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RESEARCH MEMORANDUM 60-18

Evaluation of Experimental AQB Tests for Screening Category IV Personnel

NOVEMBER 1960

PERSONNEL RESEARCH BRANCH

Research and Development Division
The Adjutant General's Office
Department of the Army

Army Project Number
2L95-60-001

Induction b-14

(9) Research Memorandum 60-18

(6) EVALUATION OF EXPERIMENTAL AQB TESTS FOR SCREENING CATEGORY IV PERSONNEL.

(10) A. G. Bayroff, Leonard C. Seeley, and Alan A. Anderson

(12) 191

(14) AGO-PRB-RM-60-18

Submitted by

Edmund F. Fuchs
Chief, Research Group I

(11) November 1960

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EVALUATION OF EXPERIMENTAL AQB TESTS FOR SCREENING CATEGORY IV PERSONNEL

Human factors research for the Army has for many years been concerned not only with screening applicants and recruits to keep out those mentally unqualified for military training, but also with differentially classifying those accepted into job areas where they will perform to the best advantage of the Army.

The screening test which has been used to determine mental qualification for acceptance in the Armed Forces is the Armed Forces Qualification Test (AFQT), an overall measure of military trainability. Enlisted classification has meanwhile relied mainly on the identification of aptitudes in classifying men for job training and in assigning them in accordance with total Army manpower requirements. Differential measures of an individual's aptitudes are derived from his scores on the Army Classification Battery (ACB), administered during initial processing. The aptitude measures, or aptitude area scores, are composites of ACB test scores, each composite representing a combination of aptitudes required in a particular set of Army jobs, or occupational area.

Recently, however, a shift in Army policy has required the use of the ACB as an additional screening tool for Category IV personnel (those having AFQT percentile scores of 10 to 30 inclusive). In October 1957, the ACB was introduced at six Armed Forces Examining Stations (AFES) as a supplementary screening measure for Category IV applicants for enlistment. Individuals were considered unacceptable if they failed to achieve a standard score of 90 or higher on two or more aptitude areas. In August 1958, the program was extended to all AFES and applied to Selective Service registrants as well as nonprior service enlistees. Action of January 1959 requiring an AFQT percentile score of 31 or higher for nonprior service RA enlistment in effect precluded acceptance of Category IV enlistees. Differential screening by means of the ACB has continued to apply to all Category IV Selective Service registrants being processed through AFES. Personnel failing to qualify are currently classified 4F and deferred, with little prospect of recall except under emergency conditions.

ACB tests were developed to measure a wide range of ability levels and are not ideally suited for use with Category IV personnel, since a large percentage of the items are beyond their capacity. In addition, administration of the ACB at AFES lengthens testing time for the individual by four or five hours. Fortunately, the Personnel Research Branch had anticipated the need for a shorter battery and had under way an analysis of AFQT content in relation to ACB tests and aptitude area scores. Results of the analysis facilitated production of a battery of

tests, shorter than the ACB tests and more appropriate for Category IV personnel. While used heretofore as a single measure, the AFQT is made up of four content areas or subtests: Vocabulary (Verbal), Arithmetic Reasoning, Tool Functions, and Spatial Relations. The four AFQT subtest scores were found to be reasonably good measures of aptitudes measured by counterpart ACB tests[1/]. With the addition of four short tests constructed to parallel additional ACB tests--Mechanical Aptitude, Electrical Information, Automotive Information, and Clerical Speed--a battery was developed and recommended to replace the longer ACB for use at AFES. Designated the Army Qualification Battery, AQB-1, the set of tests provides an effective means of screening incoming Category IV personnel to meet differential aptitude requirements.

OBJECTIVE OF THE STUDY

The AQB-1 was regarded as an interim battery assembled in a minimum of time to meet military needs. The desirability of further development of a battery suited to the initial classification of Category IV personnel prompted concurrent research on additional tests. As a minimum, the battery needed to be expanded to provide content coverage equivalent to that of the currently operational Army Classification Battery. The ACB contains two tests developed on the basis of extensive research for use in identifying men who are potentially good combat soldiers: The Classification Inventory, a noncognitive personality test, and the General Information Test, a measure of interests and activities. While the two tests are not at the present time administered at AFES, the need for their inclusion was anticipated. Short parallel tests of the two areas were prepared and included in the experimental testing necessary to the development of AQB-1.

