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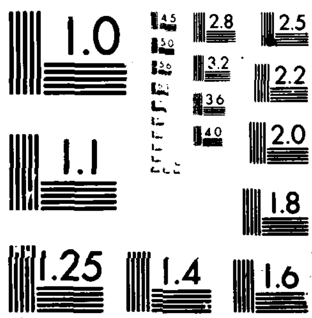
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EVALUATION OF ALTERNATE ASVAB COMPOSITES FOR SELECTED NAVY TECHNICAL SCHOOLS

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The purpose of this study was to determine whether alternate selection test composites from the ASVAB could be used to reduce academic attrition in certain Navy technical schools. Students from schools studied were assigned to a test selection or a hold-out sample. Using multiple regression, the most valid test composites were identified for each school in the test selection sample and validated, along with the current selector composite, in the hold-out sample. Results indicated that using a new

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered) selection composite, 2MK+AR+GS, for BE/E for Aviation Support Equipment Technician would reduce attrition in that school and improve performance in the follow-on ASE "A" school. No other recommendations to change selection composites were made.

FOREWORD

This study was conducted in response to a request from the Naval Military Personnel Command (NMPC) and is part of a continuing program of research aimed at maintaining and improving the use of the Armed Services Vocational Aptitude Battery (ASVAB) for initial assignment of enlisted personnel to Navy technical schools. Specifically, this report examined the possibility of improving ASVAB selection composites for certain technical training courses where high academic attrition rates had been reported.

Appreciation is expressed to PNCS E. R. Adkins (NMPC-4) who coordinated data gathering at the technical schools that were the subject of the study.

RICHARD C. SORENSON
Director of Programs

SUMMARY

Problem

High attrition has been reported in certain Navy technical training courses. For those schools where attrition is characterized as academic, rather than nonacademic, the current ASVAB selector composites may not be the most appropriate.

Objective

The objective of this study was to determine if there were alternate ASVAB selection composites that would reduce attrition in certain schools reporting high academic attrition. The schools were: Air Traffic Controller (AC), Signalman (SM), Basic Submarine (SUB), and Basic Electricity and Electronics for Aviation Support Equipment Technician (BE/E (ASE)).

Approach

Samples from each school were gathered and divided into a test selection sample and a hold-out sample. Attritees were classified by reason for disenrollment and those who attrited for nonacademic reasons were excluded from further study. Using a multiple regression procedure, the most valid test composites were identified for each school in the test selection sample. These new test composites and the current selector composites were then validated in the hold-out sample. Results from the hold-out sample validation were used to compare the current and new composites.

Findings

In two of the schools, SM and SUB, the reported attrition was primarily nonacademic. In AC, which had 21 percent academic attrition, no alternate selection composite was found to be more valid than the current selector, WK+AR, nor was there sufficient evidence to suggest raising the WK+AR cutting score. In BE/E(ASE) an alternate composite, 2MK+AR+GS, was identified that was significantly more valid than the current selector, WK+MC+SI.

Conclusions and Recommendations

1. As a result of relatively low academic attrition in the SM and SUB schools, coupled with the fact that no alternative composite was significantly more valid than the current selection composite, no changes are recommended for these schools.

2. Although the AC school sample did have high academic attrition, no alternate composite improved on the accuracy of the current selector. Therefore, continued use of the current composite is recommended.

3. For the BE/E(ASE) and ASE schools, it is recommended that a new composite, 2MK+AR+GS, be used. This selector composite was significantly more valid than the current selector. If the new composite is used with the recommended cutting score of 210, it should reduce attrition in BE/E(ASE) and improve student performance in the ASE school.

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INTRODUCTION

Problem

High attrition in certain initial Navy technical training courses continues to be a signficant problem for the naval establishment. While it is sometimes difficult to discern the reason for an individual's disenrollment, the causes are usually classified as academic or nonacademic. Nonacademic losses, presumably, are individuals who are disenrolled because of motivational, disciplinary, or medical problems, while academic losses include those who fail because of lack of aptitude, cognitive skills, or other intellectual abilities. Academic attrition has received considerable attention during the past 2 years, in part because of the introduction of the Armed Services Vocational Aptitude Battery (ASVAB) as the Navy's principle cognitive screening device. Problems attendant to the use of this new test battery coupled with the shift to an all-volunteer force appear to have exacerbated the Navy's normal technical training attrition problem. As a result, a number of studies on academic attrition have been undertaken (Swanson, 1978, 1979; Dann, 1978). These studies focused on the development and evaluation of aptitude test composites for assigning enlisted personnel to initial technical training.

