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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)

Development of USES Aptitude Test Battery

for

Offset-Web-Press Man

(print & pub.) 4-48.033

For Administrative Use Only

U.S. DEPARTMENT OF LABOR
W. Willard Wirtz, Secretary
MANPOWER ADMINISTRATION
BUREAU OF EMPLOYMENT SECURITY
Washington, D.C. 20210

Technical Report on Development of USES Aptitude Test Battery

For .....

Offset-Web-Press Man (print. & pub.), 4-48.033

B-634 or

S-354

U.S. Employment Service
in Cooperation with
California, Michigan, Ohio, Pennsylvania, and
Wisconsin State Employment Services

November 1965

GATB Study #2571

DEVELOPMENT OF USES APTITUDE TEST BATTERY

For

Offset-Web-Press Man (print. & pub.), 4-48.033

B-634

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Offset-Web Press Man (print. & pub.), 4-48.033. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB, B-1002 Scores
Q - Clerical Perception	80
K - Motor Coordination	85
M - Manual Dexterity	70

RESEARCH SUMMARY

Sample:

53 male Offset-Web-Press Men employed in California, Michigan, Ohio, Pennsylvania, and Wisconsin.

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 job analysis and statistical analyses of aptitude mean scores, standard deviations, and selective efficiencies.

Concurrent Validity:

Phi Coefficient = .32 ($p/2 < .01$)

Effectiveness of Norms: Only 68% of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 77% would have been good workers. 32% of the non-test-selected workers used for this study were poor workers; if the workers had been test selected with the above norms, only 23% 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%	77%
Poor Workers	32%	23%

SAMPLE DESCRIPTION

Size: N = 53

Occupational Status: Employed workers

Work Setting: Workers were employed by the following companies:

1. Pacific Press, Inc., Los Angeles, California
2. Safran Printing Co., Detroit, Michigan
3. U.S. Playing Card Co., Cincinnati, Ohio
4. McCall Corporation, Dayton, Ohio
5. Moore Business Forms, Inc., Lewisburg, Pennsylvania
6. General Manifold and Printing Co., Franklin, Pa.
7. Emerson Press, Pittsburgh, Pennsylvania
8. McGregor Printing Co., Pittsburgh, Pa. (Now out of business)
9. Democrat Printing Co., Madison, Wisconsin
10. Western Printing Co., Racine, Wisconsin
11. Krueger Co., Brookfield, Wisconsin
12. Wisconsin Cuneo Press, Milwaukee, Wisconsin

Company Selection Requirements:

Age: No fixed age requirement
Education: High School preferred
Previous Experience: Second Pressman or Pressman Helper
Tests: None
Other: Promotion from Second Pressman or Pressman Helper. One agency promoted workers through a union bid system which was based largely on seniority.

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

Minimum Experience: All workers had completed an on-the job training period of 48 months and had at least one year's job experience in present classification with their present employer.

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)	38.6	7.0	22-51	.168
Education (years)	11.3	1.4	7-13	.002
Experience (mos.) (Present employer)	126.4	87.0	12-396	.146

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002B, IBM, were administered between 5/31/63 and 9/15/65 to the experimental sample, concurrent with the collection of criterion data.

CRITERION

The criterion data consisted of first line supervisory ratings of job proficiency made on an adaptation of the Descriptive Rating Scale (SP-21) provided by the Michigan Agency.

Rating Scale: Adaptation of USES Form SP-21, "Descriptive Rating Scale." The scale (see Appendix) consisted of 13 items covering different aspects of job performance. Each item had five alternatives corresponding to different degrees of job proficiency.

Reliability: First and second ratings were made by the same supervisor with a minimum time interval of two weeks between ratings for 47 of the 53 individuals in the sample. A reliability coefficient of .911 was obtained between the two sets of ratings for the 47 sample members. The two ratings were combined, and the rating score for the six sample members with only one rating were doubled.

Criterion distribution:	Possible range: 26-130 Actual range: 69-118 Mean: 95.2 Standard Deviation: 13.7
Criterion dichotomy:	The criterion distribution was dichotomized into high and low groups by placing 32% 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."

