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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 1971

U.S. Training and Employment Service
Technical Report
S-131R

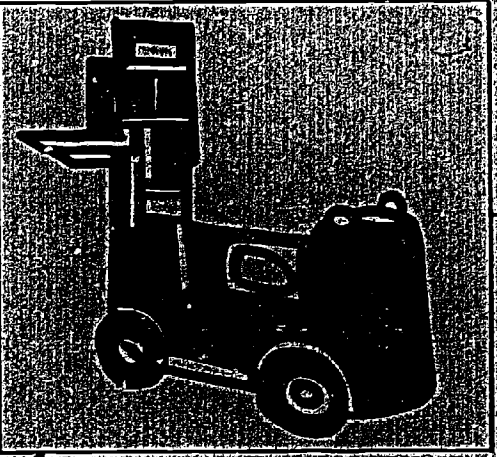
Development of USTES

APTITUDE TEST BATTERY FOR

FORK-LIFT-TRUCK OPERATOR

(any ind.)
922.883

U.S. DEPARTMENT OF LABOR
Manpower Administration



Technical Report on Development of USTES Aptitude Test Battery

For. . . . . .

Fork-Lift-Truck Operator (any ind.) 922.883

S-131R

(Developed in Cooperation with the Illinois, California, New Jersey, and Missouri State Employment Services)

U.S. Department of Labor
Manpower Administration

June 1971

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 #2764
2844

DEVELOPMENT OF USTES APTITUDE TEST BATTERY

for

Fork-Lift-Truck Operator (any ind.) 922.883-018

S-131R

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Fork-Lift-Truck Operator (any ind.) 922.883. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
S - Spatial Aptitude	70
F - Finger Dexterity	70

Research Summary

Sample:

89 male Fork-Lift-Truck Operators employed at American Can Company in Illinois and Continental Can Company in Illinois, California, New Jersey and Missouri. Forty-three of the sample members were Negro, seven were Mexican American and one was Puerto Rican. The rest of the sample consisted of nonminority group members.

Criterion:

Supervisory ratings.

Design:

Concurrent (test and criterion data were collected at about the same time.)

Minimum aptitude requirements (or norms) were determined on the basis of job analysis and statistical analyses of aptitude mean scores, standard deviations, aptitude-criterion correlations, and selective efficiencies. Although norms were developed through analysis of data from total sample, effect of possible norms resulting from analysis on both minorites and nonminorities was investigated before final norms were set.

Concurrent Validity:

Phi Coefficient for total sample = .40 ($P/2 < .001$)

Phi Coefficient for minority subsample = .29 ($P/2 < .025$)
Phi Coefficient for nonminority subsample = .42 ($P/2 < .005$)

There is essentially no difference in these Phi Coefficients.

Phi Coefficient for culturally deprived subsample = .31 ($P/2 < .025$)
Phi Coefficient for culturally exposed subsample = .43 ($P/2 < .005$)

There is essentially no difference in these Phi Coefficients.

Effectiveness of Norms:

71% of the nontest-selected workers used for this study were good workers. If the workers had been test-selected with the above norms, 86% would have been good workers. 29% of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 14% would have been poor workers. The effectiveness of the norms is shown in Table 1.

TABLE 1

Effectiveness of Norms

	Without Tests	With Tests
Good Workers	71%	86%
Poor Workers	29%	14%

Comparison of Minority and Nonminority Groups:

No differential validity for this battery was found. (See Phi Coefficients above.)

20% of the minority workers did not meet the established norms and were good workers; 13% of the nonminority workers did not meet the established norms and were good workers. The difference is not significant.

Composition of Culturally Deprived and Culturally Exposed Groups:

No differential validity for this battery was found. (See Phi Coefficients above.)

19% of the culturally deprived workers did not meet the established norms and were good workers; 15% of the culturally exposed workers did not meet the established norms and were good workers. The difference is not significant.

Sample Description

Size:

N = 89

Occupational Status:

Employed Workers

Work Setting:

Workers were employed at American Can Company plants in Maywood and Chicago, Illinois and Continental Can Company plants in San Jose and San Leadro, California; Paterson, New Jersey; Chicago, Illinois; and St. Louis, Missouri.

Employer Selection Requirements:

Education: High School education or equivalent required at two plants. No education requirement at other plants.

Tests: Vision and driving tests required in one plant. Two plants had required Wonderlic and Purdue at varying cutting scores for periods in past.

Other: Three plants select on basis of "seniority". Two plants consider interest, work habits, and related work experiences derived from an 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 sample had at least three months experience on the job.

TABLE 2

Means (M), Standard Deviations (SD), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, Experience and Cultural Exposure.

	Mean	SD	Range	r
Age (years)	40.5	9.7	20-59	.108
Education (years)	10.6	1.9	6-13	.108
Experience (months)	133.7	95.7	3-408	.136
Cultural Exposure*	3.1	1.8	0-6	-.062

*Cultural exposure scores from American Can Company had to be statistically converted from scores reflecting interim key to scores reflecting empirical key because individual item responses were destroyed.

