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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)

November 1970

U.S. Training and Employment Service Technical Report

S-457

Development of USTES

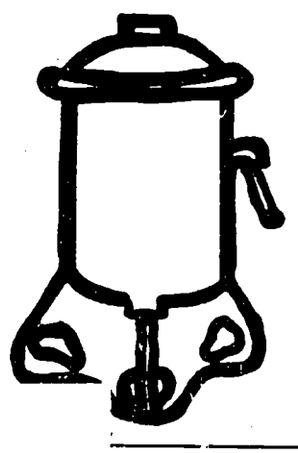
APTITUDE TEST BATTERY FOR

ASSEMBLER, OIL FILTERS

(auto. mfg.)

739.887

U.S DEPARTMENT OF LABOR
Manpower Administration



Technical Report on Development of USTES Aptitude Test Battery

For .....

Assembler, Oil Filters (auto mfg.) 739.887

S-457

(Developed in Cooperation with the
North Carolina State Employment Service)

Manpower Administration
U.S. Department of Labor

November 1970

FOREWORD

The United States Training and 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 signficant 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.

GATB Study #2817

DEVELOPMENT OF USTES APTITUDE TEST BATTERY

for

Assembler, Oil Filters (auto mfg.) 739.887- 030

S-457

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Assembler, Oil Filters (auto mfg.) 739.887-030. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
Q - Clerical Perception	85
K - Motor Coordination	100
M - Manual Dexterity	105

RESEARCH SUMMARY

Sample:

50 females employed as Line Workers by Purolator, Inc., Fayetteville, North Carolina. Three individuals were identified as American Indians, one subject was Negro, and the remaining 46 subjects were nonminority group persons.

Criterion:

Supervisory Ratings.

Design:

Longitudinal. Workers were tested from 1963 to 1970. Criterion data were collected in 1970.

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 = .32 ($p/2 < .025$)

Effectiveness of Norms:

Only 66% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 80% would have been good workers. 34% of the

nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 20% would have been poor workers. The effectiveness of the norms is shown graphically in Table 1:

TABLE 1

Effectiveness of Norms

	Without Tests	With Tests
Good Workers	66%	80%
Poor Workers	34%	20%

SAMPLE DESCRIPTION

Size:

N = 48 for Aptitudes G and N due to zero scores on Part 6 of the GATB for two subjects. These two subjects were retained in the total sample because G and N were considered by analysts to be relatively unimportant in this job. N = 50 for all other aptitudes.

Occupational Status:

Employed workers.

Work Setting:

Workers were employed in the Purolator, Inc. plant in Fayetteville, North Carolina.

Employer Selection Requirements:

Education: No requirement. 10th grade preferred.

Previous Experience: None.

Tests: None

Other: Personal interview. Pass company physical.

Principal Activities:

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

Minimum Experience:

None.

TABLE 2

Means, Standard Deviations (SD), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, Experience, and Cultural Exposure. N=50+

	Mean	SD	Range	r
Age (years)	28.0	7.6	18-45	-.035
Education (years)	10.7	1.5	7-14	.181
Experience (months)	7.5	3.5	2-12	.400**
Cultural Exposure	2.4	1.1	1-6	.153

**Significant at the .01 level

+Cultural Exposure data were collected for 32 employees.

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002 B were administered to the sample group from 1963 to 1970.

CRITERION

The SP-21 Rating Form was not suitable since the tasks performed at each work station were not at an equal level of complexity (the supervisors rated some tasks four times as important as others); and, workers rotated between work stations in such a way that different workers spent different amounts of time at each station. A special rating form was developed (copy attached). A proportionate weight was assigned to each task according to its rated importance and skill level required. Relative importance of each task was rated by the supervisors initially. Supervisors completed the first form, rating each worker at each work station and giving percent of time worker spent at each station and an overall efficiency rating for the worker. This weight was multiplied by the percent of time the worker spent at this work station. The weighted scores for each task performed by this worker were then totalled to provide an overall rating for this worker. This was done for the first and second ratings and the total of both used as the criterion score for this worker. The correlation between first and second ratings was .968. The weights assigned the efficiency ratings were: (Lowest Level of Complexity) Could Improve = 3, Average =6, Above Average =9, Excellent =12; (Second Level of Complexity) Could Improve =6, Average =12, Above Average =18, Excellent =24; (Third Level of Complexity) Could Improve =9, Average =18, Above Average =27, Excellent =36; (Highest Level of Complexity) Could Improve =12, Average =24, Above Average =36, Excellent =48.

