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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 tothat shown in the job that shown in the job description presented in this report. A description of the validation sample is included. (AG)

TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

EGG CANDLER (any ind.) 7-76.110

B-378 or S-118

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

U. S. DEPARTMENT OF LABOR
Bureau of Employment Security
Washington 25, D. C.
June 1958

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY
FOR
EGG CANDLER 7-76.110

B-378

Summary

The General Aptitude Test Battery, B-1002A, was administered to 52 women employed as Egg Candlers 7-76.110 by the Poultry Producers of Central California, at branch plants in Modesto and Sacramento, California. The criterion used in developing norms consisted of broad category ratings by inspectors. On the basis of mean scores, job analysis data, and correlations with the criterion, the following aptitudes were selected to be included in the test norms: P-Form Perception, K-Motor Coordination and M-Manual Dexterity.

GATB Norms for Egg Candler 7-76.110 - B-378

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Egg Candler 7-76.110.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for B-378

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
P	CB-1-A CB-1-L	80	P	Part 5 Part 7	80
K	CB-1-G CB-1-K	80	K	Part 8	85
M	CB-1-M CB-1-N	105	M	Part 9 Part 10	100

Effectiveness of Norms

The data in Table VI indicate that 10 of the 20 poor workers, or 50 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 50 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 25 of the 35 workers who made qualifying test scores, or 71 percent, were good workers.

TECHNICAL REPORT

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 Egg Candler 7-76.110.

II. Sample

The General Aptitude Test Battery, B-1002A, was administered on December 5 and December 12, 1956, to 58 female workers employed as Egg Candlers 7-76.110 by the Poultry Producers of Central California. The tested sample included all except two workers employed on this job at the Modesto and Sacramento branch plants of the company.

Of the 58 workers tested, four "flash candlers" were eliminated from the sample because their system of grading eggs was not comparable to that used by the other workers. Two others were eliminated because of a poor attitude toward the testing. Thus, the final sample subjected to analysis consisted of 52 workers, 32 from the Sacramento branch, and 20 from the Modesto branch of the company.

No special training courses are given by the employer. The new employee is first assigned duties of a miscellaneous worker until she becomes familiar with the handling of eggs. She is then trained to candle eggs on the job. The foreman can usually tell within two weeks if the new worker will become a successful candler. There was some difference of opinion as to the training time required, but there was agreement that the worker usually attained fair production within six weeks.

Selection of Egg Candlers is based on an interview by the foreman. Although there are no fixed minimum or maximum age limits, applicants in the range of 20 to 45 years of age are preferred. Selection is usually limited to high school graduates. Good eyesight and ability to stand for the full shift period is required.

Table II shows the means, standard deviations, ranges and Pearson product-moment correlations (corrected for broad categories) with the criterion for age, education and experience.

TABLE II

Means (M), Standard Deviations (σ), Ranges, and Pearson Product-Moment Correlations (Corrected for Broad Categories) with the Criterion (r_{cr}) for Age, Education and Experience

Egg Candler 7-76.110

N = 52

	M	σ	Range	cr
Age (years)	32.5	7.7	19-48	.048
Education (years)	10.4	1.5	7-13	-.176
Experience (months)	14.0	9.8	2-32	.225

The data in the above table indicate that the sample is suitable for test development purposes with respect to age, education and experience.

II. Job Description

Job Title: Egg Candler 7-76.110

Job Summary: Inspects eggs for quality and fitness for consumption by holding the egg before a strong, shielded light which renders the egg translucent. Observes characteristic streaks and shadings that denote the internal condition of the egg and segregates eggs accordingly.

Work Performed: Pulls and slides cardboard case, containing 30 dozen eggs arranged on trays six layers deep, from rollers onto low bench. Removes inventory slip, which indicates ownership and number of cases in lot, and enters own name and date and places slip on clipboard hanging at side of station.

Opens flaps of cardboard case. From top layer of trays, picks up two eggs in each hand and examines eggs for dirt and cracks. Momentarily places each egg before a strong shielded light which renders the egg translucent. Observes size of air cell, mobility, visibility and shape of the yolk shadow, dark spots and streaks in order to determine internal condition of egg. Segregates acceptable eggs according to grade by placing them on various "shuffle racks" or slanting troughs arranged in rising tiers above bench. (The shuffle racks feed the eggs into machine which weighs, counts and packs them.) Breaks cracked eggs into jar and throws shells into bucket on floor. Marks inedible eggs with black crayon attached to candling light and places them in tray so that they will not be mixed up with regular run of eggs. Presses lever on counter machine to provide count of every egg not put through grading machine.

