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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)

June 1968 United States Employment Service Technical Report S-416

S-416

Development of USES Aptitude Test Battery

for

Farm Hand, Dairy

(agric.) I 411.884

U.S. DEPARTMENT OF LABOR
MANPOWER ADMINISTRATION

Technical Report on Development of USES Aptitude Test Battery

For . . . .

Farm Hand, Dairy (agric.) I 411.884

S-416

(Developed in Cooperation with the
California State Employment Service)

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June 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 #2706

DEVELOPMENT OF USES APTITUDE TEST BATTERY

FOR

Farm Hand, Dairy (agric.) I 411.884-010

S-416

This report describes the research undertaken for the development of the interim non-verbal General Aptitude Test Battery (GATB) norms for the occupation of Farm Hand, Dairy (agric.) I 411.884-010. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
S - Spatial Aptitude	75
K - Motor Coordination	70
M - Manual Dexterity	75

RESEARCH SUMMARY

Sample:

54 male trainees enrolled in Manpower Development Training Courses (MDTA) for Dairy Farm Hands in California.

Criterion:

Total gradepoints with equal weight applied to On-the-Job-Training performance and to Classroom performance.

Design:

Longitudinal (tests were administered at the beginning of the courses and criterion data obtained at the end of the training.)

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.

Predictive Validity:

Phi Coefficient = .41 (P/2 less than .005)

Effectiveness of Norms:

Only 67% of the nontest-selected trainees used for this study were good trainees; if the trainees had been test-selected with the S-416 norms, 81% would have been good trainees. 33% of the nontest-selected trainees were poor trainees; if the trainees had been test selected with the S-416 norms, only 19% would have been poor trainees. The effectiveness of the norms is shown graphically in Table 1:

TABLE 1

Effectiveness of Norms

	Without Tests	With Tests
Good Trainees	67%	81%
Poor Trainees	33%	19%

SAMPLE DESCRIPTION

Size:

N = 54

Occupational Status:

MDTA trainees

Educational Institution:

Trainees were enrolled in Manpower Development Training (MDTA) courses conducted by the following California schools:

School	City	Length of Course: Hours	Weeks	Number of Classes	Class Size*
Pengrove School	Petaluma	288	8	1	13
Modesto Junior College	Modesto	360	12	1	8
College of the Sequoias	Visalia	180	6	4	33
				6	54

*This excludes trainees dropped from the initial sample.

School Selection Requirements:

Education: None

Experience: None

Tests: None

Physical: Normal ability to walk, bend, and stoop and to use the arms, hands, and fingers.

Principal Activities:

The job duties for each trainee are comparable to those shown in the Fact Sheet.

Minimum Experience:

All trainees in the sample were tested prior to enrollment in the course.

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)	28.9	9.5	18-56	-.100
Education (years)	9.6	1.9	7-14	.113

EXPERIMENTAL TEST BATTERY

The interim, non-verbal version of the GATB, using the IPAT test of "G", was selected for the test battery for the following reasons:

1. It was estimated that approximately 25% of the trainees would have less than a sixth grade functioning literacy level which would cause the normal GATB test results to be questionable.

2. Qualitative analysis of the job indicated that aptitudes V, N, and Q were irrelevant.

The final test battery consisted of the following aptitudes:

G - General Intelligence (IPAT non-verbal "G")

S - Spatial Aptitude

P - Form Perception

K - Motor Coordination

F - Finger Dexterity

M - Manual Dexterity

CRITERION

The criterion data, obtained after completion of training, consisted of equally weighted gradepoints for both Classroom performance and On-the-Job Training performance. Instructors were asked to rate each student and to assign normal letter grades. Rating were obtained after each class ended. Gradepoints were assigned on the following basis:

Letter Grade	Gradepoints
A	14
B	13
C	12
D	11
Fail	10

Reliability

There was a .78 correlation between the On-the-Job Training grade and the Classroom training grade.

Criterion Score Distribution

Possible Range: 20 - 28
Actual Range: 20 - 28

Mean: 24.6
Standard Deviation: 2.5

Criterion Dichotomy

The criterion distribution was dichotomized into low and high groups by placing 33% of the sample in the low criterion group to correspond with the percentage of trainees considered marginal or unsatisfactory. Trainees in the high criterion group were designated as "good trainees" and those in the low group as "poor trainees." The criterion critical score is 24.

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 statistical analysis of test and criterion data. Tables 3, 4, and 5 show the results of the qualitative and statistical analyses.

TABLE 3

Qualitative Analysis

(Based on observations, job description, and course outline, these aptitudes appeared to be important to the work performed.)

Aptitude	Rationale
K - Motor Coordination	Moves rapidly between cows during milking, rapidly connecting and disconnecting milking units between cows and milking machine system.
M - Manual Dexterity	Rapidly connects and disconnects milking units between cows and milking machine system. Treats sick and injured cows, using such items as hypodermic syringes and teat dialators.

TABLE 4

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

Aptitude	Mean	SD	Range	r
G - General Intelligence (IPAT)	88.0	17.8	48 - 125	.402**
S - Spatial Aptitude	92.6	19.0	61 - 143	.379**
P - Form Perception	87.5	20.9	42 - 138	.309*
K - Motor Coordination	90.0	17.3	51 - 126	.342*
F - Finger Dexterity	87.4	18.4	35 - 133	.316*
M - Manual Dexterity	92.5	23.0	39 - 143	.357**

*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
Irrelevant		X	X			X			
Relatively High Mean				X			X		X
Relatively Low Standard Dev.									
Significant Correlation with Criterion	X			X	X		X	X	X
Aptitudes to be Considered for Trial Norms	G			S	P		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 aptitudes G, S, P, K, F, and M at trial cutting scores were able to differentiate between the 67% of the sample considered good trainees and the 33% of the sample considered poor trainees. 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, minimum of cutting scores 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 Farm Hand, Dairy (agric.) I 411.884-010 was provided by norms of S-75, K-70, and M-75. The validity of these norms is shown in Table 6 and is significant at the .005 level).