Objective

At the request of the Naval Military Personnel Command, a special study was undertaken to investigate reported high academic attrition in the technical schools shown in Table 1. The objective of this research was to determine if there were alternate ASVAB selection composites that would reduce academic attrition in these schools.

Table 1

Schools Included in Study

School	School Abbreviation	Location
1. Air Traffic Controller	AC	Memphis
2. Aviation Support Equipment Technician (Electrical)	ASE	Memphis
3. Basic Electricity and Electronics for ASE	BE/E(ASE)	Memphis
4. Signalman	SM(O)	Orlando
5. Signalman	SM(SD)	San Diego
6. Basic Submarine	SUB	New London

APPROACH

Predictors

The predictors used in this study were the 12 subtests that comprise ASVAB, Forms 6 or 7. These subtests are described briefly in Table 2.

Predictor test scores were obtained from an Enlisted Master Tape Extract maintained by NAVPERSRANDCEN. All ASVAB test scores were reported as Navy Standard Scores, which have a mean of approximately 50 and a standard deviation of about 10 in an unrestricted Navy recruit population.

Criterion

The criterion for all schools except BE/E(ASE) was a final school grade. For BE/E(ASE), a days-in-training measure was used. Performance data were obtained directly from each school. To avoid discarding academic attritees who typically have no meaningful criterion score, they were assigned criterion scores using a procedure devised by Abrahams and Alf (1978). This procedure assumes that criterion scores for failures and graduates, when combined, would be normally distributed and assigns scores to the failures at the appropriate point in the lower end of the criterion distribution.

Sample

The original sample consisted of all recruits (excluding foreign students) who graduated or attrited from the subject schools during 1977. For schools with low enrollment, ASE and BE/E(ASE), the sampling period began in June 1976. USMC students, USN students who were nonacademic disenrollees, and USN students with incomplete ASVAB scores were removed from the sample. Table 3 provides a breakdown of the original sample, the subjects removed, and the final sample used in all subsequent analyses.

The loss of large numbers of subjects from the originial sample calls into question the representativeness of the final sample. Table 4 shows the proportion of academic attrition in (1) the original sample, (2) after removal of USMC and nonacademic disenrollees, and (3) after further removal of USN subjects with incomplete or missing ASVAB scores. In order to assure that subjects with complete data were representative, Fisher's exact probability test was used for each school to determine whether the students with complete and incomplete ASVAB scores differed significantly in their academic attrition rates. These tests showed no significant differences for any school, indicating that the deletion of a relatively large number of subjects with missing ASVAB scores has not significantly altered the proportion of academic drops in the final sample. It therefore seemed reasonable to conclude that the final sample was representative with respect to academic performance.

It should be noted that, in Table 4, only two schools, AC and BE/E(ASE), actually showed high academic attrition in both the original and final sample. Both SM school samples and the SUB school sample had high nonacademic attrition, ranging from 11 to 23 percent.

Data analyses described in the next section were carried out on all school samples, even those with low academic attrition, to see if more valid selection composites could be identified.

Table 2

ASVAB Subtests and Their Content Descriptions

ASVAB Subtest	Abbreviation	Content Description
General Information	GI	Questions about geography, sports, art, first aid, and military history
Numerical Operations	NO	A highly speeded test containing problems of addition, subtraction, multiplication, and division
Attention to Detail	AD	A highly speeded test in which the examinee counts the number of Cs imbedded in two lines of Os
Word Knowledge	WK	Vocabulary items
Arithmetic Reasoning	AR	Arithmetic word problems
Space Perception	SP	Questions requiring the examinee to select one of four flat patterns that could form each three-dimensional figure given as a stimulus
Mathematics Knowledge	MK	Mathematical problems requiring knowledge of algebra, geometry, fractions, decimals, and exponents
Electronics Information	EI	Questions covering knowledge of electrical and electronic components, principles, symbols, and diagrams
Mechanical Comprehension	MC	Questions about drawings illustrating mechanical principles
General Science	GS	Questions about physical and biological science
Shop Information	SI	Questions that measure knowledge of shop practices and the use of tools
Automotive Information	AI	Items that assess knowledge of automobile parts and their operations

(After Dann, 1978).