As each layer is completed, removes empty trays and stacks them at one side to be removed by helper. May count and place stacked trays in empty case for removal by helper. Pushes or tosses emptied case aside to be collapsed and removed by helper. May fold collapsible cardboard case and toss it aside to be removed by helper. When last case of lot is finished, removes inventory slip from clipboard and places it in slot of counter for stamping with number of eggs processed in each grade. Pulls lever to clear counter for next lot of eggs. May enter lot number and number of cases on note pad in order to keep personal record to check against company count.

Must know the rather complicated egg grading system. Must be able to determine grade rapidly according to internal condition of egg in order to maintain grade and production standards. Must be able to manipulate eggs within hands and place eggs on racks quickly but gently to avoid breakage to maintain high daily production. Must be able to stand in one place for two-hour periods, do repeated reaching and pulling and sliding cases weighing about 50 pounds. Must have normal vision.

IV. Experimental Battery

All of the tests of the GATB, B-1002, were administered to the sample group.

V. Criterion

The criterion consisted of broad category ratings made by the night shift and day shift inspectors in the two plants. Table III shows the number of workers rated by each inspector.

TABLE III

Number of Workers Rated by each Inspector in the Sacramento and Modesto Plants

	Sacramento	Modesto
Night shift inspector	16	10
Day shift inspector	16	10

Discussions with the inspectors who prepared the ratings indicated that the four groups of workers could be considered comparable with respect to ability on the job.

Each inspector rated the workers on his shift twice. The second rating was made approximately three weeks after the first rating. The ratings were made in terms of highest (A), middle (B) and Lowest (C) thirds with respect to job proficiency. The product-moment correlation between the first and second sets of ratings was .91, indicating a high degree of agreement. Since a combination of the two sets of ratings would tend to be more reliable than either the first or the second set alone, the combined ratings of the inspectors were used as the final criterion. Table IV shows the broad categories formed by combining the first and second inspectors' ratings, the number of workers falling in each category, and the numerical score corresponding to each category.

TABLE IV

Broad Categories Formed by Combining First and Second Inspectors' Ratings, the Number of Workers Falling in each Category and the Numerical Score Corresponding to each Category

Category	N	Numerical Score
AA	15	62
AB	2	55
BB	15	51
BC	6	45
CC	14	38

VI. Statistical and Qualitative Analysis

Table V shows the means, standard deviations, and Pearson product-moment correlations (corrected for broad categories) 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 V

Means (M), Standard Deviations (σ), and Pearson Product-Moment Correlations (Corrected for Broad Categories) with the Criterion ($_{c}r$) for the Aptitudes of the GATB

Egg Candler 7-76.110
N = 52

Aptitudes	M	σ	$_{c}r$
G-Intelligence	91.5	15.4	.048
V-Verbal Aptitude	97.9	15.0	.023
N-Numerical Aptitude	86.3	16.4	.077
S-Spatial Aptitude	92.3	18.2	.033
P-Form Perception	99.6	17.4	-.050
Q-Clerical Perception	100.5	13.6	.145
K-Motor Coordination	104.1	17.4	.171
F-Finger Dexterity	101.6	17.2	.174
M-Manual Dexterity	115.2	20.1	.321*

* Significant at the .05 level

The statistical results were interpreted in the light of the job analysis data. The job analysis indicated that the following aptitudes measured by the GATB appear to be important for this occupation:

Form Perception (P) - required to detect small differences in size of air cell, to perceive pertinent detail within egg, such as minute spots and streaks, and to make visual comparisons as to mobility, visibility and shape of yolk shadow.

Motor Coordination (K) - required to coordinate eyes and hands in picking up and positioning eggs in light beam and placing eggs on shuffle racks.

Manual Dexterity (M) - required to make rapid hand and arm movements in picking up eggs, rolling and shifting eggs within palm, and placing eggs on shuffle racks.