A special word is in order concerning the spatial area. The measure included in AQB-1 is the spatial subtest of AFQT forms 5 and 6, which were operational at the time of the experimental testing. The AFQT subtest items differ in format and content from the pattern analysis items of the ACB test. The preliminary study of AFQT content had shown the correlation of the AFQT spatial subtest with the ACB Pattern Analysis Test to be relatively low. This finding, coupled with the fact that the spatial content of AFQT-7 and -8, soon to become operational, is closer to the pattern analysis items of the ACB than are items in AFQT-5 and -6, led to the construction of a special experimental AQB test of spatial relations, herein termed SP.

The purpose of the present study was to continue the development of a battery of short tests, suitable for use with Category IV personnel, which would parallel the longer ACB measures and, in appropriate combinations, provide useful aptitude area measures corresponding adequately to the aptitude area scores derived from the

1/Correlation coefficients of AFQT subtests with counterpart ACB tests were: verbal, .79; arithmetic reasoning, .86; spatial, .66; mechanical, .63.

ACB. The research accomplished in developing the eight-test AQB-1 was briefly reported in a previous Personnel Research Branch Technical Research Report (Bayroff, Seeley, and Anderson, 1959). The present report covers the construction and analysis of eleven tests--the eight AQB-1 tests, plus the Classification Inventory, the General Information Test, and the additional Spatial Relations Test, SP--as well as the aptitude area composites of the eleven tests.

The battery of experimental tests was evaluated in terms of its capacity to yield scores comparable to those obtained with the already established differential classification battery, the ACB. The ACB has been developed over a period of many years and is now so constituted that each aptitude area composite is the best measure of potential performance in a given occupational area, or set of related Army jobs. At the same time, each aptitude area differentiates the level of ability in that area from the level of ability in other areas.

THE EXPERIMENTAL ARMY QUALIFICATION BATTERY

THE EXPERIMENTAL TESTS

The four subtests of AFQT formed the Verbal, Arithmetic Reasoning, Tool Functions, and Spatial Relations tests of the experimental battery. Seven additional tests were constructed. The composition of the experimental battery is outlined on page 4 to clarify its relationship to AQB-1 and to the ACB. No AQB test was constructed to parallel the Army Radio Code Aptitude Test. The ARC is not included among ACB tests administered to Category IV personnel at AFES since it is used to meet a specialized and restricted personnel requirement.

The seven tests constructed for the AQB are described below:

Mechanical Aptitude, AQB-MA. The experimental form administered in this study was contained in Supplementary Army Qualification Test, SAQT-SME, PT 3560. The test is made up of 20 picture items, each having two, three, or four alternatives. Items are based on elementary mechanical principles which can readily be gleaned from practical observation and experience and are similar to items in the Bennett Mechanical Comprehension Test. Items are of the same type as are items comprising the ACB-MA Test. The fact that more than a third of the items in the ACB-SM test are also of the Bennett type could be expected to produce substantial correlation between AQB-MA and ACB-SM, and was to be taken into account in evaluating the AQB-MA as a differential measure of its ACB counterpart. Administration time: 8 minutes.

Electrical Information, AQB-ELI. Items are all in verbal form, whereas half the items in ACB-ELI are verbal, the

AQB EXPERIMENTAL TESTS AND THEIR ACB COUNTERPARTS

AQB TESTS	ACB TESTS
Part A of AQB-1 (AFQT Subtests)	
AQB-VE--Vocabulary	ACB-VE--Verbal
AQB-AR--Arithmetic Reasoning	ACB-AR--Arithmetic Reasoning
AQB-SM--Tool Functions	ACB-SM--Shop Mechanics
AQB-PA--Spatial Relations	ACB-PA--Pattern Analysis
Part B of AQB-1 (Newly constructed tests)	
AQB-MA--Mechanical Aptitude	ACB-MA--Mechanical Aptitude
AQB-ELI--Electrical Information	ACB-ELI--Electronics Information (Radio and Electrical Information)
AQB-AI--Automotive Information	ACB-AI--Automotive Information
AQB-ACS--Clerical Speed	ACB-ACS--Army Clerical Speed
Additional newly constructed tests	
AQB-CI--Classification Inventory	ACB-CI--Classification Inventory
AQB-GIT--General Information Test	ACB-GIT--General Information Test
AQB-SP--Spatial Relations	(ACB-PA)
(No AQB Test)	ACB-ARC--Army Radio Code Aptitude

