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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)

...nical Report on Development of USES Aptitude Test Battery

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Lemon Picker (agric.) 404.887

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U. S. Employment Service
in Cooperation with
California State Employment Service

September 1965

GATB Study #2567

DEVELOPMENT OF USES APTITUDE TEST BATTERY

For

Lemon Picker (agric.) 404.887-018

S-351

This report describes research undertaken for the purpose of determining General Aptitude Test Battery (GATB) norms for the occupation of Lemon Picker (agric.) 404.887. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB, B-1002 Scores
P - Form Perception	75
K - Motor Coordination	70
M - Manual Dexterity	70

RESEARCH SUMMARY

Sample:
50 employed workers (12 females and 38 males) working as Lemon Pickers in Southern California

Criterion:
Supervisory ratings

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

Concurrent Validity:
Phi Coefficient = .40 ($P/2 < .005$)

Effectiveness of Norms: Only 71% of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 87% would have been good workers. 29% of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 13% would have been poor workers. The effectiveness of the norms is shown graphically in Table 1:

Effectiveness of Norms

	Without Tests	With Tests
Good workers	71%	87%
Poor workers	29%	13%

SAMPLE DESCRIPTION

Size: N=50

Occupational Status: Employed workers

Work Setting: Workers were employed by two growers associations and one ranch:

1. Upland Lemon Growers Association, Upland California
2. Corona Growers, Inc., Corona, California
3. Limoniera Ranch, Santa Paula, California

Employer Selection Requirements:

Education: No requirement
Previous Experience: No requirement
Tests: A ladder-handling test and a use of clipper and picking ring test
Other: Personel interview by ES staff.

Principal Activities: The job duties for each worker are comparable to those shown in the job description in the Appendix.

Minimum Experience: All workers had completed a three week on-the-job training period.

TABLE 2

Means, Sigmas, Ranges, and Pearson Product-Moment Correlations with the criterion (r) for Age, Education, and Experience

	Mean	Sigma	Range	r
Age (years)	38.6	13.4	18-62	.042
Education (years)	8.6	2.5	2-12	.054
Experience (mos.)	29.5	45.0	1-180	.266

EXPERIMENTAL TEST BATTERY

Parts 1, 3, 5, and 7 through 12 of the GATB, B-1002B were administered during the period December 17, 1964 - March 19, 1965.

CRITERION

The criterion data consisted of supervisory ratings of job proficiency. Ratings and reratings for each worker were made at approximately the same times as the tests were administered with a time interval of two weeks between the first and second ratings.

Rating Scale: An adaptation of the USES Descriptive Rating Scale was used. The scale (see appendix) consisted of five items covering different aspects of job performance. Each item has five alternatives corresponding to different degrees of job proficiency.

Reliability: The coefficient of reliability between the two ratings was .774 indicating a significant relationship. The final criterion score consisted of the combined score of the two ratings.

Criterion Score Distribution:

Possible Range:	10-50
Actual Range:	20-50
Mean:	33.48
Sigma:	6.0

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 unsatisfactory or marginal. Workers in the high criterion group were designated as "good workers" and those in the low group as "poor workers."

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 a statistical analysis of test and criterion data. Usual test development procedures needed to be revised slightly for this study:

1. As Parts 2, 4 and 6 of the GATB could not be administered due to the low educational level of the sample, Aptitudes G, V and N could not be considered for inclusion in the norms.

2. Usually aptitudes which have a significant correlation with the criterion are automatically considered for inclusion in the norms as long as they have not been rated irrelevant. In this study none of the six aptitudes used had a significant correlation with the criterion, so aptitudes with a relatively high correlation with the criterion and another piece of information (ie. high mean, low sigma or rated relevant) were considered for inclusion in the norms.

TABLE 3

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

Aptitude	Rationale
P - Form Perception	Visually selecting lemons by approximate shape and size prior to checking with sizing loop and discriminating between different shades, in order to pick according to specifications
K - Motor Coordination	Coordinating hands and eyes to make precise movements quickly in selecting, picking, and depositing lemons into picking sack.
M - Manual Dexterity	Positioning sizing loop, holding, clipping, depositing and arranging lemons; moving and setting up ladder

TABLE 4

Means, Sigmas, and Pearson Product Moment Correlations with the Criterion (r) for the Aptitudes of the GATB

Aptitude	Mean	Sigma	r
S-Spatial Aptitude	91.9	17.2	-.111
P-Form Perception	85.2	22.9	.229
Q-Clerical Perception	84.4	16.6	.089
K-Motor Coordination	86.4	22.3	.249
F-Finger Dexterity	81.8	21.0	.102
M-Manual Dexterity	87.8	22.2	.218

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
Irrelevant	X	X	X			X			
Relatively High Mean				X			X		X
Relatively Low Sigma									
Relatively High Correlation with Criterion					X		X		X
Aptitudes to be Considered for Trial Norms					P		K		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 various combinations of Aptitudes P, K, and M at trial cutting scores were able to differentiate between the 71% of the sample considered good workers and the 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 1/3 of the sample. The Phi Coefficient was used as a basis for comparing trial norms. Norms of P-75, K-70, M-70 provided the highest degree of differentiation for the occupation of Lemon Picker (agric.) 404.887. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .40 (statistically significant at the .005 level).