TABLE 6

Predictive Validity of Test Norms
S-75, K-70 and M-75

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Trainees	6	30	36
Poor Trainees	11	7	18
Total	17	37	54

Phi Coefficient (ϕ) = .41 Chi Square (X^2_y) = 9.0
Significance Level = P/2 is less than .005

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study did not meet the requirements for incorporating this occupation into any of the 36 Occupational Aptitude Patterns 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

Course Outline

Each school's course varied in relation to course content and the degree of emphasis placed on each subject. Nevertheless, all of the courses were approximately the same. The following course outline was used by the College of the Sequoias in their four classes and differs only slightly from the courses taught by Pengrove School and Modesto Junior College:

1.	Introduction to the Dairy Industry Identification of Milking Equipment Safety	6
2.	Physiology of Cows Udder Anatomy Composition of Milk	12
3.	Handling of Cows Fundamentals of Milking Operation of Milking Machine	18
4.	Dairy Records (feed, production, breeding)	6
5.	Breeding and Calving	12
6.	Prevention, Recognition, and Treatment of Sick and Injured Cows	12
7.	Sanitation	6
8.	On-the-Job Training	108
	TOTAL HOURS	180

FACT SHEET

Job Title

Farm Hand, Dairy (agric.) I 411.884-010

Job Summary

Works on dairy farm, performing duties requiring knowledge of dairy cattle: Weighs and mixes specified feeds and feed supplements, fills feed troughs with grain and roughage, and fills water troughs. Drives cows from stalls into pasture for grazing. Examines cows to detect diseases, such as mastitis (inflammation of mammary gland), conjunctivitis (pinkeye), and foot rot, and injuries, such as cuts and bruises. Vaccinates animals for diseases, using hypodermic needle, or administers vaccines in pill form. Applies medications to cuts or bruises, and sprays cows with insecticide repellents, or drives cows down ramps and into bath of insecticide. Cleans stalls and barns, using disinfectant solutions, brushes, and shovels, and replaces bedding in stalls. Marks identification symbols or notches on cows using hand clippers. Washes udders of cows prior to milking and milks cows by hand or by machine. May maintain farm buildings and equipment, plant, cultivate, and harvest feed for stock, and maintain breeding, feeding, and cost records.

Work Performed

Tends milking-machine system that milks dairy cows and performs other related tasks:

1. Prepares for milking: Cleans empty milk storage tank with water and detergent and allows tank to drain after rinsing. Closes drain valve and opens inlet valve so that tank may fill. Inserts clean filter in milking - machine system following manufacturer's directions. Starts cooling unit that refrigerates milk in storage tank. Presses switches that start vacuum and milk pumps and turns valves to regulate pressures to specified settings. Scoops feed from cart, or sets dial on automatic feed conveyor system, so that cows may feed while being milked.

2. Milks cows: Leads cows to milking stations inside barn. Closes stanchions around cows' necks to restrict their movement during milking. Pre-washes areas surrounding cows' udders, using hose and soft brush, and dries teats with paper towels. Notes paint markings on cow's flank for information relating to special handling. Squeezes each teat, while wiping area with disinfectant soaked cloth, in order to stimulate the flow of milk into the teat. Observes samples of milk from each teat to detect such symptoms of mastitis as lumps, shreds, or blood in milk. Couples milking unit hoses to vacuum and milk manifold lines and presses teat cups into place on each teat. Repeats process with second milking unit on adjacent cow while first cow is being milked. When necessary, feels cow's udder or notes flow of milk through clear-plastic milk hose to ascertain when to remove milking unit without injuring the cow by over-milking. Releases cows from stanchions and herds cows into pasture.

3. Cleans equipment: Closes valve between milking machine and storage tank to avoid contaminating milk. Removes used filters from system. Pumps

solution through hoses, milk manifold lines, and pumps and drains system after rinsing with water. Cleans teat cups and other parts of milking unit and places in rack in preparation for reuse. Cleans barn area, using hose and broom.

4. Treats sick or injured cows and cares for calves: Continually observes cows for injuries and symptoms of illness and oestrous (heat period). Treats such minor ailments as scores, cuts, chapped teats by cleaning affected area and applying appropriate medications, such as antiseptics or balms. Reports such conditions as oestrous or symptoms of mastitis to superior. Tests samples of milk for mastitis, using California Mastitis Test. Administers prescribed medications following specific instructions from veterinarian or superior, using such devices as hypodermic syringe or teat canula. When ordered, inserts teat dialator, on temporary basis, into cows with swollen or obstructed teats in order to enlarge the opening. Marks cow's flank with symbols to indicate illness, injury, or medications that require special handling. When necessary, hand milks cows with injured teats. Assists in calving by performing such tasks as cutting, cauterizing, and tying the umbilical cord, preparing a warm, dry stall for the calf, and feeding the calf. Dehorns calves, using dehorning tool or saw, antiseptic, bandaging materials, and insect repellent.

5. Other duties: Performs such other duties as making minor repairs and adjustments to the milking machine, recording periodic milk production, inventorying supplies, planting feed crops, driving tractors, and mending fences.

Effectiveness of Norms:

Only 67% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with S-416 norms, 81% would have been good workers. 33% of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with S-416 norms, only 19% would have been poor workers.

Applicability of S-416 Norms:

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

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