other half graphic. It was recognized that the difference in item form could result in a lower degree of correlation between the AQB test and its ACB counterpart than would otherwise be expected. The fact that AQB-ELI has electrical information items only, whereas ACB-ELI measures radio information as well as electrical, was also considered likely to depress the intercorrelation. However, inclusion of both radio and electrical information items in a 20-item test was judged inadvisable. Administration time: 8 minutes.

Automotive Information, AQB-AI. Supplementary Army Qualification Test, SAQT-AI, PT 3628. The test contains 20 four-alternative verbal items. Since ACB-AI is part verbal and part pictorial, the correlation between the counterpart tests was expected to be lower than if the two tests were of similar format. Administration time: 8 minutes.

Clerical Speed, AQB-ACS. Supplementary Army Qualification Test, SAQT-C, PT 3561. This test is approximately a half-length counterpart of the ACB-ACS test. Part I, Number Reversal, contains 60 instead of the 125 number pairs of the ACS. Part II, Coding, contains 50 number-word pairs rather than 100 pairs, as does the ACB-ACS. Although all content is completely new, instructions and format are almost identical in the two measures, and high correlation between the two was expected. Administration time: 5 minutes.

Spatial Relations, AQB-SP. Supplementary Army Qualification Test, SAQT-SME, PT 3560. The test has 20 picture items, each with four alternatives. The lead picture is a pattern, which when folded becomes a three-dimensional form. The alternatives in most cases present the forms from varying angles. The items resemble the folding patterns of ACB-PA more closely than do the rotated blocks of AQB-PA, the AFQT subtest. The folding operation characteristic of the SP items, but lacking in AQB-PA, was believed likely to result in higher correlation with ACB-PA. Administration time: 15 minutes.

General Information Test, AQB-GIT. Supplementary Army Qualification Test, SAQT-G, PT 3580 (Part I). The test contains 30 four-choice verbal items covering general knowledge of a variety of fields including outdoor activities, athletics, automobiles, etc. Administration time for GIT and CI together: 25 minutes.

Classification Inventory, AQB-CI. Supplementary Army Qualification Test, SAQT-G, PT 3580 (Part II). Thirty yes-no statements are presented pertaining to attitudes and behavior. The examinee states whether or not each statement applies to himself.

TEST CONSTRUCTION

In constructing the tests, items were selected largely from existing pools maintained in the Personnel Research Branch. Since the measures were intended primarily for use with Category IV personnel, item content was selected to insure that the tests would be discriminating at the desired level. However, the questions were sufficiently varied in difficulty to allow for possible adjustment of the qualifying score of 90 upward to 110 and for a sufficient range (80-120) to permit the differential measurement of the individual's aptitudes. The following principles governed item selection on the basis of difficulty:

1. The narrow range around the present critical Army standard score of 90 would be measured most effectively.

2. For the 80 to 100 range, the test would be as discriminating as it could be made without detracting from sensitivity around 90.

3. The test would provide adequate discrimination should the critical score be raised to 100 or even 110.

To meet these objectives, the distribution of difficulty levels shown in Table 1 was adhered to in selecting items for MA, ELI, AI, and SP.[2/] The 30 items of the GIT followed proportionately the difficulty pattern shown in Table 1. The p-values of the table were not applicable to the Clerical Test which is highly speeded nor to the Classification Inventory which is noncognitive. Items for the General Information Test and the Classification Inventory were selected from the corresponding ACB tests.

