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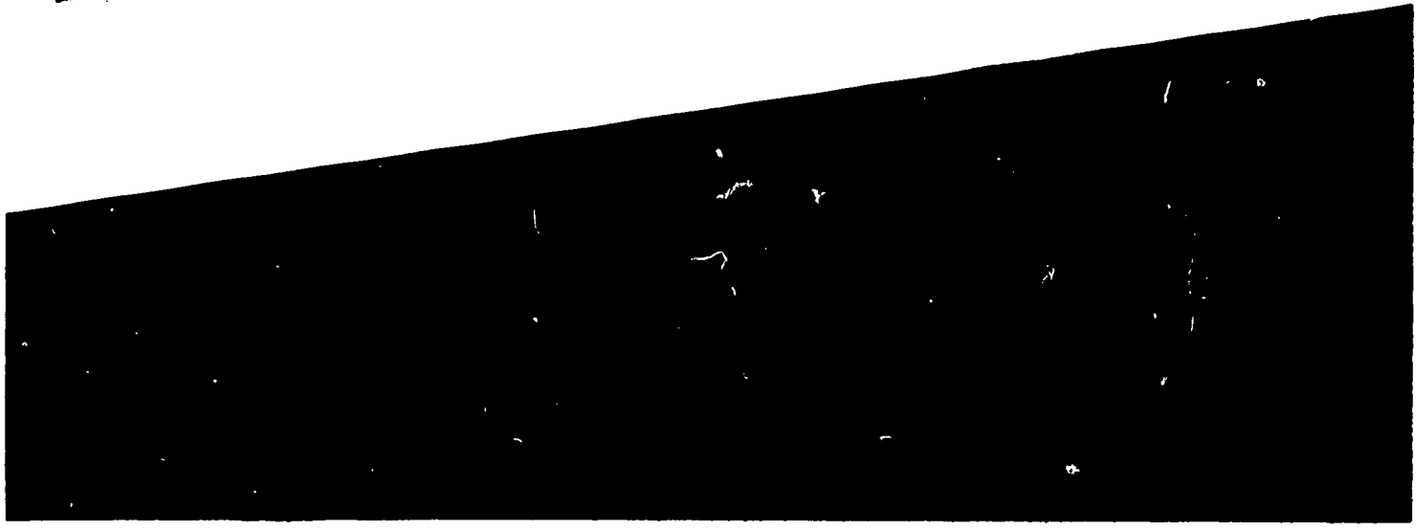
ABSTRACT

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 signicant 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)

Development of USES Aptitude Test Battery for Medical Laboratory Assistant

(medical ser.) 078.381



U.S. DEPARTMENT OF LABOR
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Washington, D.C. 20210

Technical Report on Development of USES Aptitude Test Battery

For.....

Medical-Laboratory Assistant
(medical ser.) 078.381
S-384

U. S. Employment Service
in Cooperation with
Illinois, Indiana, Minnesota, and Wisconsin
State Employment Services

October 1966

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.

Frank H. Cassell

Frank H. Cassell, Director
U. S. Employment Service

GATB Study #2627

DEVELOPMENT OF USES APTITUDE TEST BATTERY

FOR

Medical-Laboratory Assistant (medical ser.) 078.381

S-384

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Medical-Laboratory Assistant 078.381. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB, B-1002 Scores
N - Numerical Aptitude	100
S - Spatial Aptitude	110
Q - Clerical Perception	110

RESEARCH SUMMARY

Sample:
Eighty female students and one male student enrolled in Medical-Laboratory Assistant training classes in institutions in Illinois, Indiana, Minnesota, and Wisconsin.

Criterion:
Percentage grade on certification examination.

Design:
Concurrent (test and criterion data were obtained at approximately the same time.)

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

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

Effectiveness of Norms:

Only 72% of the non-test-selected students used for this study were good students; if the students had been test selected with the S-384 norms, 88% would have been good students. 28% of the non-test selected students were poor students; if the students had been test selected with the S-384 norms, only 12% would have been poor students.

The effectiveness of the norms is shown graphically in Table 1

TABLE 1

Effectiveness of Norms

	Without Tests	With Tests
Good Students	72%	88%
Poor Students	28%	12%

SAMPLE DESCRIPTION

Size: N = 81

Occupational Status: Students

Type of School: All persons in the sample were students in a training course conducted in an institution approved by the Board of Certified Laboratory Assistants. The following institutions were involved: Hibbing Area Technical Institute, Hibbing, Minnesota; University of Minnesota, Minneapolis, Minnesota; Alexandria Area Technical School, Alexandria, Minnesota; Waupun Memorial Hospital, Waupun, Wisconsin; Swedish Covenant Hospital, Chicago, Illinois; Little Company of Mary Hospital, Evergreen Park, Illinois; St. Anthony's Hospital, Michigan City, Indiana; Terre Haute Medical Laboratory, Terre Haute, Indiana.

