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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 also included.
(AG)

FINAL REPORT

TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

MANAGER, INDUSTRIAL ORGANIZATION 0-97.41

B-422 or S-155

U. S. Employment Service in
Cooperation with
New York State Employment Service

U. S. DEPARTMENT OF LABOR
Bureau of Employment Security
Washington 25, D. C.
May 1959

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY
FOR
MANAGER, INDUSTRIAL ORGANIZATION 0-97.41

B-422

Summary

The General Aptitude Test Battery was administered to a total sample of
70 students attending a two-year Scientific Management Course at the
Fashion Institute of Technology, New York, New York. This is a junior-
college-level school chartered by the Board of Regents of the University
at the State of New York and operated by the New York City Board of Higher
Education. The sample consisted of 41 students who were tested during the
school year 1947-1948 with the B-1001 edition of the GATB and 29 students
who were tested during the school year 1956-1957 with the B-1002 edition
of the GATB. The criterion consisted of grade-point averages for all sub-
jects in the course. On the basis of mean scores, correlations with the
criterion, job analysis data, and their combined selective efficiency,
Aptitudes G-Intelligence, V-Verbal Aptitude, and S-Spatial Aptitude were
selected for inclusion in the test norms.

GATB Norms for Manager, Industrial Organization 0-97.41 - B-422

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each
aptitude included in the test norms for Manager, Industrial Organization
0-97.41.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for B-422

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
G	CB-1-H CB-1-I CB-1-J	100	G	Part 3 Part 4 Part 6	95
V	CB-1-J	100	V	Part 4	100
S	CB-1-F CB-1-H	105	S	Part 3	100

Effectiveness of Norms

The data in Table IV indicate that 15 of the 23 poor students, or 65 percent of them, did not achieve the minimum scores established as outting scores on the recommended test norms. This shows that 65 percent of the poor students would not have been chosen if the recommended test norms had been used in the selection process. Moreover, 38 of the 46 students who made qualifying test scores, or 83 percent, were good students.

I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Manager, Industrial Organization O-97.41.

II. Sample

The GATB, B-1001 was administered during the school year 1947-1948 to a group of 41 students (40 males and 1 female) in the Scientific Management Course at the Fashion Institute of Technology, New York, New York. During the school year 1956-1957 the GATB, B-1002A, was administered to another group of 29 students (26 males and 3 females) at this school. The two groups were combined into a total sample of 70 students (66 males and 4 females). All the 70 students had completed the two-year course at the school.

Table II shows the means, standard deviations, ranges, and Pearson product-moment correlations with the criterion for age.

TABLE II

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

Manager, Industrial Organization O-97.41
N = 70

	M	σ	Range	r
Age (years)	21.6	3.1	18-30	.461**

** Significant at the .01 level

The correlation between age and the criterion is significant at the .01 level. Careful consideration was given to this fact. Partial correlations for the aptitudes and the criterion holding age constant were computed. The correlation showed that there was no appreciable change in the pattern of the significant aptitudes.

III. Job and Course Descriptions

Job Title: Manager, Industrial Organization O-97.41

Job Summary: Coordinates the operation of production, distribution, and selling departments. Determines administrative policies, and executes them through subordinates for the efficient management of an industrial corporation.

Course Description

The objeotives of the Scientific Management course are made clear by the following excerpt from the Fashion Institute of Technology bulletin:

> "The sequence of studies in scientific management prepares graduates for positions in whioh a knowledge of apparel teohnology as well as economic and business judgment are required. Initially, suoh positions as time-study man, foreman, management engineer's assistant, and assistant to a plant manager may be expeoted. Experience in operation should lead qualified students to suoh positions as plant managers, management engineers, consultants, or eventually, to beoome heads of their own oonoems."

The training received in the Scientific Management Course is related throughout to the praotioes and problems of the Needle-Trade Industry. A detailed summary follows:

Majors:

General Management: Studies the overall history, teohniques, and problems in the field of general management in the apparel industry-- inoluding seminar on management problems.

Produotion Management: Analyzes the problems of plant engineering relating to the seleotion and installment of produotion equipment and other physioal faoilities for effective manufaoture. Reoeives study and praotioe in motion and time study, using prooess oharts, mioro-motion analyses and the prinoiples of work simplifioation. Aoquires knowledge of the theory and applioation of production and quality oontrol and planning from sales foreoasting through produotion, material and labor budgets, purchasing, routing, soheduling, dispatohing and oontrol. Uses visible index, punohed oard systems, Gantt oharts and produotion oontrol boards. Studies plant layout and various methods of apparel produotion. Aoquires praotioe in the use of operation and flow prooess oharts, single and three-dimensional templates, laying out and re-laying out plants.