SAMPLING

The sample used in evaluating the experimental measures consisted of 540 enlisted men selected from enlisted men tested at Fort Dix, Fort Knox, and Fort Chaffee. Experimental tests were administered in April 1958 while the men were in their first or second week of basic training. The Classification Inventory and the General Information

2/ PRB Technical Research Report 1101, "Development of the AFQT Forms 5 and 6," contains a detailed explanation of the basis for relating p-values to the several standard score ranges shown in the table. Briefly, the procedure involved converting the column of standard scores to percentile scores, taking the complement of each of the percentile scores (which yields the percentage of people who should know the right answer to each item at that level) and then adjusting this to allow for guessing the correct answer by chance.

Table 1

DISTRIBUTION OF ITEMS ACCORDING TO DIFFICULTY LEVELS
FOR AQB-MA, ELI, AND AI

Standard Scores	P Value	Number of Items
119 and up	up to 39	1
112-118	40-49	2
104-111	50-59	3
96-103	60-69	4
87-95	70-79	4
71-86	80-89	4
60-70	90-95	1
up to 59	96+ (warm up)	1
Total		20

Test, which were not then operational, were also administered to the experimental sample. For each man tested, operational AFQT score and ACB test scores, as well as background data including years of education, were recorded.

The standardization of all Army screening and classification tests has been based, directly or by means of scores on an intervening reference test, upon the AGCT test performance of a sample of men approximating in mental level the World War II mobilization population. In order that the AQB measures should reflect similar treatment, cases for the present evaluation were selected according to the pattern established in previous developmental research: The sample was stratified on AFQT half-decile scores, with 30 cases in each half-decile. Cases below the 10th percentile were excluded, inasmuch as Category V men had been rejected at AFES. In accomplishing the stratification, 116 obtained cases were dropped from overloaded intervals, and 57 were duplicated in intervals where shortages existed. A second sample was limited to Category IV personnel of the total stratified sample.

EVALUATION OF THE EXPERIMENTAL AQB

AQB TESTS AS DIFFERENTIAL MEASURES OF ACB TESTS

The experimental AQB tests yielded satisfactory measures of counterpart ACB tests with correlation coefficients from .65 to .90 (Table 2). Six of the eleven short tests (VE, AR, ACS, AI, GIT, CI) were clearly effective in differentiating among the aptitudes measured by counterpart ACB tests. For nine of the eleven AQB measures, correlation was higher with the counterpart ACB test than with any other ACB test (reading across the rows of Table 2). ELI was marginally satisfactory, its correlation with ACB-GIT being almost as high as with ACB-ELI. AQB-SM and AQB-MA were least satisfactory as differential measures. The correlation of AQB-SM with ACB-AI was of the same level as with ACB-SM. The coefficient of AQB-MA with ACB-MA was exceeded by its correlation with several other ACB tests.

Compared with other ACB tests (reading down columns of Table 2), seven experimental AQB tests were more highly correlated with their ACB counterparts than were any other AQB tests. As in the above comparison, AQB-SM and AQB-MA fell short of the desired differentiation. Weakness of the two tests as differential measures had been anticipated in view of the fact that AQB-MA contains items closely resembling in format those of both MA and SM of the ACB.

The behavior of the two experimental spatial tests was reasonably satisfactory. Obtained coefficients for both tests with ACB-PA were higher than for any other AQB measure. AQB-SP correlated higher with ACB-PA than did AQB-PA (the AFQT subtest), an expected result in view of the resemblance between AQB-SP and ACB-PA in both item type and content.

AQB ESTIMATES OF APTITUDE AREA SCORES

When AQB measures were combined according to ACB aptitude area formulas, resulting composite scores were very closely related to the corresponding aptitude area scores derived from ACB tests. Correlation of sums coefficients ranged from .79 to .91 in the total stratified sample (Table 3). Two-test composites identified by

Table 2

PRODUCT MOMENT CORRELATION COEFFICIENTS OF AQB TESTS WITH ACB TESTS, CORRECTED FOR RESTRICTION IN RANGE ON AFQT FOR TOTAL STRATIFIED SAMPLE (N = 540)