Table 3

Original and Final Samples with Losses by Category

School	Original Sample	Students Excluded: USMC Students	Students Excluded: USN Students (Nonacademic Losses)	Students Excluded: USN Students (Incomplete ASVABs)	Final Sample
AC	651	112	20	181	338
ASE	321	127	7	53	134
SM(O)	542	0	58	109	375
SM(SD)	317	0	39	71	207
BE/E(ASE)	255	101	10	32	112
SUB	500	0	117	83	300

Table 4

Proportion of Academic Attritees in Original and Final Samples

	Sample 1 (Original Sample)		Sample 2 (W/O USMC and Nonacademic Losses)		Sample 3 (Final Sample--W/O USMC, Nonacademic Losses, and Ss W/Missing Test Scores)	
School	N	Prop. Acad. Attritees	N	Prop. Acad. Attritees	N	Prop. Acad. Attritees
AC	651	.185	519	.198	338	.213
ASE	321	.000	188	.000	134	.000
SM(O)	542	.026	484	.029	375	.032
SM(SD)	317	.060	278	.068	207	.082
BE/E(ASE)	255	.243	146	.294	112	.295
SUB	500	.050	383	.065	300	.067

Data Analyses

The data for each school were analyzed separately. Subjects from each school were randomly divided into a test selection sample and a hold-out sample with approximately 60 percent of each group assigned to the test selection sample. Prior to this random assignment, the groups had been sorted into attritee and graduate groups to ensure that approximately the same proportion of attritees would be present in both samples. Table 5 details the composition of each sample and confirms that attritees are almost equally represented in the test selection and hold-out samples.

Table 5

Proportion of Academic Attritees in Test Selection and Hold-Out Samples

School	Test Selection Sample	Hold-Out Sample
AC	.218	.204
ASE	.000	.000
SM(O)	.042	.014
SM(SD)	.076	.093
BE/E(ASE)	.292	.298
SUB	.057	.085

Note. The proportions of columns 1 and 2 are not significantly different for any school.

The first phase of the analysis utilized the test selection sample to identify the most valid set of predictor tests. An accretion multiple regression procedure was used. In this procedure the single most valid test is entered in the regression equation followed by the test that provides the largest increase in the multiple correlation. When the addition of tests failed to increase the multiple correlation significantly, the accretion process was ended.

One problem encountered in multiple regression procedures is that of restriction in the range of test scores. This arises when the tests being validated were also used to select the students for the school. Since relatively high test scores are required for admission to technical schools, recruits with low scores are not present in these school samples. If low scores are not present, this may reduce the computed validity of the tests used in selection and result in their systematic exclusion from further analysis. To assess this effect, two methods were used when computing the multiple correlation in the test selection sample. Method I made no corrections for restriction in range, while Method II corrected for restriction in range of the subtests before the accretion multiple regression procedure was used (the correction procedure used in Method II is discussed in Appendix A). It was hypothesized that these two methods may result in the selection of different predictors.

The predictor composites identified using these two methods were then cross-validated in the hold-out sample. Unit weights were assigned to each predictor test in the cross validation. This was done because under operational conditions, it has been more convenient to give each test an integer weight, usually of 1. By using such weights a closer estimate of the validity expected under actual operational conditions can be obtained. Validity coefficients obtained for predictor composites in the hold-out sample were corrected for restriction of range using conventional procedures as described in standard statistics texts.[1]

The corrected correlations were then examined to identify the most valid composites.

RESULTS AND DISCUSSION

The first phase multiple regression procedure identified two predictor composites for each school. These are given in Table 6. In most cases the two methods selected similar predictor combinations. In all six schools, at least one subtest is common to each combination. In four of the schools, the first subtest selected by each method was the same.