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. There were no significant correlations between the criterion and the aptitudes for this sample. 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
G - Intelligence	Necessary in planning and supervising activities of subordinates; adapting to changes required by production of various media; reading blueprints; understanding use and operation of equipment.
P - Form Perception	Necessary in visual inspection of copy; reading blueprints and micrometer; observing flow of web through press.
Q - Clerical Perception	Necessary in visual inspection of copy.
K - Motor Coordination	Necessary in loading and threading paper in machine; in inserting metal printing plates in rotating cylinder.
F - Finger Dexterity	Necessary in setting and threading paper in machine; making fine adjustments; inserting and locking plates.
M - Manual Dexterity	Necessary for mounting rolls of paper in machine; inserting plates in rotating cylinder; adjusting machine.

TABLE 4

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

Aptitude	Mean	SD	Range	r
G - Intelligence	99.9	12.6	76-127	.263
V - Verbal Aptitude	97.1	11.6	78-125	.258
N - Numerical Aptitude	95.8	13.9	72-140	.087
S - Spatial Aptitude	105.8	16.7	71-143	.186
P - Form Perception	97.2	15.1	66-131	.072
Q - Clerical Perception	97.0	12.9	75-145	-.026
K - Motor Coordination	99.0	14.4	70-130	.240
F - Finger Dexterity	87.8	20.1	44-136	.224
M - Manual Dexterity	99.5	23.7	62-189	.118

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	x
Irrelevant									
Relatively High Mean	x			x			x		x
Relatively Low Sigma	x	x	x			x			
Significant Correlation with Criterion									
Aptitudes to be Considered for Trial Norms	G					Q	K		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, Q, K, and M, at trial cutting scores were able to differentiate between the 68% of the sample considered good workers and the 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. Norms of Q-80, K-85, and M-70 provided the highest degree of differentiation. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .32 (statistically significant at the .01 level).

TABLE 6

Concurrent Validity of Test Norms, Q-80, K-85, and M-70

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	6	30	36
Poor Workers	8	9	17
Total	14	39	53

Phi Coefficient (ϕ) = .322 Chi Square (X^2) = 5.495
Significance Level = $p/2 < .01$

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study did not meet the requirements for allocation to any of the existing 36 occupational aptitude patterns included in Section II of the Guide to the Use of the General Aptitude Test Battery. The data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.

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

JOB DESCRIPTION

Job Title: Offset-Web-Press Man (print. & pub.) 4-48.033

Job Summary: Supervises and assists five or six workers in setting up and operating an automatic Heat-Set, Web-Fed, Offset Printing Press which prints newspapers, books, and magazines on a continuous roll of paper.

Work Performed: As a working leader oversees, assists, and instructs a crew which prepares and operates a press.

Mounts rolls of paper in machine and moves rolls of paper to desired position near feed end of press by operating overhead conveyor. Inserts metal shaft with flanged collar through core of each roll so that the collar fits tightly against one end of roll. Fixes movable chuck against other end of shaft. May spread glue on outside section of roll to provide a sticking surface for Auto-Paster operation. Wheels roll of paper into proper position with hand cart for mounting into press. Fits shaft into bearings and rolls paper over guide arms of press. Hoists roll to press level and locks it into position.
Threads Web through press by loosening outer layer of roll and threading paper through press, winding over and between various tension and guide rollers and printing and impression cylinders, taking care to enter the webs from the several printing units in correct order. Adjusts friction brake and/or PIV setting to insure proper tension on paper as it unwinds from roll.
Inserts and locks new plates into press cylinders. Builds up packing under metal printing plates and under rubber blanket. Checks thickness of packed plate with micrometer to insure precise contact with rubber mat. Inserts metal printing plate in appropriate gap in rotating cylinder. Locks one end of plate into cylinder using hand wrench. Starts press. Runs press slowly, inching plate into position to lock in other end. Locks other end of plate to cylinder using hand wrench.
Checks ink fountains and lubrication. Wipes rollers clean with solvent and fills ink fountains in each unit, as needed, with proper color ink. Adjusts flow of ink to plate by adjusting key valves along plate. Checks lubrication of press by maintenance crew.
Sets temperature of drying oven and adjusts flow of water to chill roller as required.
Sets up folder according to type of fold required for particular operation. Consults blueprint to determine proper set-up of folder. Threads paper through folder using guide marks of folder and paper for correct alignment. Sets cutting blade to specified cutting instructions.
Starts press by pushing electrical button-switch. Raises press to full speed by dialing rheostat knob. Observes flow of web through press to discover any malfunction. Makes frequent observations of each press operation for indications of potential trouble.
Visually inspects printed copies at frequent intervals to spot irregularities in printing, such as unequal distribution of ink and improper cutting and folding. Compares printed copies for quality of color reproduction with original model using magnifying glass.