	ACB TESTS									
AQB TESTS	VE	AR	SM	PA	ACS	MA	ELI	AI	GIT	CI
VE	.90[a]	.74	.69	.70	.67	.62	.69	.47	.77	.63
AR	.75	.85	.66	.74	.71	.62	.66	.51	.72	.57
SM	.51	.54	.73	.67	.48	.62	.70	.73	.72	.54
PA	.61	.66	.67	.77	.60	.60	.66	.55	.69	.56
ACS	.64	.63	.53	.59	.85	.49	.49	.36	.57	.52
SP	.63	.68	.67	.80	.61	.61	.69	.53	.66	.54
MA	.67	.70	.73	.73	.57	.65	.71	.61	.72	.61
ELI	.66	.67	.69	.68	.54	.66	.72	.60	.71	.56
AI	.41	.42	.64	.30	.34	.54	.54	.79	.65	.49
GIT	.73	.68	.68	.69	.60	.64	.68	.57	.86	.67
CI	.47	.45	.52	.45	.43	.47	.46	.41	.53	.80

[a]Inter-r's for pairs of counterpart tests have been underlined.

Table 3

CORRELATION OF AQB EXPERIMENTAL TEST COMPOSITES WITH ACB OPERATIONAL APTITUDE AREA SCORES IN TOTAL STRATIFIED SAMPLE (N = 540)

			AQB Best 2-Test Composite		
Aptitude Area	Operational Weighted Composite	AQB Counterpart Composite	Component Tests With Beta Weights	Weighted Composite	With Integral Weights
		r		R	r
Infantry, IN	AR + 2CI	.87	GIT(55) VE(46)	.88	.87
Armor, Art., Engineer	AI + GIT	.89	SM(48) CI(48)	.88	.88
Electronic	MA + 2ELI	.79	ELI(49) SM(41)	.81	.81
Gen. Maint.	PA + 2SM	.81	MA(50) SM(42)	.84	.84
Motor Maint.	MA + 2AI	.81	VE(25) 2AI(66)	.81	.80
Clerical	VE + 2ACS	.88	VE(46) ACS(54)	.91	.90
Gen. Tech.	VE + AR	.91	VE(55) AR(42)	.91	.91
Combat A	AR + 2PA	.85	AR(50) SP(45)	.88	.88
Combat B	PA + 2MA	.80	SP(49) CI(40)	.81	.81

square-root test selection procedures and used with Beta weights yielded slightly higher correlation with ACB aptitude area score for seven of nine aptitude areas.3/ However, in no case was the gain more than three correlation points. In all but one instance, Betas were quite close, a result which suggests the feasibility of employing integral weights in the event the best test composites are adopted for operational use. In three of the nine aptitude areas, tests in composites resulting from the test selection procedure were the same as the tests comprising the operational aptitude areas: Combat A, Clerical, and General Technical.

AQB VS ACB IN THE CATEGORY IV SAMPLE

While correlation coefficients were lower in a sample limited to Category IV cases than in the total stratified sample, the pattern of correspondence between AQB tests and counterpart ACB tests was generally maintained (Table 4 and 5). Further justification was noted for employing integral weights instead of Beta weights in computing aptitude area scores. Within the restricted sample--as in the total sample--the simpler procedure resulted in almost no reduction of the correlation with ACB aptitude area scores.

TEST INTERCORRELATION

The degree of intercorrelation among the experimental AQB tests in the total stratified sample was found to be about the same as that of ACB tests, when both sets of coefficients were corrected for restriction in range on AFQT (Table 6 and 7). The mean of all coefficients (obtained by use of z transformation) was .62 for AQB tests, .63 for ACB tests. The result supported the inference that the AQB, despite the shortness of the component tests, is approximately as reliable as the ACB. To verify this conclusion, an

3/All currently operational aptitude area composites, with the exception of RC, were considered. Two sets of combat predictor composites were included: (1) Combat A and Combat B which were operational at the time data were obtained (and which are still computed for Category IV personnel tested at AFES), and (2) the two currently operational aptitude areas, Infantry (IN) and Armor, Artillery, Engineer (AE), introduced in 1958 at the same time as the Classification Inventory and the General Information Test.