Finanoial and Sales Management: Studies and applies the prinoiples of business eoonomics (inoluding oost estimating, pricing) to marketing from the viewpoint of the needle trades manufaoturer. Aoquires a knowledge of business law.

Personnel Management: Studies and oarries out researoh projeots in modern personnel management partioularly as pertinent to the small apparel manufaoturer, inoluding the areas of seleotion, training, motivation, and personnel reoords. Considers the prinoiples of the area wage, systems of job evaluation, wage determination, and inoentives.

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Related Technical Courses:

Apparel Construction: Studies the principles of apparel construction in relation to price range, labor and costs.

Sewing Technology: Becomes familiar with the use of machine techniques in apparel manufacture--sewing machines, folders, sewing attachments, and machine repair.

Cutting Technology: Studies the theory and acquires practice in the preparation of markers, spreading the lay, and actual cutting--with stress on optimum cloth economy.

Textile Technology: Learns the classification of fibers, construction of basic weaves, and methods of dyeing and printing. Studies chemical and physical testing of textiles. Acquires ability in identification of raw material, construction, color and finish, working properties, launderability, etc.

Tool Courses: Studies and acquires practice in basic elements of cost accounting and record procedures applicable to the needle trades; the interpretation and uses of business statistics; the essentials of drafting--conveying of structural ideas in the form of a blue print on sketch.

Academic and Cultural Courses:

Report Techniques (oral and written)
Sociology
Economics
Industrial Psychology
History

IV. Experimental Battery

All the parts of the GATB, B-1001, were administered to the 1947-1948 class and all the parts of the GATB, B-1002A, were administered to the 1956-1957 class.

V. Criterion

The criterion used for this study consisted of grade-point averages for the entire two-year course. The averages were based on grades received for all subjects including those not directly related to the specific tasks of the job. The grade-point average was computed by multiplying the number of hours per week by the grade value of the mark in each subject, and dividing by the total number of hours:

Mark		Grade Value
Honor	- 95-100	4
Good	- 85-94	3
Satisfactory	- 75-84	2
Low	- 70-74	1
Failure	- Below 70	0

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The distribution of grade-point averages ranged from 1.87 to 4.00 with a mean of 2.76 and a standard deviation of .50. The reliability of the criterion was determined by correlating the grades achieved for the first and third terms with those achieved for the second and fourth terms. The obtained coefficient of correlation was .86; application of the Spearman-Brown Propheoy formula raises this correlation to .93.

VI. Statistical and Qualitative Analyses

A. Statistical Analysis:

Since the 1948 class of 41 students was tested with the B-1001 edition of the GATB, the scores for the 41 students were converted to equivalent B-1002 scores by the use of Table IV entitled Equivalent GATB Scores on B-1001 and B-1002, dated December 1953. (This table was developed by the Testing Division, Bureau of Employment Security.)

Table III shows the means, standard deviations, and Pearson produce-moment correlations with the criterion for the aptitudes of the GATB. The means and standard deviations of the aptitudes are comparable to general working population norms with a mean of 100 and a standard deviation of 20.

TABLE III

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

Manager, Industrial Organization 0-97.41
N = 70

Aptitudes	M	σ	r
G-Intelligence	121.5#	15.2	.524**
V-Verbal Aptitude	117.5#	16.4	.387**
N-Numerical Aptitude	118.0#	12.6	.270*
S-Spatial Aptitude	114.7	22.6	.458**
P-Form Perception	113.5	14.4	.165
Q-Clerical Perception	110.5	13.6	.167
K-Motor Coordination	112.6	14.0	.112
F-Finger Dexterity	102.3	15.3	-.126
M-Manual Dexterity	104.4	21.6	.121

** Significant at the .01 level
* Significant at the .05 level
# Relatively high mean score

The highest mean scores in descending order of magnitude were
obtained for Aptitudes G, N, and V respectively. All the ap-
titudes, except Aptitudes S and M have standard deviations of
less than 20. Aptitude N has the lowest standard deviation.
For a sample of 70 cases, correlations of .307 and .236 are
significant at the .01 level and the .05 level of confidence,
respectively. Aptitudes G, V, and S correlate significantly
with the criterion at the .01 level. Aptitude N correlates
significantly with the criterion at the .05 level.

B. Qualitative Analysis:

The job analysis indicated that the following aptitudes measured
by the GATB appear to be important for this occupation.