The data in Table V show that (1) the highest mean scores were obtained for Aptitudes M and K, and (2) a significant correlation with the criterion was obtained for Aptitude M.

Based on the qualitative and quantitative evidence cited above, Aptitudes P, K and M were considered further for inclusion in the norms. Aptitudes M and K were selected for further consideration because those aptitudes appeared important from the qualitative analysis and had relatively high mean scores. In addition, Aptitude M had a significant correlation with the criterion. There was no statistical evidence for Aptitude P, but this aptitude appeared so important from the qualtitative analysis that it was also selected for tryout in the norms.

Several sets of norms, consisting of various combinations of Aptitudes P, K and M with appropriate cutting scores were selected for trial, and the selective efficiency of each set of trial norms was evaluated for the sample. To determine the selective efficiency of trial norms, the relationship was obtained between the norms and the dichotomized criterion, using a criterion critical score of 51. This critical score, when applied to the criterion distribution, resulted in placing as close as possible to one-third of the sample in the low criterion group. Based on a comparison of the selective efficiencies of the various trial norms and a consideration of the importance of Aptitude P in the job duties, Aptitudes P, K and M with cutting scores of 80, 85 and 100, respectively, were selected as the most appropriate norms for Egg Candler 7-76.110. Addition of P-80 to norms consisting of K-85 and M-100 resulted in failing two more workers in the high criterion group and no more workers in the low criterion group. However, Aptitude P appears to be so important from a qualitative analysis of the job duties of Egg Candler that it was decided to include it in the norms in spite of the general lack of statistical evidence for this aptitude.

In test development studies an attempt is made to develop a set of norms such that the cutting score for each aptitude 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 the case of this study, the aptitude cutting scores are each within five points of one standard deviation below the aptitude mean of the experimental sample.

VII. Concurrent Validity of Norms

Table VI shows the relationship between test norms consisting of Aptitudes P, K and M with critical scores of 80, 85 and 100, respectively, and the dichotomized criterion for Egg Candler 7-76.110. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE VI

Relationship between Test Norms Consisting of Aptitudes P, K and M with Critical Scores of 80, 85 and 100, Respectively, and the Criterion for Egg Candler 7-76.110

N = 52

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	7	25	32
Poor Workers	10	10	20
Total	17	35	52

$r_{tet} = .47$ $\quad X^2 = 3.238$

$\sigma_{r_{tet}} = .23$ $\quad P/2 < .05$

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

III. Conclusions

On the basis of mean scores, correlations with the criterion, job analysis data and their combined selective efficiency, Aptitudes P, K and M with minimum scores of 80, 85 and 100, respectively, are recommended as B-1002 norms for the occupation of Egg Candler 7-76.110. The equivalent B-1001 norms consist of P-80, T-80 and M-105.

IX. Determination of Occupational Aptitude Pattern

When the specific test norms for an occupation include three aptitudes, only those occupational aptitude patterns which include the same three aptitudes with cutting scores that are within 10 points of the cutting scores established for the specific norms are considered for that occupation. None of the existing 23 occupational aptitude patterns meets these requirements for this study. Therefore, none of the existing OAP's is recommended for the occupation of Egg Candler 7-76.110. However, the data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.

June 1958

S-11

FACT SHEET

Job Title

Egg Candler (any ind.) 529.687-018

Job Summary

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Opens flaps of cardboard case. From top layer of trays, picks up two eggs in each hand and examines eggs for dirt and cracks. Momentarily places each egg before a strong shielded light which renders the egg translucent. Observes size of air cell, mobility, visibility and shape of the yolk shadow, dark spots and streaks in order to determine internal condition of egg. Segregates acceptable eggs according to grade by placing them on various "shuffle racks" or slanting troughs arranged in rising tiers above bench. (The shuffle racks feed the eggs into machine which weighs, counts and packs them.) Breaks cracked eggs into jar and throws shells into bucket on floor. Marks inedible eggs with black crayon attached to candling light and places them in tray so that they will not be mixed up with regular run of eggs. Presses lever on counter machine to provide count of every egg not put through grading machine.

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Effectiveness of Norms

Only 62% of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the S-118 norms, 71% would have been good workers. 38% of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the S-118 norms, only 29% would have been poor workers.

Applicability of S-118 Norms

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

313-785 (58)