Table 4

PRODUCT MOMENT CORRELATION COEFFICIENTS[a] OF AQB TESTS WITH ACB TESTS IN THE CATEGORY IV SAMPLE (N = 123)

	ACB TESTS									
AQB TESTS	VE	AR	SM	PA	ACS	MA	ELI	AI	GIT	CI
VE	.82[b]	.32	.29	.22	.45	.21	.15	.07	.45	.41
AR	.46	.66	.17	.29	.48	.17	.11	.15	.42	.33
SM	.20	.17	.46	.30	.22	.27	.44	.41	.52	.28
PA	.15	.26	.33	.44	.27	.16	.20	.14	.36	.37
ACS	.46	.29	.23	.28	.78	.26	.06	.10	.40	.46
SP	.13	.32	.15	.51	.29	.06	.14	.02	.17	.17
MA	.33	.35	.48	.28	.35	.35	.29	.30	.46	.51
ELI	.39	.30	.44	.25	.36	.28	.34	.44	.60	.48
AI	.07	.07	.52	.13	.16	.34	.32	.55	.55	.45
GIT	.30	.23	.45	.29	.33	.30	.29	.36	.68	.55
CI	.29	.08	.37	.07	.28	.18	.08	.18	.41	.77

[a] Uncorrected for restriction in range.
[b] Inter-r's for pairs of counterpart tests have been underlined.

Table 5

CORRELATION OF AQB EXPERIMENTAL TEST COMPOSITES WITH ACB OPERATIONAL APTITUDE AREAS IN CATEGORY IV SAMPLE (N = 123)

			AQB Best 2-Test Composite		
Aptitude Area	Operational Weighted Composite	AQB Counterpart Composite	Component Tests With Beta Weights	Weighted Composite	With Integral Weights
		r		R	r
Infantry, IN	AR + 2CI	.79	AR(31) 2CI(65)	.79	.79
Armor, Artillery Engineer	AI + GIT	.72	AI(45) ELI(38)	.74	.74
Electronic	MA + 2ELI	.42	MA(18) 2SM(41)	.51	.51
Gen. Maint.	PA + 2SM	.55	MA(35) SM(33)	.59	.58
Motor Maint.	MA + 2AI	.56	ELI(21) 2AI(44)	.58	.58
Clerical	VE + 2ACS	.82	VE(38) ACS(60)	.84	.84
Gen Tech.	VE + AR	.81	VE(53) AR(41)	.81	.81
Combat A	AR + 2PA	.55	AR(32) SP(42)	.62	.61
Combat B	PA + 2MA	.49	ACS(26) MA(37)	.52	.45

Table 6

AQB RAW SCORE MEANS, STANDARD DEVIATIONS, AND PRODUCT MOMENT INTERCORRELATION COEFFICIENTS CORRECTED FOR RESTRICTION IN RANGE ON AFQT FOR TOTAL STRATIFIED SAMPLE (N = 540)

AQB TESTS	MEAN	S. D.	VE	AR	SM	PA	ACS	SP	MA	ELI	AI	GIT
VE	14.73	9.37										
AR	15.36	8.64	.78									
SM	15.40	7.26	.59	.61								
PA	16.13	8.15	.68	.74	.72							
ACS	53.45	18.95	.63	.68	.45	.60						
SP	10.79	6.19	.65	.72	.66	.78	.59					
MA	12.08	5.28	.71	.71	.68	.73	.54	.74				
ELI	9.82	5.96	.69	.68	.65	.66	.51	.69	.75			
AI	12.63	6.20	.47	.52	.73	.58	.38	.53	.64	.62		
GIT	11.86	7.46	.73	.73	.68	.69	.58	.66	.70	.67	.63	
CI	19.03	5.01	.50	.50	.48	.51	.43	.48	.54	.49	.45	.56

Table 7

ACB STANDARD SCORE MEANS, STANDARD DEVIATIONS AND PRODUCT MOMENT INTERCORRELATION COEFFICIENTS CORRECTED FOR RESTRICTION IN RANGE ON AFQT FOR TOTAL STRATIFIED SAMPLE (N = 540)