TABLE 6

Concurrent Validity of Test Norms, P-75, K-70, M-70

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	10	26	36
Poor Workers	10	4	14
Total	20	30	50

Phi Coefficient (ϕ) = .400 Chi Square (X^2) = 8.000
Significance Level = $P/2 < .005$.

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 Guide to the Use of 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.

DESCRIPTIVE RATING SCALE
(an adaptation)

1. HOW MUCH WORK DOES HE GET DONE? (Worker's ability to make efficient use of his time and to work at high speed.)

( ) Very low work output. Performs only at an unsatisfactory pace.
( ) Low work output. Performs at a slow pace.
( ) Fair work output. Performs at an acceptable but not a fast pace.
( ) High work output. Performs at a fast pace.
( ) Very high work output. Performs at an unusually fast pace.

2. HOW GOOD IS THE QUALITY OF HIS WORK? (Worker's ability to do high-grade work which meets quality standards.)

( ) Very poor. Does work of unsatisfactory grade. Performance is inferior and almost never meets minimum quality standards.
( ) Not too bad, but the grade of his work could stand improvement. Performance is usually acceptable but somewhat inferior in quality.
( ) Fair. The grade of his work is mediocre. Performance is acceptable but usually not above average in quality.
( ) Good, but the grade of his work is not outstanding. Performance is usually better than average in quality.
( ) Very good. Does work of outstanding grade. Performance is almost always of the highest quality.

3. 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.)

( ) Has very limited knowledge. Does not know enough to do his job adequately.
( ) Has little knowledge. Knows enough to "get by."
( ) Has moderate amount of knowledge. Knows enough to do fair work.
( ) Has broad knowledge. Knows enough to do good work.
( ) Has almost complete knowledge. Knows enough to do outstanding work.

4. HOW MUCH ABILITY DOES HE HAVE FOR THIS KIND OF WORK? (Worker's adeptness or knack for performing his job easily and well.)

( ) Very low ability. Has great difficulty doing his job. Not at all suited to this kind of work.
( ) Low ability. Usually has some difficulty doing his job. Not too well suited to this kind of work.
( ) Moderate ability. Does his job without too much difficulty. Fairly well suited to this kind of work.

( ) High ability. Usually does his job without difficulty. Well suited to this kind of work.
( ) Very high ability. Does his job with great ease. Unusually well suited for this kind of work.

5. CONSIDERING ALL THE FACTORS ALREADY RATED, AND ONLY THESE FACTOPS, HOW SATISFACTORY IS HIS WORK? (Worker's "all-around" ability to do his job.)

( ) Definitely unsatisfactory. Would be better off without him. Performance usually not acceptable.
( ) Not completely satisfactory. Of limited value to the organization. Performance somewhat inferior.
( ) Satisfactory. A fairly proficient worker. Performance generally acceptable.
( ) Very good. A valuable worker. Performance usually better than average.
( ) Outstanding. An unusually competent worker. Performance almost always top notch.

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FACT SHEET

Job Title: Lemon Picker (agric.) 404.887-018

Job Summary: Picks lemons according to shade or color and size: visually and manually selects, determines size of lemon with sizing loop; with clipper in other hand, clips lemon from tree into picking sack and deposits lemons into shipping box when sack is full.

Work Performed: Receives instructions from crew boss on which set of trees to pick, size, color or shade of lemons to pick, and picking number. Obtains picking sack, slips strap over head on to right shoulder, and adjusts sack so that opening is just above waist in a position to allow hands to drop into it easily. Dons soft fabric gloves and picks up tripod ladder (length depends on size of trees) from flat trailer.

Carries ladder by rungs, right hand above left, down box row to first tree in assigned set. Swings ladder's pole support under tree and adjusts ladder in firm position. Slips finger ring of assigned metal sizing loop on index finger of left hand with sizing loop in palm of hand. Slips and adjusts strap of hand lemon clipper over index finger of right hand and clipper into palm of hand with concave cutters up facing palm of hand.

Climbs ladder and starts picking at the top, working to the bottom. Positions sizing loop on selected lemon and holds with left hand with lemon pointed towards opening of picking sack. Positions clipper on stem, if lemon does not go through sizing loop, and slides clipper gently down against button. Clips stem off squarely dropping lemon into sack and at the same time brings next selected lemon into position with left hand. Repeats operation, working down to bottom of ladder, then by standing, stooping and/or kneeling, picks from lower left branches to finish filling the picking sack. Totes filled sack to box area, places sack in bottom of box, releases snaps on sack's bottom flap and slowly pulls sack up from box to deposit lemons. Arranges lemons in box even with end cleats, placing any surplus lemons in next empty box. Marks picking number on top edge of box with chalk and stacks next empty or partially filled box on top.

Returns to tree, picks up and moves ladder to next position to the left, and repeats operation until all specified types of lemons on the tree are picked. Moves ladder to next assigned tree and repeats entire operation. Cuts stem on hard to reach lemons about $\frac{1}{2}$ inch above button, then makes second cut to cut stem off squarely at the button before placing in sack.

Selects and picks lemons according to size and shade (green, silver, light green, etc.) or when specified by crew boss, picks tree ripe lemons that are all yellow, without a green tip next to the button. Clips off all split, dehydrated, or lemons with mold and drops them on the ground.

Effectiveness of Norms: Only 71% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the S-351 norms, 87% 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-351 norms, only 13% would have been poor workers.

Applicability of S-351 Norms: The aptitude test battery is applicable to jobs which include a majority of duties described above.

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