School Requirements:

Education: High School graduate. Courses in high school algebra and chemistry preferred. Scholastic rank in top half of their high school graduating class.

Previous Experience: None

Tests: The 25 students at University of Minnesota were required to have a college aptitude rating of 50% or higher on the Minnesota Scholastic Aptitude Test. Tests were not used at the other institutions.

Other: Personal interview

TABLE 2

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

	Mean	SD	Range	r
Age (years)	19.6	2.7	18-37	.041
Education (years)	12.5	.7	12-16	-.396

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002B were administered during the final month of training.

CRITERION

The criterion data consisted of the percentage grades achieved by the students on the certification examination taken after their training was completed. The data were obtained from the Medical Laboratory Assistant Certification Board of the Minnesota Society of Clinical Pathologists and Minnesota Society of Medical Technologists and the Board of Certified Laboratory Assistants of the American Society of Clinical Pathologists.

Reliability: Since only one criterion was involved, no measure of criterion reliability is available.

Criterion Score Distribution:

Range:	51-87
Mean:	70.4
Standard Deviation:	9.3

Criterion Dichotomy: The criterion distibution was dichotomized into high and low groups by placing 28% of the sample in the low group. 65 was chosen as the critical score as this is appropriately the passing score in the certification examinations. Students in the high criterion group were designated as "good students" and those in the low group as "poor students."

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were selected for tryout on the basis of a qualitative analysis of job duties involved and a statistical analysis of test and criterion data. All aptitudes except F and M were considered for inclusion in the norms. Aptitudes G, V, N, S, P and Q have a significant correlation with the criterion. Aptitude K, which does not have a high correlation with the criterion, was considered for inclusion in the norms because the sample had a relatively high mean score and a relatively low standard deviation on this aptitude. In a concurrent study, a relatively low standard deviation indicates that some sample pre-selection may have taken place and this restricted range of scores (low standard deviation) will depress the correlation between the aptitude and the criterion. A relatively high mean score in a concurrent study may also indicate some sample pre-selection. 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 - General Learning Ability	Necessary to understand use of apparatus and to understand technical aspects of work ability to make judgments based on available data.
Q - Clerical Perception	Necessary in reading instruments, and graphs and in recording information accurately.

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 - General Learning Ability	119.2	12.1	84-149	.442**
V - Verbal Aptitude	112.0	12.2	90-145	.243*
N - Numerical Aptitude	121.1	13.9	78-149	.412**
S - Spatial Aptitude	116.7	15.0	74-153	.346**
P - Form Perception	133.1	16.8	88-159	.220*
Q - Clerical Perception	132.8	15.5	99-181	.248*
K - Motor Coordination	120.8	14.3	84-157	.208
F - Finger Dexterity	115.6	15.9	82-152	.069
M - Manual Dexterity	113.9	18.1	77-155	-.011

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

TABLE 5

Summary of Qualitative and Quantitative Data

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

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, P, Q, and K at trial cutting scores were able to differentiate between the 72% of the sample considered good students and the 28% of the sample considered poor students. 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 higher than one standard deviation below the mean will eliminate about one third of the sample; for four-aptitude trial norms, cutting scores of 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. Norms of N-100, S-110, and Q-110 provided the highest degree of differentiation. 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).

Predictive Validity of Test Norms N-100, S-110 and Q-110

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Students	13	45	58
Poor Students	17	6	23
Total	30	51	81

Phi Coefficient (ϕ) = .48 Chi Square (X^2) = 18.735
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 any of the 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.

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

General Information

A **Medical-Laboratory** Assistant is a graduate of an accredited high school who has successfully completed the prescribed twelve month course of training approved for **Medical-Laboratory** Assistants and who has passed the special examination based on this training. This laboratory worker serves as an assistant to the medical technologist (ASCP) and works under the direct supervision of the medical technologist and a pathologist or other qualified physician.

The program for training of **Medical-**Laboratory Assistants is not to be construed as a program for training of replacements or substitutes for medical technologists, nor is it intended at any time to duplicate the training program for medical technologist (ASCP) as the primary and pivotal laboratory worker through whom the laboratory director sets standards for quality performance.