ACB TESTS	MEAN	S. D.	VE	AR	SM	PA	ACS	MA	ELI	AI	GIT
VE	100.95	26.94									
AR	99.61	23.77	.77								
SM	102.04	21.69	.67	.65							
PA	100.45	26.96	.69	.74	.72						
ACS	97.95	24.17	.70	.69	.58	.65					
MA	98.78	19.92	.63	.63	.76	.65	.55				
ELI	97.95	25.68	.69	.67	.74	.73	.55	.68			
AI	99.21	20.16	.45	.48	.75	.55	.38	.67	.63		
GIT	99.90	23.80	.76	.69	.72	.70	.60	.64	.69	.61	
CI	89.88	27.53	.59	.52	.55	.50	.51	.52	.53	.43	.60

estimate of reliability was obtained for each test in the two batteries.[4/] In most instances the coefficient for the AQB measure was surprisingly close to that of its ACB counterpart (Table 8). In the case of VE, AR, and MA, the shorter AQB test actually yielded a higher coefficient of reliability than did the corresponding ACB measure. Mean reliability coefficients of AQB tests and of ACB tests were .80 and .81 respectively (again obtained by means of z transformations).

An intercorrelation matrix of all variables in the study is provided as Table 9.

CONCLUSIONS

Experimental AQB tests yield reliable measures, substantially correlated with scores on individual counterpart ACB tests.

Used in two-test composites corresponding to current aptitude areas, or in Beta-weighted composites identified through test selection procedures, AQB tests afford a satisfactory means of screening Category IV personnel to meet differential aptitude requirements and provide a basis for the classification of those accepted.

The experimental tests which proved least satisfactory as differential aptitude measures are MA, SM, and ELI. Continuing effort to develop the Army Qualification Battery should emphasize refinement of measurement in the mechanical ability area.

AQB composites obtained with integral weights provide as satisfactory measures of aptitude areas as do the less conveniently computed Beta-weighted composites.

The tests evaluated in this study could also be useful in determining eligibility for service schools in the case of enlisted commitment, since the aptitude area cutting scores for most schools are within the range of maximum sensitivity of these tests.

4/Reliability was estimated by a method developed by Personnel Research Branch statisticians. It is based on the assumption that the vectors of each content pair were colinear in the true factor space, and that the best fitting line of the coordinate points passes through the origin. Preliminary testing of these assumptions, accomplished by graphing the correlation between ACB and AQB counterparts and the remaining ACB tests, indicated reasonable colinearity for eight of ten pairs and a fair degree of colinearity for the other pairs; the best-fitting line passes reasonably close to the origin for all pairs. The computing procedure made use of column proportionality for colinear test vectors, and of the fact that the correlation between tests whose vectors are colinear is the product of the two vectors lengths.

Table 8

RELIABILITY COEFFICIENTS OF AQB AND ACB COUNTERPART TESTS

Test	AQB r	ACB r
VE	.91	.89
AR	.87	.83
SM	.70	.76
PA	.76	.78
ACS	.83	.87
MA	.68	.62
ELI	.72	.72
AI	.79	.79
GIT	.85	.87
CI	.75	.86

Table 9

MEANS AND STANDARD DEVIATIONS (UNCORRECTED) AND PRODUCT-MOMENT INTERCORRELATION COEFFICIENTS (CORRECTED AND UNCORRECTED)[a] OF AFQT, AQB TESTS AND ACB TESTS

