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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 included. (AG)

September 1968 United States Employment Service Technical Report S-419

S-419

Development of USES Aptitude Test Battery

for

Traffic Device Maintainer

{ gov. ser.} 869.884

U.S. DEPARTMENT OF LABOR

MANPOWER ADMINISTRATION

Technical Report on Development of USES Aptitude Test Battery

For . . . .

Traffic Device Maintainer (gov. ser.) 869.884
S-419

(Developed in Cooperation with the
New York State Employment Service)

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September 1968

FOREWORD

The United States 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.

Charles E. Odell, Director
U.S. Employment Service

GATB Study #2705

DEVELOPMENT OF USES APTITUDE TEST BATTERY

FOR

Traffic Device Maintainer (gov. ser.) 869.884-077

This report describes research undertaken for the development of General Aptitude Test Battery (GATB) norms for the occupation of Traffic Device Maintainer (gov. ser.) 869.884-077. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
V - Verbal Aptitude	80
Q - Clerical Perception	70
K - Motor Coordination	85
M - Manual Dexterity	75

RESEARCH SUMMARY

Sample:
67 male workers employed as Traffic Device Maintainers in New York.

Criterion:
Supervisory rank-comparison ratings.

Design:
Concurrent (test data were collected approximately one year after criterion data).

Minimum aptitude requirements were determined on the basis of a job analysis and statistical analyses of aptitude mean scores, standard deviations, aptitude-criterion correlations, and selective efficiencies.

Concurrent Validity:
Phi Coefficient (ϕ) = .39 ($P/2 < .0005$)

Effectiveness of Norms:
Only 66% of the nontest-selected workers used for this study were good workers. If the workers had been test-selected with the S-419 norms, 81% would have been good workers. 34% of the nontest-selected workers used for this study were poor workers. If the workers had been test-selected with the S-419 norms, only 19% 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	66%	81%
Poor workers	34%	19%

SAMPLE DESCRIPTION

Size:
N = 67

Occupational Status:
Employed workers.

Work Setting:
Workers were employed by the Department of Traffic of the City of New York, New York.

Employer Selection Requirments:
Education: None indicated.

Previous Experience: None indicated.

Tests: None indicated.

Principle Activities:
The job duties for workers in the final sample are outlined in the job description in the Appendix.

Minimum Experience:
All workers had at least 21 months of job experience.

TABLE 2

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

	Mean	SD	Range	r
Age (years)	43.9	6.3	31-59	-.101
Education (years)	10.3	1.78	3-13	-.051
Experience (months)	78.8	39.59	21-193	-.154

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002B, were administered in 1968 approximately 13 months after criterion data were obtained.

CRITERION

The criterion data consisted of rank-comparison ratings from supervisors made at approximately the same time as test data were collected. Ratings and re-ratings, obtained one month apart, were made by the immediate supervisors of each worker.

Reliability:
A reliability coefficient of .84 was obtained between the initial rating and re-rating, indicating a significant relationship. The final criterion score consisted of the combined score of the two ratings.

Criterion Score Distribution:

Range:	21-188
Mean:	106
Standard Deviation:	36

Criterion Dichotomy:
The criterion distribution was dichotomized into low and high groups by placing 34% of the sample into 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 criterion group as "poor workers." The criterion critical score is 46.

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were considered 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 S, Q, K and M which do not have significant correlations with the criterion were considered for inclusion in the norms because the qualitative analysis indicated that these aptitudes were important for the job duties. In addition, the sample had a relatively high mean score on Aptitudes V, S, K and M and a relatively low standard deviation on Aptitudes V and Q. Aptitudes P and F were considered for inclusion in the norms since Form Perception and Finger Dexterity were considered to be of critical importance to the job. 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
S - Spatial Perception	Needed to operate truck in tight places, maintain parking meters, etc.
P - Form Perception	Working with various sprayers, tools, and line marking machine.
Q - Clerical Perception	In preparing and submitting report of completed work and vehicle use.
K - Motor Coordination	Needed to operate truck and various vehicles, in using tools and machinery in spraying and servicing traffic control devices.

TABLE 3 (cont'd)

Aptitude	Rationale
F - Finger Dexterity	In operating punch press, shear, paint sprayers, servicing parking meters.
M - Manual Dexterity	In using pneumatic tools (rock drills, jackhammers, compressors) driving and servicing duties.

TABLE 4

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

Aptitudes	Mean	SD	Range	r
G - General Learning Ability	90.2	13.5	59-114	.111
V - Verbal Aptitude	91.2	10.5	66-121	.013
N - Numerical Aptitude	87.1	16.5	35-119	.163
S - Spatial Aptitude	95.6	16.0	65-127	.195
P - Form Perception	86.8	19.6	24-124	.220
Q - Clerical Perception	88.0	10.9	67-113	.162
K - Motor Coordination	95.7	17.6	58-128	.218
F - Finger Dexterity	87.9	17.1	50-135	.135
M - Manual Dexterity	91.8	19.8	44-138	.157

TABLE 5

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis					*			*	
Important				X	X	X	X	X	X
Irrelevant									
Relatively High Mean		X		X			X		X
Relatively Low Standard Deviations	X	X				X			
Significant Correlation with Criterion									
Aptitudes to be Considered for Trial Norms		V		S	* P	Q	K	* F	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 V, S, P, Q, K, F, and M at trial cutting scores were able to differentiate between the 66% of the sample considered good workers and the 34% of 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 slightly higher than one standard deviation below the mean will eliminate about one-third of the sample. For four-aptitude trial norms, minimum cutting scores slightly lower 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 Traffic Device Maintainer (gov. ser.) 869.884-077 was provided by norms of V-80, Q-70, K-85, and M-75. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .39 (statistically significant at the .005 level).

TABLE 6

Concurrent Validity of Test Norms, V-80,Q-70,K-85, and M-75

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	10	34	44
Poor Workers	15	8	23
Total	25	42	67

Phi Coefficient (ϕ) = .39 Chi Square (X^2_y) = 9.9
Significance Level = $P/2 < .005$

DETERMINATION OF OCCUPATIONAL APTITUDE NORMS

The data for this study did not meet the requirements for incorporating the occupation studied into any of the existing 36 OAP's included in Section II of the Manual for 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.

FACT SHEET

Job Title:

Traffic Device Maintainer (gov. ser.) 869.884-077

Job Summary:

Under direct supervision of foreman, prepares, installs and maintains traffic control devices and markings including signs, parking meters and traffic counters.

Work Performed:

Fabricates and paints traffic signs and supporting stanchions, using punch press, shear, paint sprayers, etc. Installs, repairs and maintains parking meters, permanent markers, signs and supporting structures. Uses pneumatic tools (rock drills, jackhammers, compressors, etc.) in preparing foundations for supporting structures.

Operates lane-marking machines and specialized road-marking equipment. Drives vehicles of various sizes, ranging from passenger cars to heavy trucks. Prepares and submits reports on completed work and vehicle use.

Effectiveness of Norms:

Only 66% of the nontest-selected workers used for this study were good workers. If the workers had been test-selected with the S-419 norms, 81% would have been good workers. 34% of the nontest-selected workers used for this study were poor workers. If the workers had been test-selected with the S-419 norms, only 19% would have been poor workers.

Applicability of S-419 Norms:

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

GPO 865-008

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