Experimental Test Battery

All 12 tests of the GATB, B-1002B and the Research Questionnaire-Background were administered during the period of February to April 1969 to the American Can sample and November to December 1970 to the Continental Can sample.

Criterion

The criterion consisted of supervisory ratings of each individual's job performance collected at approximately the same time as the tests were administered.

Rating Scale:

Form SP-21 "Descriptive Rating Scale" was used. This scale (see Appendix) consists of 7 items covering different aspects of job performance. Each item has five alternatives corresponding to different degrees of job proficiency.

Reliability:

A reliability coefficient of .83 was obtained between the initial ratings and re-ratings obtained two weeks later, indicating a significant relationship. The final criterion score consisted of the combined score for the two ratings.

Criterion Score Distribution:

	Total Sample	Minority Sample	Nonminority Sample
Possible Range:	14-70	14-70	14-70
Actual Range:	26-70	26-70	28-67
Mean:	50.2	47.9	53.2
Standard Deviation:	10.0	9.9	9.3

Criterion Dichotomy:

The criterion distribution was dichotomized into low and high groups by placing 29% of the sample in the low group to correspond with the percentage of workers considered by the employer to be 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 44.

Aptitudes Considered For Inclusion In The Norms

Aptitudes were selected for tryout in the norms on the basis of a qualitative analysis of test and criterion data. Aptitudes S, Q and K, which do not have a significant correlation with the criterion, were considered because the qualitative analysis indicated they were important and the sample had relatively high mean scores on these aptitudes. With employed workers, a relatively high mean may indicate that some sample pre-selection has taken place. Tables 3, 4, and 5 show the results of the qualitative and statistical analyses.

TABLE 3

Qualitative Analysis
(Based on job analysis, the aptitudes listed appear to be important to the work performed)

Aptitude	Rationale
S - Spatial Aptitude	Required in stocking of material and in the loading and re-loading of trucks and freight cars.
Q - Clerical Perception	Required in checking gages, weight, and stability of objects and in identification of parts.
K - Motor Coordination	Required to coordinate eyes and hands rapidly in making precise movements with speed in operation of vehicle.
F - Finger Dexterity	Required to move hands swiftly and accurately in operating levers on trucks while loading, stocking or driving.
M - Manual Dexterity	Required to move arms and hands swiftly and accurately in operating levers on trucks while loading, stocking or driving.

TABLE 4

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB. N=89

Aptitude	Mean	SD	Range	r
G-General Learning Ability	81.9	18.0	46-131	.248*
V-Verbal Aptitude	84.8	12.2	66-117	.210*
N-Numerical Aptitude	81.4	22.6	30-142	.246*
S-Spatial Aptitude	86.4	18.5	58-130	.147
P-Form Perception	82.7	23.6	29-140	.141
Q-Clerical Perception	93.3	16.5	57-144	.074
K-Motor Coordination	88.3	20.3	37-140	.177
F-Finger Dexterity	82.6	23.1	27-135	.267*
M-Manual Dexterity	85.2	22.7	32-146	.187

TABLE 4a

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for the Minority Subsample, N=51

Aptitude	Mean	SD	Range	r
G-General Learning Ability	74.5	15.5	46-128	.118
V-Verbal Aptitude	80.0	9.3	66-111	.022
N-Numerical Aptitude	72.5	21.2	30-115	.159
S-Spatial Aptitude	80.1	15.7	58-117	-.001
P-Form Perception	75.1	24.5	29-136	.005
Q-Clerical Perception	88.3	14.9	57-134	.039
K-Motor Coordination	81.9	18.1	39-132	.065
F-Finger Dexterity	78.8	23.7	27-135	.206
M-Manual Dexterity	83.4	22.3	32-135	.112

TABLE 4b

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for the Nonminority Subsample, N=38

Aptitude	Mean	SD	Range	r
G-General Learning Ability	92.0	16.6	55-131	.185
V-Verbal Aptitude	91.2	12.7	66-117	.201
N-Numerical Aptitude	93.3	18.6	58-142	.133
S-Spatial Aptitude	94.9	18.5	68-130	.114
P-Form Perception	92.8	18.1	59-140	.141
Q-Clerical Perception	100.0	16.1	66-144	-.094
K-Motor Coordination	96.9	19.9	37-140	.127
F-Finger Dexterity	87.6	21.3	41-131	.270
M-Manual Dexterity	87.6	22.9	36-146	.251

TABLE 4c

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for the Culturally Deprived Subsample, N= 42

Aptitude	Mean	SD	Range	r
G-General Learning Ability	78.9	17.7	46-128	.078
V-Verbal Aptitude	83.8	12.8	66-117	.086
N-Numerical Aptitude	76.3	21.8	32-125	.121
S-Spatial Aptitude	84.0	18.2	58-120	-.053
P-Form Perception	83.3	23.4	30-140	.025
Q-Clerical Perception	94.0	17.4	57-144	.058
K-Motor Coordination	88.8	18.7	47-140	.218
F-Finger Dexterity	83.1	22.2	41-135	.156
M-Manual Dexterity	88.6	20.9	36-121	.016