Total Sample, N = 540

Ver. No.	VARIABLES	MEAN	S. D.	Variable Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1.	Years Education	11.28	2.28	-	61[b]	63	64	65	38	51	55	54	52	53	29	56	38	67	65	58	48	60	36	49	28	49	58	46
2.	Operational AFQT (Total raw score)	67.27	19.44	52	-	88	79	81	70	79	61	77	71	69	58	75	50	77	76	80	72	69	36	76	62	74	76	57
3.	Experimental AFQT (Total raw score)	66.48	24.71	55	82	-	88	90	82	89	68	81	81	77	65	81	57	81	80	82	70	71	38	78	64	77	83	66
	EXPERIMENTAL AQB (raw scores)																											
4.	Verbal (AQB-VE)	16.17	8.16	56	71	84	-	78	59	68	63	65	71	69	47	73	50	90	74	70	62	67	35	69	47	69	77	63
5.	Arithmetic Reasoning (AQB-AR)	16.72	7.41	57	73	86	71	-	61	74	68	72	71	68	52	73	50	75	85	74	62	71	36	66	51	66	72	57
6.	Shop Mechanics (AQB-SM)	16.39	6.54	25	61	77	47	50	-	72	45	66	68	65	73	68	48	51	54	67	62	48	22	73	73	70	72	54
7.	Pattern Analysis (AQB-PA)	17.39	7.10	40	71	85	57	65	64	-	60	78	73	66	58	69	51	61	66	77	60	60	36	67	55	66	69	56
8.	Clerical (AQB-ACS)	55.70	17.46	47	51	61	55	61	34	52	-	59	54	51	38	58	43	64	63	59	49	85	44	53	36	49	57	52
9.	Spatial Relations (AQB-SP)	11.72	5.46	44	69	74	54	63	57	71	50	-	74	69	53	66	48	63	68	80	61	61	30	67	53	69	66	54
10.	Mechanical Aptitude (AQB-MA)	12.81	4.69	42	61	76	63	63	60	66	45	67	-	75	64	70	54	67	70	73	65	57	30	73	61	71	72	61
11.	Electrical Information (AQB-ELI)	10.62	5.39	44	60	70	60	59	56	57	41	61	69	-	62	67	49	66	67	68	66	54	29	59	60	72	71	56
12.	Automotive Information (AQB-AI)	13.33	5.76	18	48	58	36	42	68	50	28	44	58	55	-	63	45	41	45	53	58	36	22	69	79	58	65	49
13.	General Information (AQB-GIT)	12.95	6.57	47	66	75	65	64	59	59	49	55	62	58	56	-	56	73	68	69	64	60	38	68	57	68	86	67
14.	Classification Inventory (AQB-CI)	19.52	4.76	29	41	50	42	41	40	43	35	39	47	42	38	49	-	47	45	45	47	43	23	52	41	46	53	80
	ACB (standard scores)																											
15.	Verbal (ACB-VE)	104.99	23.44	60	68	74	87	67	38	49	56	52	58	58	28	64	38	-	77	69	63	70	37	67	45	69	76	59
16.	Arithmetic Reasoning (ACB-AR)	103.13	21.07	58	58	74	66	80	41	56	56	58	62	59	34	58	36	70	-	74	63	69	41	65	48	67	69	52
17.	Pattern Analysis (ACB-PA)	104.66	23.31	49	72	75	60	65	57	69	50	74	65	59	43	59	35	59	66	-	65	65	37	72	55	73	70	50
18.	Mechanical Aptitude (ACB-MA)	101.58	17.62	38	62	61	51	51	52	49	39	50	57	53	50	54	39	53	53	55	-	55	35	76	67	68	64	52
19.	Army Clerical Speed (ACB-ACS)	101.20	21.86	51	60	62	58	62	36	49	82	51	46	43	24	49	34	62	61	56	44	-	41	58	38	55	60	51
20.	Army Radio Code Aptitude (ACB-ARC)	93.06	15.84	31	28	31	29	29	14	29	39	23	23	22	15	32	17	30	35	31	28	36	-	30	23	28	32	29
21.	Shop Mechanics (ACB-SM)	105.25	18.99	38	67	71	59	55	66	56	43	58	66	60	63	59	44	57	55	63	70	48	23	-	75	74	72	55
22.	Automotive Information (ACB-AI)	101.65	18.65	15	53	55	34	39	67	45	25	42	53	52	76	48	33	32	36	45	60	25	16	69	-	63	61	43
23.	Electronics Information (ACB-ELI)	101.65	22.73	38	65	70	59	55	62	56	38	61	54	65	50	58	37	60	58	65	59	43	20	67	55	-	69	53
24.	General Information (ACB-GIT)	103.43	20.83	49	67	77	69	64	64	59	48	55	65	63	58	82	45	69	60	61	55	49	25	64	52	63	-	60
25.	Classification Inventory (ACB-CI)	92.94	25.63	37	47	60	56	48	45	47	45	44	54	48	42	61	78	51	42	40	43	42	23	46	34	45	57	-

[a] Coefficients below the diagonal are uncorrected; those above are corrected for restriction in range on AFQT.

[b] Decimal points omitted.

REFERENCE

Bayroff, A. G., Seeley, L. C., Anderson, A. A. Development of the Army Qualification Battery, AQB-1. Personnel Research Branch Technical Research Report 1117. October 1959.