Table 6

Predictors Selected Using Test Selection Sample

School	Predictors Selected		Current Predictor Composite
	Method I	Method II	
AC	AR+WK	AR+SP	WK+AR
ASE	AI+WK+AR	SI+AI+NO+WK	WK+MC+SI
SM(O)	MK+GI	MK+GI	WK+AR
SM(SD)	NO+MC+SP	NO+SP+MC	WK+AR
BE/E(ASE)	AR+WK	AR+AD+SI	WK+MC+SI
SUB	GI+WK	WK+AR+SI	WK+AR

[1]The correction procedure applied to the validity coefficients obtained in the hold-out sample should not be confused with the Method II correction procedure used with the test selection sample. The correction procedure used with the test selection sample was applied to permit unbiased selection of subtests in the accretion multiple regression process. The correction procedure for the hold-out sample is a means of estimating the magnitude of the correlations for the test combinations in an unrestricted population, i.e., in a typical recruit applicant group. The formula used to correct the hold-out sample correlations is given in Fundamental Statistics in Psychology and Education, Guilford, J. P., New York: McGraw Hill, 1965, pp. 340-345. Case III was used.

The predictor combinations selected, and the current selector composites, were then validated in the hold-out sample. Table 7 lists the correlations obtained in the hold-out sample. These results are discussed below on a school-by-school basis.

Table 7

Validities of Predictor Composites In Hold-Out Sample

School	Method I		Method II		Current Predictor Composite	
	r_u	r_c	r_u	r_c	r_u	r_c
AC	.447	.785	.093	.390	.447	.785
ASE	.227	.421	-.109	.245	.186	.403
SM(O)	.280	.480	.280	.480	.264	.485
SM(SD)	.159	.355	.159	.355	.373	.625
BE/E(ASE)	-.361	-.356	-.033	-.134	-.096	-.184
SUB	.331	.468	.226	.395	.272	.436

Notes.

1. See Table 6 for tests that were selected by each method.
2. All correlations are Pearson product-moment correlations.
3. r_u = uncorrected correlation.
4. r_c = correlation after correction for restriction in range.

AC School

Academic attrition for USN students in the AC school sample was extremely high at 19.8 percent (see Table 4). No new predictor composite, however, yielded better results than the current composite, WK+AR, with a correct validity coefficient of .785.

Because of the high rate of academic attrition in this school, the question of whether raising the cutting score would reduce attrition was addressed. Table B-1, Appendix B, shows academic attrition rates in the AC school sample at various WK+AR cutting scores, and the percent of a typical recruit population expected to obtain scores at or above each score. Using the present cutting score of 105, the school is experiencing about 20 percent academic attrition. Table B-1 shows that approximately 50 percent of the typical recruit population could be expected to qualify for this school by obtaining WK+AR scores of 105 or greater. In the AC school sample used in this study, no appreciable change in attrition is noted until a score level of 112 is reached at which point academic attrition falls to 17.2 percent. Only 36.6 percent of the recruit population, however, is expected to score at or above 112. At a score of 115, attrition is further reduced to 14.6 percent, but only 29 percent of the recruit pool would qualify for the school.

ASE School

In ASE school, a new combination, AI+WK+AR, validated slightly higher than the current selector, WK+MC+SI, .421 and .403 respectively. This difference, .018, is not of any practical significance.

It should be noted that there was no academic attrition in ASE "A" school. The school was included in this study because it is the follow-on school for BE/E(ASE), which has very high attrition. Any change in selection composites would have to be evaluated for impact on performance in both schools. ASE selection composites are discussed below in conjunction with BE/E(ASE) results.

BE/E(ASE) School

This school sample had the highest academic attrition rate of any school in the study, 29.4 percent. The currently used selector composite, WK+MC+SI, correlated -.184 with the days-in-training criterion. (A negative correlation is expected because of the inverse relation between ability, as measured by ASVAB, and the criterion.) A new combination, WK+AR, yielded a correlation of -.356 with the criterion. This is significantly higher than the current selector composite.

Because of the extremely high attrition in this school, some additional analyses were undertaken involving an alternate selector composite, 2MK+AR+GS. This combination was chosen for study because it had been recommended as a BE/E selection composite in Dann's (1978) study, and has been put into limited operational use as a selector in other electrically-oriented ratings. Correlations for 2MK+AR+GS, WK+AR, and WK+MC+SI for BE/E(ASE) and ASE "A" school were computed using the hold-out samples. The results, as shown in Table 8, indicate that either 2MK+AR+GS or WK+AR is considerably more valid than the current selector combination, WK+MC+SI.