TABLE 4d

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for the Culturally Exposed Subsample, N=47

Aptitude	Mean	SD	Range	r
G-General Learning Ability	84.7	17.8	48-131	.404**
V-Verbal Aptitude	85.7	11.6	66-111	.335*
N-Numerical Aptitude	84.1	22.9	30-142	.354*
S-Spatial Aptitude	88.6	18.5	61-130	.327*
P-Form Perception	82.1	23.8	29-128	.254
Q-Clerical Perception	92.7	15.6	66-133	.095
K-Motor Coordination	87.9	21.7	37-134	.147
F-Finger Dexterity	82.0	23.9	27-131	.371**
M-Manual Dexterity	82.1	23.7	32-146	.351*

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

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, N, S, Q, K and F at trial cutting scores were able to differentiate between 71% of the sample considered good workers and 29% 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 Fork-Lift-Truck Operator (any ind.) 922.883 was provided by norms of S-70, F-70. The validity of these norms is shown in Table 6 and is indicated by a phi coefficient of .40 (statistically significant at the .001 level).

TABLE 6

Concurrent Validity of Test Norms, S-70, F-70

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	15	48	63
Poor Workers	18	8	26
Total	33	56	89

Phi Coefficient (ϕ) = .40 Chi Square (X^2_y) = 14.4

Significance Level = $P/2 < .001$

TABLE 7

Concurrent Validity of Test Norms S-70, F-70 when Applied to Minority Subsample

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	10	20	30
Poor Workers	14	7	21
Total	24	27	51

Phi Coefficient (ϕ) = .29 Chi Square (X^2_y) = 4.3

Significance Level = $P/2 < .025$

TABLE 8

Concurrent Validity of Test Norms S-70, F-70 when Applied to Nonminority Subsample

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	5	28	33
Poor Workers	4	1	5
Total	9	29	38

Phi Coefficient (ϕ) = .42 Chi Square (X^2_y) = 6.8

Significance Level = $P/2 < .005$

TABLE 9

Concurrent Validity of Test Norms S-70, F-70 when Applied to Low Cultural Exposure Sample

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	8	19	27
Poor Workers	10	5	15
Total	18	24	42

Phi Coefficient (ϕ) = .31 Chi Square (X^2_y) = 4.0

Significance Level = $P/2 < .025$

TABLE 10

Concurrent Validity of Test Norms S-70, F-70 when Applied to High Cultural Exposure Sample

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	7	29	36
Poor Workers	8	3	11
Total	15	32	47

Phi Coefficient (ϕ) = .43 Chi Square (X^2_y) = 8.6

Significance Level = $P/2 < .005$

Determination Of Occupational Aptitude Pattern

The data for this study met the requirements for incorporating the occupation studied into OAP-47 which is shown in the 1970 edition of Section II of the Manual for the General Aptitude Test Battery. A Phi Coefficient of .25 is obtained with the OAP-47 norms of S-80, F-80, M-85.

SP-21
Rev. 5/67

UNITED STATES EMPLOYMENT SERVICE

DESCRIPTIVE RATING SCALE
(For Aptitude Test Development Studies)

SCORE_____

RATING SCALE FOR_____
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 years' experience. Don't rate one worker as poorer 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 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 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. 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 is usually superior.
5. ☐ An unusually competent worker. Performance almost always top notch.

Rated by..... Title..... Date.....

Company or organization..... Location.....
(City) (State)

June 1971 S-131R

Fact Sheet

Job Title: Fork-Lift-Truck Operator (any ind.) 922.883-018

Job Summary: Drives "LP" gas or gasoline-powered fork-lift trucks of varying size to pick up, haul and stack palletized/boxed/packaged plate, can parts, completed cans, production and packing material to and from designated production, storage, shipping and receiving areas.

Work Performed: Moves levers, depresses pedals, checks engine-operated gages to drive truck, controls height positioning of mast so that loads are properly lifted and stacked. Operates lift truck so that when truck is in horizontal motion the loaded/unloaded forks are in a trailing position. Checks/estimates weight of all lifts to prevent overloading. Checks visually load stability prior to pick-up so that spillage and damage are avoided. Stacks loads observing floor loading and stack height restrictions. Complies with verbal/written movement instructions from foreman. Identifies parts and automatically moves them from one fabrication point to the next without specific instructions. Loads and unloads trucks and freight cars. Prepares time card and daily load movement record. Reports equipment defects to truck mechanic.

Effectiveness of Norms: 71% of the nontest-selected workers used for this study were good workers. If the workers had been test-selected with the S-131R norms, 86% would have been good workers. 29% of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the S-131R norms, only 14% would have been poor workers.

Effectiveness of Norms with Minority Subsample: 20% of the minority workers did not meet the established norms and were good workers; 13% of the nonminority workers did not meet the established norms and were good workers. The difference is not significant.

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