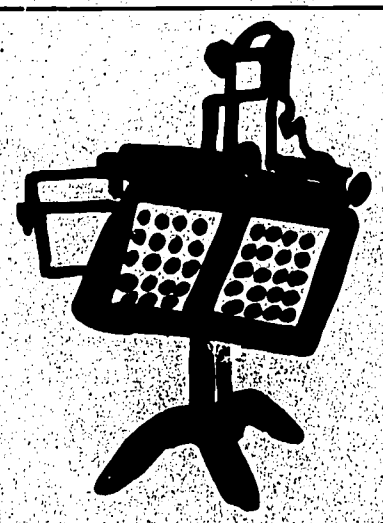
Development of USTES

APTITUDE TEST
BATTERY FOR

MONOTYPE-KEYBOARD OPERATOR

(print.& pub.; type found)
650.582

U.S. DEPARTMENT OF LABOR
Manpower Administration



Technical Report on Development of USTES Aptitude Test Battery

For . . . .

Monotype-Keyboard Operator (print. & pub.; type found.) 650.582

S-163R

(Developed in Cooperation with the
Pennsylvania State Employment Service)

U.S. DEPARTMENT OF LABOR
Manpower Administration

June 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 Study # 2245

Development of USTES Aptitude Test Battery

For

Monotype-Keyboard Operator (print. & pub.; type found.) 650.582-018

S-163R

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Monotype-Keyboard Operator (print. & pub.; type found.) 650.582-018. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
V - Verbal Aptitude	85
Q - Clerical Perception	105
K - Motor Coordination	95

RESEARCH SUMMARY

Sample:

49 male and 3 female workers employed as Monotype-Keyboard Operators in Pennsylvania. This study was conducted prior to the requirement of providing minority group information. Therefore, minority group status is unknown.

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, aptitude-criterion correlations and selective efficiencies.

Concurrent Validity:

Phi Coefficient = .48 ($P/2 < .0005$)

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, 82% would have been good workers. Thirty-one percent of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 18% would have been poor workers. The effectiveness of the norms is shown graphically in Table 1:

TABLE I

Effectiveness of Norms

	Without Tests	With Tests
Good Workers	69%	82%
Poor Workers	31%	18%

SAMPLE DESCRIPTION

Size:

N = 52

Occupational Status:

Employed Workers.

Work Setting:

Workers were employed by nine companies in Pennsylvania;

Company	Location	Number Tested
Mack Printing Company	Easton	32
Bethlehem Steel Company	Bethlehem	7
Cox Printing Company	Wilmerding	1
Davis and Wade, Incorported	Pittsburgh	1
Royal Typographers	Philadelphia	2
Allen, Lane and Scott	Philadelphia	2
Alfred J. Jordan, Incorporated	Philadelphia	1
Westcott and Thomson	Philadelphia	4
W.T. Armstrong Company	Philadelphia	2
	Total	52

Employer Selection Requirements:

Education: Nine years required.

Previous Experience: None required

Tests: None used.

Other: Personal interview.

Principal Activities:

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

Minimum Experience:

All workers in the final sample had at least four months 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)	36.1	10.4	21-65	.437**
Education (years)	11.9	.9	9-15	-.059
Experience (months)	152.4	116.7	4-485	.450**

**Significant at the .01 level.

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002A, were administered April, October, November, and December of 1957 and during September of 1958.

CRITERION

The criterion data consisted of one supervisory rating of job proficiency made at approximately the same time as the tests were administered. The immediate supervisor rated each worker.

Rating Scale:

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

Criterion Score Distribution:

Possible Range:	9-45
Actual Range:	24-45
Mean:	33.6
Standard Deviation:	6.1

Criterion Dichotomy:

The criterion distribution was dichotomized into low and high groups by placing 31% of the sample 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 29.

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 N and Q which do not have high correlations with the criterion were considered for inclusion in the norms because the qualitative analysis

indicated that the aptitudes might be important for the job duties and the sample had relatively high mean scores 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 performance)

Aptitude	Rationale
G - General Learning Ability	Required to use judgement in properly setting up keyboard in accordance with certain specifications and to memorize and understand ideas and techniques in performing the variety of tasks and skills required.
N - Numerical Aptitude	Required for accurately computing proper number of ems and units by converting from pica measurement according to conversion tables and arithmetic computations and other simple mathematical procedures in determining set up of keyboard operations.
P - Form Perception	Required for rapid and accurate perception of material to be set in type, to observe differences in copy and to avoid perceptual errors.
Q - Clerical Perception	Required to select and install proper frames and banks of keys according to specified size and style of type, to refer to tabular material and to keep daily record sheet.
K - Motor Coordination	Required to coordinate eyes, hand, and fingers rapidly to perform speed operations and intricate manipulations with machine.
F - Finger Dexterity	Required for precision accuracy, and speed in striking proper keys.