Table 8

Corrected Correlations of Alternate Selection Composites
in BE/E(ASE) and ASE Hold-Out Samples

Composites	BE/E(ASE)	ASE
WK+MC+SI	-.184	.403
2MK+AR+GS	-.352	.498
WK+AR	-.356	.553

A question of further interest concerns the extent to which either of these new selector composites would reduce attrition in BE/E(ASE). The reduction expected as a result of using a more valid selector can be estimated using the Taylor-Russell Tables (1939). The tables indicate that approximately 78 percent of the sample would graduate using either of the new composites compared to 70.5 percent with the current selectors. This represents an improvement of about 7.5 percent, or a 25 percent reduction in attrition from 29.5 to 22 percent.

A similar analysis could be carried out in the ASE "A" school where the proportion of students above or below the median final school grade is used as the measure of satisfactory performance. In the current sample, 50 percent of the students in ASE will score, by definition, above the median. Using 2MK+AR+GS, we would expect 54 percent to score above the current median final school grade, and with WK+AR we would predict that 56 percent would obtain final school grades above the current median.

SM(O) and SM(SD) Schools

For these two schools, which had academic attrition rates of 2.9 and 6.8 percent, there was no support for replacement of the current composite, WK+AR. The current composite produced corrected correlations in the hold-out sample of .485 in SM(O) and .625 in SM(SD). These schools did have fairly high nonacademic attrition, 10-12 percent, but nonacademic attrition was not addressed in this study.

SUB School

The SUB school sample showed a high loss rate (see Table 4) but the losses were primarily nonacademic. Academic attrition of only 5 percent was found in the original SUB school sample (N = 500). The current SUB school selection composite, WK+AR, had a corrected validity of .436 in the hold-out sample, while a new combination, GI+WK, had a validity of .468. This difference, .032, is not large enough to warrant changing selector composites, particularly in light of the relatively low academic loss rate in this school.

CONCLUSIONS AND RECOMMENDATIONS

Results of this research indicate that, for SM(O), SM(SD), and SUB schools, academic attrition is not a significant problem. In samples for these schools, no other combination of predictor tests was significantly more valid than that currently in use and no change in selector composites is recommended.

For AC school, which does have high academic attrition, the sample data argue for continued use of the current selector, WK+AR. As seen in Table B-1, Appendix B, a change in cutting score for this school would be of limited value and would reduce significantly the size of the pool of eligible recruits. Consequently, no change in cutting scores is recommended.

For BE/E(ASE) and ASE, two possible approaches are suggested from this study. The first would be to use a two-stage selection procedure in which either 2MK+AR+GS or WK+AR is used as a screen for BE/E(ASE) in addition to the continued use of the current ASE selector, WK+MC+SI. To be selected using this approach, a recruit would need to qualify on the BE/E(ASE) selector and on the ASE selector. If this procedure is used, a relatively low cutting score for the BE/E(ASE) selector would be advisable so that the pool of qualified applicants would not be unnecessarily restricted. A cutting score of 200 for 2MK+AR+GS or 100 for WK+AR should be appropriate (see Table B-3 and B-4, Appendix B). The more stringent cutting score of 156 for WK+MC+SI would continue in use (see Table B-5, Appendix B).

The second approach involves using a single selector, 2MK+AR+GS, for both schools. This method is far less cumbersome to administer than the two-stage procedure described above, and is the recommended approach. Since there were only slight differences in the magnitude of the correlations of 2MK+AR+GS and WK+AR with the school performance criterion measure (see Table 8), the decision to recommend 2MK+AR+GS rather than WK+AR is based on other considerations, namely:

1. Evidence from Dann's (1978) study which indicated that 2MK+AR+GS was a valid predictor of BE/E performance.

2. 2MK+AR+GS is being used successfully to select recruits for other electrical ratings.

3. 2MK+AR+GS is used for selection in far fewer technical schools than WK+AR so there should be less competition for high scoring students.

In terms of an unselected recruit population, a cutting score of 210 for 2MK+AR+GS would be comparable to the 156 which has been used with WK+MC+SI and would ensure that approximately 56 percent of a typical recruit population would continue to qualify for this school (see Tables B-2 and B-3, Appendix B).