Curriculum

The twelve month training period covers both formal lectures (or tutorial instruction if class enrollment is less than five students) and practice training under competent **supervision.** The training program stresses routine and repetitive types of laboratory procedures. Its primary objective is to provide a technically qualified "assistant" to the medical technologist, in order to free the latter of routine work, except for supervision, and allow him time to perform the more complicated and critical laboratory procedures.

The training program approved by the American Society of Clinical Pathologists, and American Society of Medical Technologists and the Board of Certified Laboratory Assistants is as follows:

A. Ten weeks of training must be devoted to "Introduction to the Clinical Laboratory" and include basic orientation in such areas as: 1) medical ethics and conduct; 2) medical terminology; 3) laboratory records; 4) handling identification and care of laboratory equipment; 5) basic laboratory mathematics 6) handling of histologic and cytologic specimens; and 7) preparation of basic laboratory solutions and media.

B. Bacteriology, serology and parasitology. Eight weeks training in which the student shall be taught the technical aspects of these subjects. The duties, with covering lectures, should include: 1) staining of slides for bacteriologic study; 2) application of sensitivity discs to culture plates and reading of results; 3) preparation of bacteriologic and serologic speciments for mailing; 4) performance of one flocculation for diagnosis of syphilis; and 5) fecal concentration for parasitologic study.

C. Hematology. Ten weeks of training including 1) collection and performance of a complete blood count, limited to normal pattern 2) performance of bleeding time and coagulation time; 3) performance of a sedimentation rate; 4) performance of a prothrombin time, using adequate controls.

D. Clinical chemistry: Ten weeks devoted to methodology of commonly accepted procedures, stress being placed on proper use and care of equipment and reagents, sources of technical error, and use of quality control program.

E. Blood Bank. Six weeks of training with emphasis on strict adherence to proper technique and use of controls, as well as on the great responsibility which rests upon the individual who performs blood banking procedures.

F. Routine Analysis. The six weeks training will include: 1) performance of a routine analysis of urine; 2) titration of aspirated gastric fluid for free and total acid; 3) Test for increased globulin concentration in body fluids; 4) performance of a cell count in cerebrospinal fluid; 5) detection of occult blood and neutral fat in feces.

G. Basal metabolism and electrocardiography. During the two weeks training the student will be taught 1) proper use and maintenance of machines used in these tests; 2) preparation of the patient and performance of the tests; 3) detection and correction of errors.

(In general context from "Guide Book for an Approved School of Laboratory Assistants," published by the Board of Certified Laboratory Assistants of the American Society of Clinical Pathologists)

S-384 October 1966

FACT SHEET

Job Title: **Medical-** Laboratory Assistant (medical ser.) 078.381

Job Summary: Performs routine laboratory procedures in areas of basal metabolism, urinalysis, hematology and chemistry to relieve Medical Technicians for tests demanding higher skill.

Work Performed: Determines basal metabolism rates: Attaches breathing apparatus to patient to measure oxygen used within a specific unit of time. Completes patient information card showing patient's sex, age and verified height, weight, respiration, pulse and temperature. Determines plus or minus metabolic rate comparing BMR graphed results and patient's physical data against standard norms.

Maintains meabolator apparatus: Boils mouthpiece and cleans tubes before and after each use. Fills bellows with oxygen before each test; replaces carbon dioxide absorbent material and midget oxygen tank when indicated. Scrubs machine daily.

Analyzes urine specimens: Performs routine urinalysis describing color and clarity of sample; determines specific gravity of sample using urinometer. Measures acidity or alkalinity of urine comparing color stain on treated paper against standard color chart; determines presence of protein or sugar using combistix; runs confirmatory test when positive protein or sugar is indicated. Records results. Examines sediment under microscope for red or white cells, bacteria, chemical crystals.

Carries out special urinalysis procedures, e.g. tubeless gastric determinations and PSP tests measuring dye concentrations.

Draws and tests blood samples: Draws blood samples employing venepuncture and capillary techniques, using standard pipette. Determines white and red cell count using automatic diluter machine and coulter counter. Reads blood smears under microscope to ascertain differential counts. Determines sedimentation rates, measures packed volume of red cells using centrifuge and micro-hematocrit reader. Prepares reagents when supply is depleted; measures reagent ingredients using analytical balance and following specific formulas.

Performs manual chemical procedures: Determines amounts of urea-nitrogen in blood using a filtrating procedure that precipitates protein from serum or whole blood. Measures sugar level in blood, urine or spinal fluid by treating sample with reagent and measuring resulting color intensity with spectrophotometer.

(This sheet is printed in duplicate. One copy should remain as part of the Appendix in order to complete the technical report. The other copy can be removed by employment service personnel who wish to set up separate fact sheet files.)

GPO 916-344

S-384 October 1966

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