Stops press if web breaks and press has not stopped automatically.
Rethreads web through press or makes necessary adjustments. Stops press when automatic counter shows required number of copies printed.
Maintains production records.
Advises foreman whenever trouble, spoilage, breakdown, paper stock, or quality problems are encountered.

DESCRIPTIVE RATING SCALE

(For Aptitude Test Development Studies)

SCORE _____

RATING SCALE FOR WEB-OFFSET-PRESSMAN 4-48.052 [changed to Offset-Web-Press Man 4-48.033]
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 year's experience. Don't rate one worker as better 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 quickly can the Pressman set-up the press for operation. (Pressman's ability to organize and set-up the press efficiently.)

1. ☐ Sets up press too slowly. Performs at unsatisfactory pace.
2. ☐ Sets up press slower than desirable.
3. ☐ Performance is acceptable, but not superior.
4. ☐ Sets up press quickly.
5. ☐ Sets up press with unusual speed.

B. How good is the quality of his non-color printed copy? (Pressman's ability to do high-grade work which meets quality standards.)

1. ☐ Copy is inferior and almost never meets minimum quality standards.
2. ☐ The grade of his work could stand improvement. Copy is usually acceptable but somewhat inferior in quality.
3. ☐ Copy is acceptable but usually not superior in quality.
4. ☐ Copy is usually superior in quality.
5. ☐ Copy is almost always of the highest quality.

C. How good is the quality of his color copy? (Pressman's ability to do high-grade work which meets quality standards.)

1. ☐ Copy is inferior and almost never meets minimum quality standards.
2. ☐ The grade of his work could stand improvement. Copy is usually acceptable but somewhat inferior in quality.
3. ☐ Copy is acceptable but usually not superior in quality.
4. ☐ Copy is usually superior in quality.
5. ☐ Copy is almost always of the highest quality.

D. How much does he know about his job? (Pressman's understanding of the principles, equipment, materials and methods that have to do directly or indirectly with running the press.)

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? (Pressman'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? (Pressman'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? (Pressman'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? (Pressman'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. How well does he check finished copy? (Pressman's ability to visually inspect printed matter.)

1. ☐ Misses major imperfections. Work needs constant checking.
2. ☐ Has difficulty spotting imperfections. Work needs more checking than is desirable.
3. ☐ Misses some details. Work needs only normal checking.
4. ☐ Inspects copy well. Work seldom needs checking.
5. ☐ Is very observant. Work almost never needs checking.

J. How much work can he get done? (Pressman's ability to make efficient use of his time and to work at high speed.)

1. ☐ Capable of very low work output. Runs press at an unsatisfactory pace.
2. ☐ Capable of low work output. Runs press at a slow pace.
3. ☐ Capable of fair work output. Runs press at an acceptable but not fast pace.
4. ☐ Capable of high work output. Runs press at a fast pace.
5. ☐ Capable of very high work output. Runs press at an unusually fast pace.

K. How clearly does he communicate with others. (Pressman's ability to relate intelligible messages and instructions.)

1. ☐ Has great difficulty communicating clearly to others.
2. ☐ Can be confusing at times. Does not express himself well.
3. ☐ Can usually give and receive information without too much difficulty.
4. ☐ Communicates well and is understood.
5. ☐ Can communicate very well. Speaks very clearly and effectively.

L. How alert and observant is he of press operations? (Pressman's ability to detect potential malfunctions and safety hazards.)

1. ☐ Almost never spots potential trouble.
2. ☐ Rarely spots potential trouble.
3. ☐ Sometimes, but not often spots potential trouble.
4. ☐ Is observant and can foresee potential trouble.
5. ☐ Is very alert and observant and often averts potential trouble.

M. Considering all the factors already rated, and only these factors, how acceptable is his work? (Pressman'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)