Reliability:

The correlation between first and second ratings was .968 indicating satisfactory reliability.

Criterion Distribution:

Range: 7-96
Mean: 34.0
SD: 21.3

Criterion Dichotomy:

The criterion distribution was dichotomized, on the basis of the analysts' judgment, into low and high groups by placing 34% of the sample in the low criterion 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." The criterion critical score is 21.

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. Aptitudes Q, F, and M which do not have high correlations with the criterion, were considered for inclusion in the norms because the qualitative analysis indicated that the aptitudes might be important for the job duties and the sample had relatively high mean scores on these aptitudes. Aptitude K was considered for inclusion in the trial norms since this aptitude was considered to be of critical importance in the performance of job duties. 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
Q - Clerical Perception	Necessary to perceive flaws in the packs as they go down the line so that rejects may be pulled out and discarded.
K - Motor Coordination	Necessary to place paper and other materials precisely with speed to keep production up.

F - Finger Dexterity — Necessary to manipulate and assemble small parts.

M - Manual Dexterity — Necessary to place and turn parts and assemblies of parts.

TABLE 4

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

N = 50+

Aptitudes	Mean	SD	Range	r
G - General Learning Ability	88.9	13.8	61-127	.218
V - Verbal Aptitude	91.1	10.8	68-117	.241
N - Numerical Aptitude	87.3	17.5	49-124	.025
S - Spatial Aptitude	92.8	17.6	61-137	.381**
P - Form Perception	106.8	18.7	67-165	.304*
Q - Clerical Perception	108.3	19.5	59-171	.176
K - Motor Coordination	104.7	18.0	56-142	.160
F - Finger Dexterity	106.8	21.1	60-147	.075
M - Manual Dexterity	120.3	21.2	70-172	.242

*Significant at the .05 level
**Significant at the .01 level
+N = 48 for Aptitudes G and N

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	X
Irrelevant									
Relatively High Mean					X	X		X	X
Relatively Low SD	X	X							
Significant Correlation With Criterion				X	X				
Aptitudes to be Considered for Trial Norms				S	P	Q	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 various combinations of Aptitudes S, P, Q, K, F, and M, at trial cutting scores were able to differentiate between the 66% of the sample considered good workers and 34% 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 one-third of the sample. The Phi Coefficient was used as a basis for comparing trial norms. The optimum differentation for the occupation of Assembler, Oil Filters (auto mfg.) 739.887-030 was provided by the norms of Q-85, K-100, and M-105. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .32 (statistically significant at the .025 level).

TABLE 6

Predictive Validity of Test Norms Q-85, K-100, and M-105

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	9	24	33
Poor Workers	11	6	17
Total	20	30	50

Phi Coefficient (ϕ) = .32 Chi Square (X^2_y) = 5.1
Significance Level = P/2 < .025

DETERMINATION OF OCCUPATIONAL APTITUDE NORMS

Although the specific norms established for this occupation did not meet all the requirements for incorporation into OAP-60 which is shown in the 1970 edition of Section II of the Manual for the General Aptitude Test Battery, this occupation was entered into the OAP. A phi coefficient of .281 is obtained with OAP-60 norms of Q-85, K-80, and M-90.

Date_____

Rater_____

- 7 -

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

Oil Filter

WORK STATION

CUT OFF Level 4																			
% of Time on Station																			
Experience on This Station																			
Could Improve																			
Average																			
Above Average																			
Excellent																			
SIDE SEALER Level 4																			
% of Time on Station																			
Experience on This Station																			
Could Improve																			
Average																			
Above Average																			
Excellent																			
STRING TYER Level 2																			
% of Time on Station																			
Experience on This Station																			
Could Improve																			
Average																			
Above Average																			
Excellent																			
ASSEMBLE PACK TO END DISC Level 2																			
% of Time on Station																			
Experience on This Station																			
Could Improve																			
Average																			
Above Average																			
Excellent																			
PLACE ELEMENT IN OVEN Level 2																			
% of Time on Station																			
Experience on This Station																			
Could Improve																			
Average																			
Above Average																			
Excellent																			

*Levels of complexity were assigned after all ratings were obtained.