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APPENDIX A

CORRECTION PROCEDURE USED IN METHOD II

CORRECTION PROCEDURE USED IN METHOD II

In order to use an accretion multiple regression procedure which will not be biased against subtests that were used to select recruits for school assignments, the correction for restriction must be applied before using the regression procedure. This can be accomplished by:

1. Correcting the sample zero-order correlations using standard correction formulas. (The zero-order correlations are the correlations of each subtest with the criterion.)

2. Correcting the subtest intercorrelations by using intercorrelations from the U.S. Navy ASVAB standardization sample. This sample can be considered an unselected or unrestricted sample.

3. Correcting the subtest standard deviations by using the standard deviations from the ASVAB standardization sample.

Using the above procedure, a corrected correlation matrix was constructed and used in the accretion multiple regression procedure to identify the most valid tests in the test selection sample.

APPENDIX B

DISTRIBUTIONS OF COMPOSITE SCORES

Table B-1

Distribution of WK+AR Scores for AC School Sample (N = 338)

Score (WK+AR)	Distributions: Graduates N	Graduates Cum N	Academic Attritees N	Academic Attritees Cum N.	Total N	Total Cum N	Attrition Rate in Sample at Various Cutting Scores (%)	% at or Above Cut Score in Recruit Population
95	1	1	0	0	1	1	21.0	84
96	0	1	1	1	1	2	21.1	82
97	1	2	0	1	1	3	20.8	81
98	0	2	0	1	0	3	20.8	78
99	0	2	0	1	0	3	20.8	76
100	0	2	0	1	0	3	20.8	73
101	0	2	0	1	0	3	20.8	70
102	0	2	0	1	0	3	20.8	67
103	0	2	1	2	1	4	20.9	65
104	1	3	3	5	4	8	20.7	61
105	4	7	2	7	6	14	20.0	50
106	2	9	0	7	2	16	19.8	55
107	2	11	0	7	2	18	19.9	51
108	2	13	0	7	2	20	20.0	48
109	4	17	1	8	5	25	20.1	45
110	10	27	7	15	17	42	20.1	42
111	14	41	9	24	23	65	19.9	39
112	9	50	3	27	12	77	17.2	36
113	11	61	6	33	17	94	16.9	33
114	19	80	6	39	25	119	15.6	31
115	13	93	5	44	18	137	14.6	29
116	16	109	5	49	21	158	13.4	26
117	14	123	5	54	19	177	12.2	24
118	15	138	4	58	19	196	10.6	22
119	4	142	0	58	4	200	9.2	20
120	15	157	4	62	19	219	9.4	18
121	6	163	3	65	9	228	7.6	17
122	12	175	0	65	12	240	5.5	15
123	17	192	2	67	19	259	6.1	13
124	8	200	1	68	9	268	5.1	11
125	11	211	0	68	11	279	4.3	10
126	5	216	1	69	6	285	5.1	
127	12	228	1	70	13	298	3.8	
128	3	231	1	71	4	302	2.5	
129	13	244	0	71	13	315	0.0	
130	9	253	0	71	9	324		
131	0	253	0	71	0	324		
132	1	254	0	71	1	325		
133	6	260	0	71	6	331		
134	2	262	0	71	2	333		
135	2	264	0	71	2	335		
136	1	265	0	71	1	336		
137	2	267	0	71	2	338		

Table B-2

Distribution of WK+MC+SI Scores for BE/E(ASE)