TABLE 4

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) fot the Aptitudes of the GATB; N=52.

	Mean	SD	Range	r
G - General Learning Ability	111.0	12.9	78-149	.312*
V - Verbal Aptitude	109.3	14.3	80-149	.329*
N - Numberical Aptitude	111.7	16.7	67-142	.249
S - Spatial Aptitude	102.3	18.1	61.143	-.049
P - Form Perception	103.9	17.4	65-141	-.133
Q - Clerical Perception	121.4	15.4	85-157	.393**
K - Motor Coordination	117.8	15.5	78-155	.128
F - Finger Dexterity	96.1	23.8	31-143	.096
M - Manual Dexterity	108.7	22.0	55-159	-.178

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

TABLE 5

Summary of Qualitative and Quantitative Data

	Aptitudes								
Type of Evidence	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important	X		X		X	X	X	X	
Irrelevant									
Relatively High Mean	X		X			X	X		
Relatively Low Standard Dev.	X	X							
Significant Correlation with Criterion	X	X				X			
Aptitudes to be Considered for Trial Norms	G	V	N			Q	K		

Final norms were derived on the basis of the degree to which trial norms consisting of various combinations of aptitudes G, V, N, Q and K at trial cutting scores were able to differentiate between the 69% of the sample considered to be good workers and the 31% 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 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 V-80, Q-105 and K-95 provided optimum differentiation for the occupation of Monotype Keyboard Operator (print. & pub.; type found.) 650.582-018. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .48 (statistically significant at the .0005 level).

TABLE 6

Concurrent Validity of Test Norms

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	3	33	36
Poor Workers	9	7	16
Total	12	40	52

Phi Coefficient = .48 Chi Square (X^2_y) = 11.7
Significance Level = $P/2 < .0005$

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study did not meet the requirements for incorporating the occupation studied into an OAP. However, the occupation was placed in OAP-15 which is shown in the 1970 edition of Section II of the Manual for the General Aptitude Test Battery as a result of qualitative analysis.

SP-21
Rev. 2/61

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 Form SP-20, "Suggestions to Raters", and then fill in the items listed below. In making your ratings, only <u>one</u> 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: Monotype-Keyboard Operator (print. & pub.; type found.), 650.582-018

Job Summary: Prepares the monotype machine with the proper layout arrangement and operates the keyboard of the machine by pressing keys which automatically perforate rolled strips of paper that are later used to control the casting of type.

Work Performed: Receives and reads copy from supervisor containing instructions on the size of type, length of line, and other measurements: checks attached keyboard ribbon ticket to determine proper settings of machine, and clips copy to be typed in position on copy holder.

Prepares the keyboard with proper layout arrangement: Selects and installs proper frames and banks of keys according to specified size and style of type. Selects proper justification scale and mounts on cylinder: According to specifications on ticket uses table on justification scale to determine proper justifying keys to punch in order to set fixed units and spaces in a composed line.

Converts pica measure of the material being set to Ems: Refers to an Em scale chart, and figures units of measurement by simple mental arithmetic. Sets Em scale and key base according to number of ems and units required. After Em scale and justification scale are set, operator punches proper keys to set first line in order to check accuracy of setting on the keyboard.

Installs roll of paper strip onto a winding spool and threads into machine to install monotype ribbon on which holes are punched by keyboard mechanism.

Strikes keys on keyboard of machine to set copy on monotype ribbon used to control the casting of type: Operates largely by touch system using all fingers. Observes copy, watches signals, and checks on Em and justifying scales to properly set type and operate machine.

When copy is completely typed, tears strip loose from supply roll: Attaches type-casting instructions to reel and forwards reel to casting room for casting of type.

Keeps a daily keyboard Time Ticket on which operator records material completed according to kind and type of work, size and type of mold, pica measurement, ems per line, lines, non-productive time, productive time, etc.

Effectiveness of Norms:

Only 69% of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the S-163R norms, 82% would have been good workers. 31% of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the S-163 norms, only 18% would have been poor workers.

Applicability of S-163R Norms:

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

GPO 898.711