Intelligence (G) - required to learn and understand the
overall techniques and problems in the field of manage-
ment and to analyze management problems.

Verbal Aptitude (V) - required for facility of expression
in studying and carrying out research projects in manage-
ment and for reading comprehension.

Numerical Aptitude (N) - required to interpret and use
business statistics, cost accounting, pricing, etc. Also
required to analyze time and motion study data, and pro-
duction and quality control.

Form Perception (P) - required to learn textile technology
such as the classification of fibers, construction of basic
weaves and identification of raw material.

Spatial Aptitude (S) - required to analyze problems of plant
engineering and installation of production equipment. Also
required to use templates; to learn the essentials of draft-
ing and to study plant layout.

C. Selection of Test Norms:

Based on the quantitative and qualitative evidence cited above,
Aptitudes G, V, N, and S warranted further consideration for
inclusion in the test norms. The evidence for each of these
aptitudes is indicated below.

Aptitude	Relatively High Mean Score	Significant Correlation with the Criterion	Importance Indicated by Qualitative Analysis
G	X	X	X
V	X	X	X
N	X	X	X
S		X	X

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Various combinations of Aptitudes G, V, N, and S with appropriate cutting scores were selected as trial norms. The relationship between each set of trial norms and the criterion (dichotomized as indicated in section VII) was determined.

A comparison of the results showed that B-1002 norms consisting of G-95, V-100, and S-100 had the best selective efficiency.

In test development studies an attempt is made to develop a set of norms such that the cutting score for each aptitude included in the norms will be set at a five-point score level close to one standard deviation below the aptitude mean of the experimental sample. Adjustments of cutting scores from one standard deviation below the mean are made to effect better selective efficiency of the norms. In this study the aptitude cutting scores are each within 12 points of one standard deviation below the aptitude mean of the sample.

VII. Concurrent Validity of Norms

For the purpose of computing the tetrachoric correlation coefficient between the test norms and the criterion and applying the Chi Square test, the criterion was dichotomized by placing approximately one-third of the sample in the low criterion group. This was accomplished by setting the grade-point average of 2.48 as the criterion critical score and resulted in 23 of the 70 students, or 33 percent of the sample, being placed in the low criterion group.

Table IV shows the relationship between test norms consisting of Aptitudes G, V, and S with critical scores of 95, 100, and, 100, respectively, and the dichotomized criterion for Manager, Industrial Organization 0-97.41. Students in the high criterion group have been designated as "good students" and those in the low criterion group as "poor students."

TABLE IV

Relationship between Test Norms Consisting of Aptitudes G, V, and S with Critical Scores of 95, 100, and 100, Respectively, and the Criterion for Manager, Industrial Organization 0-97.41

N = 70

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Students	9	38	47
Poor Students	15	8	23
Total	24	46	70

$r_{tet} = .68$ $x^2 = 12.574$

$\sigma r_{tet} = .20$ 9 $P/2 < .0005$

The data in the above table indicate a significant relationship between the test norms and the criterion for the sample.

VIII. Conolusions

On the basis of mean scores, oorrelations with the oriterion, job analysis
data, and their combined seleotive efficienoy, Aptitudes G, V, and S with
minimum soores of 95, 100, and 100, respeotively, are reoommended as B-1002
norms for the oooupation of Manager, Industrial Organization 0-97.41. The
equivalent B-1001 norms oonsist of G-100, V-100, and S-105.

IX. Determination of Oocupational Aptitude Pattern

When the speoifio test norms for an oooupation inolude three aptitudes,
only those oooupational aptitude patterns whioh inolude the same three
aptitudes with outting soores that are within 10 points of the outting
soores established for the speoifio norms are oonsidered for that ooou-
pation. The only one of the existing 23 oooupational aptitude patterns
whioh meets these oriteria for this study is OAP-18 whioh oonsists of
G-100, V-100, and S-90 for B-1002 and G-105, V-100, and S-95 for B-1001.
The seleotive efficienoy of OAP-18 for this sample was determined by
means of the tetraohorio oorrelation teohnique. A tetraohorio oorrelation
of .44 with a standard error of .21 was obtained, whioh indioates a signif-
ioant relationship between OAP-18 and the oriterion for this experimental
sample. The proportion of the sample soreened out by OAP-18 was .27, whioh
is within the required range of .10 to .60. Therefore, it is reoommended
that OAP-18 be used in oounseling for the oooupation of Manager, Industrial
Organization 0-97.41.