	Distributions							
	Graduates		Academic Attritees		Total			
Score (WK+MC+SI)	N	Cum N	N	Cum N	N	Cum N	Attrition Rate in Sample at Various Cutting Scores (%)	% at or Above Cut Score in Recruit Population
126	0	0	1	1	1	1	29.9	
128	1	1	1	2	2	3	29.2	
130	0	1	0	2	0	3	29.2	
132	0	1	0	2	0	3	29.2	
134	0	1	0	2	0	3	29.2	
136	0	1	0	2	0	3	29.2	90
138	0	1	0	2	0	3	29.2	88
140	0	1	1	3	1	4	28.8	85
142	0	1	0	3	0	4	28.8	82
144	0	1	0	3	0	4	28.8	79
146	1	2	0	3	1	5	28.2	75
148	0	1	1	4	1	6	28.4	72
150	0	2	0	4	0	6	28.4	68
151	0	2	1	5	1	7	27.7	66
152	0	2	0	5	0	7	27.7	64
153	0	2	0	5	0	7	27.7	62
154	0	2	0	5	0	7	27.7	60
155	0	2	0	5	0	7	27.7	58
156	2	4	0	5	2	9	27.0	56
157	4	8	2	7	6	15	27.6	53
158	7	15	5	12	12	27	27.2	51
159	3	18	0	12	3	30	25.0	49
160	4	22	1	13	5	35	26.0	47
161	2	24	3	16	5	40	26.4	45
162	2	26	3	19	5	45	23.9	43
163	3	29	3	22	6	51	21.0	41
164	2	31	2	24	4	55	17.9	39
165	1	32	0	24	1	56	15.4	37
166	3	35	1	25	4	60	15.7	34
167	2	37	0	25	2	62	14.9	33
168	3	40	1	26	4	66	15.6	30
169	2	42	0	26	2	68	14.6	29
170	3	45	0	26	3	71	15.4	29
171	1	46	0	26	1	72	16.7	25
172	4	50	1	27	5	77	17.1	23
173	1	51	0	27	1	78	16.7	22
174	5	56	0	27	5	83	17.2	20
176	5	61	1	28	6	89	20.8	17
178	1	62	0	28	1	90	22.2	15
180	0	62	0	28	0	90	23.5	12
182	3	65	0	28	3	93	23.5	10
184	1	66	0	28	1	94	28.6	
186	1	67	1	29	2	96	30.8	
188	0	67	1	30	1	97	27.3	
190	2	69	0	30	2	99	20.0	
192	2	71	1	31	3	102	25.0	
194	2	73	1	32	3	105	20.0	
196	1	74	0	32	1	106	0.0	
198	1	75	0	32	1	107		

Table B-3

Distribution of 2MK+AR+GS Scores for BE/E(ASE)

	Distributions							
	Graduates		Academic Attritees		Total			
Score (2MK+AR+GS)	N	Cum N	N	Cum N	N	Cum N	Attrition Rate in Sample at Various Cutting Scores (%)	% at or Above Cut Score in Recruit Population
160	1	1	2	2	3	3	29.5	
165	0	1	0	2	0	3	29.5	
170	0	1	1	3	1	4	28.4	
175	0	1	1	4	1	5	27.7	91
180	0	1	1	5	1	6	27.0	88
182	0	1	0	5	0	6	26.3	87
184	1	2	0	5	1	7	25.5	85
186	0	2	0	5	0	7	25.5	84
188	0	2	1	6	1	8	26.5	82
190	1	3	2	8	3	11	25.8	81
192	1	4	0	8	1	12	24.5	79
194	0	4	2	10	2	14	24.7	76
196	2	6	1	11	3	17	32.1	74
198	1	7	3	14	4	21	22.7	72
199	0	7	1	15	1	22	20.2	71
200	0	7	1	16	1	23	19.3	69
201	2	9	1	17	3	26	18.3	69
202	1	10	1	18	2	28	17.7	67
203	1	11	2	20	3	31	16.9	66
204	2	13	0	20	2	33	14.9	64
205	0	13	1	21	1	34	15.3	63
206	0	13	0	21	0	34	15.3	62
207	1	14	0	21	1	35	14.1	61
208	0	14	1	22	1	36	14.3	59
209	0	14	0	22	0	36	14.3	58
210	1	15	1	23	2	38	13.0	56
211	0	15	2	25	2	40	11.9	55
211	0	15	2	25	2	40	11.9	55
212	1	16	0	25	1	41	9.2	53
213	1	17	2	27	3	44	9.4	52
214	2	19	0	27	2	46	6.6	50
215	1	20	0	27	1	47	6.8	50
216	1	21	0	27	1	48	6.9	47
217	2	23	0	27	2	50	7.0	47
219	3	26	0	27	3	53	7.3	44
220	2	28	1	28	3	56	7.7	42
221	3	31	0	28	3	59	6.1	41
222	2	33	0	28	2	61	6.5	39
223	0	33	0	28	0	61	6.5	38
224	2	35	0	28	2	63	6.8	36
226	2	37	0	28	2	65	7.1	33
228	2	39	0	28	2	67	7.5	31
230	1	40	0	28	1	68	7.9	28
232	4	44	1	29	5	73	8.1	26
234	2	46	1	30	3	76	6.3	24
236	4	50	0	30	4	80	3.4	22
238	5	55	0	30	5	85	4.0	20
240	4	59	0	30	4	89	5.0	18
245	6	65	1	31	7	96	6.3	14
250	4	69	0	31	4	100	0.0	11
255	1	70	0	31	1	101		8
260	3	73	0	31	3	104		
265	1	74	0	31	1	105		