Date_____

Rater_____

A-P-F-E-R-D-I-X

Oil Filter

WORK STATION

ASSEMBLE PACK TO END DISC Level 3	
% of Time on Station	
Experience on This Station	
Could Improve	
Average	
Above Average	
Excellent	
REMOVE ELEMENT - PLACE IN CAN	
% of Time on Station Level 2	
Experience on This Station	
Could Improve	
Average	
Above Average	
Excellent	
PLACE CAN ON LINE Level 1	
% of Time on Station	
Experience on This Station	
Could Improve	
Average	
Above Average	
Excellent	
PLACE ELEMENT GUIDE IN CAN	
% of Time on Station Level 3	
Experience on This Station	
Could Improve	
Average	
Above Average	
Excellent	
In view of these and ONLY THESE FACTORS, how would you rate this worker over all?	
Could Improve	
Average	
Above Average	
Excellent	

Date_____

Rater_____

9

A-F-P-E-R-D-I-K

Air Filter

WORK STATION

CUT OFF Level 4																		
% of Time on Station																		
Experience on This Station																		
Could Improve																		
Average																		
Above Average																		
Excellent																		
SIDE SEALER Level 4																		
% of Time on Station																		
Experience on This Station																		
Could Improve																		
Average																		
Above Average																		
Excellent																		
ASSEMBLE OUTER SCREEN TO PACK																		
% of Time on Station Level 2																		
Experience on This Station																		
Could Improve																		
Average																		
Above Average																		
Excellent																		
ASSEMBLE INNER SCREEN TO PACK																		
% of Time on Station Level 2																		
Experience on This Station																		
Could Improve																		
Average																		
Above Average																		
Excellent																		
ASSEMBLE PACK TO FIRST MOLD																		
% of Time on Station Level 1																		
Experience on This Station																		
Could Improve																		
Average																		
Above Average																		
Excellent																		

* Levels of complexity were assigned after all ratings were obtained.

Date_____

Rater_____

10

A-P-T-E-T-D-T-X

Air Filter

WORK STATION

PRESS PACK IN MOLD Level 1																	
% of Time on This Station																	
Experience on This Station																	
Could Improve																	
Average																	
Above Average																	
Excellent																	
WELDER Level 2																	
% of Time on This Station																	
Experience on This Station																	
Could Improve																	
Average																	
Above Average																	
Excellent																	
ASSEMBLE PACK TO 2nd MOLD Level 1																	
% of Time on Station																	
Experience on This Station																	
Could Improve																	
Average																	
Above Average																	
Excellent																	
In view of these and ONLY THESE FACTORS, how would you rate this worker over all?																	
Could Improve																	
Average																	
Above Average																	
Excellent																	

FACT SHEET

Job Title: Assembler, Oil Filters (auto mfg.) 739.887-030

Job Summary: Assembles automobile and airplane oil filters.

Work Performed: Assembles automobile and airplane oil filters, performing any one or more of the following tasks: (1) Inspects corrugated filter paper for scorches as it comes out of curing oven. (2) Cuts to marked length with knee operated pneumatic cutter. (3) Rejects scorched paper by throwing into box at side of conveyor and places good paper on conveyor belt. (4) Picks up length of paper and places in position for foot operated clip sealer to seal ends of paper together to form filter element; steps on pedal to activate sealer; places filter element on conveyor belt. (5) Places metal core inside filter element. (6) Places unit in machine that automatically ties a string around it and drops it into a box. (7) Picks up and places unit on end disc filled with liquid plastisol as the discs come down the conveyor belt. (8) Presses down on unit to make sure it is centered in the disc and in good contact with the plastisol. (9) Pushes unit onto another conveyor belt that carries it into oven. (10) Takes unit from conveyor belt, inverts it, and places it in another end disc filled with plastisol and pushes it onto another conveyor belt that takes it into another oven. (11) Drops spring into can as it comes down conveyor belt. (12) Inserts element assembly into can on top of spring.

Effectiveness of Norms: Only 66% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 80% would have been good workers. 34% of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 20% would have been poor workers.

Applicability of S-457 Norms: The aptitude test battery is applicable to jobs which include a majority of the job duties described above.

GPO 902.719