Table B-4

Distribution of WK+AR Scores for BE/E(ASE)

	Distributions							
	Graduates		Academic Attritees		Total			
Score (WK+AR)	N	Cum N	N	Cum N	N	Cum N	Attrition Rate in Sample at Various Cutting Scores (%)	% at or Above Cut Score in Recruit Population
79	0	0	1	1	1	1	29.6	
80	0	0	0	1	0	1	29.6	
81	0	0	0	1	0	1	29.6	
82	0	0	1	2	1	2	29.0	
83	0	0	0	2	0	2	29.0	
84	0	0	0	2	0	2	29.0	
85	1	1	0	2	1	3	28.3	
86	0	1	2	4	2	5	28.6	
87	0	1	0	4	0	5	28.6	
88	0	1	0	4	0	5	28.6	
89	0	1	1	5	1	6	27.2	
90	0	1	0	5	0	6	27.2	
91	0	1	6	5	0	6	27.2	91
92	0	1	1	6	1	7	26.5	89
93	0	1	2	8	2	9	25.7	88
94	0	1	0	8	0	9	25.7	86
95	0	1	1	9	1	10	24.2	84
96	1	2	0	9	1	11	23.5	82
97	1	3	1	10	2	13	23.7	81
98	2	5	1	11	3	16	23.2	78
99	5	10	1	12	6	22	22.8	76
100	0	10	1	13	1	23	23.3	73
101	0	10	1	14	1	24	22.4	70
102	1	11	0	14	1	25	21.4	67
103	1	12	1	15	2	27	21.7	65
104	2	14	0	15	2	29	21.0	61
105	2	16	1	16	3	32	21.5	58
106	1	17	3	19	4	36	21.1	55
107	3	20	2	21	5	41	18.1	51
108	3	23	4	25	7	48	16.4	48
109	4	27	1	26	5	53	11.7	45
110	2	29	1	27	3	56	10.9	42
111	2	31	0	27	2	58	9.6	39
112	1	32	1	28	2	60	10.0	36
113	2	34	1	29	3	63	8.3	33
114	4	38	1	30	5	68	6.7	31
115	3	41	0	30	3	71	5.0	29
116	3	44	0	30	3	74	5.4	26
117	2	46	0	30	2	76	5.9	24
118	1	47	1	31	2	78	5.6	22
119	1	48	1	32	2	80	3.3	20
120	4	52	0	32	4	84	0.0	18
121	1	53	0	32	1	85		17
122	1	54	0	32	1	86		15
123	2	56	0	32	2	88		13
124	3	59	0	32	3	91		11
125	5	64	0	32	5	96		10
126	0	64	0	3.	0	96		
127	4	68	0	32	4	100		
128	1	69	0	32	1	101		
129	2	71	0	32	2	103		
130	0	71	0	32	0	103		
131	1	72	0	32	1	104		
132	4	76	0	32	4	108		

Table B-5

Distribution of Scores in ASE "A" School on Three Selection Composites

Score (WK+MC+SI)	N	Cum N	% at or Above Cut Score[a]	Score (WK+AR)	N	Cum N	% at or Above Cut Score	Score (2MK+AR+GS)	N	Cum N	% at or Above Cut Score
110	1	1		85	1	1		<194	9	9	76
120	1	2		90	0	1	90	196	2	11	74
130	1	3		92	1	2	89	198	1	12	72
135	0	3	91	94	0	2	86	199	0	12	71
140	2	5	85	96	3	5	82	200	0	12	69
145	1	6	80	98	6	11	78	201	3	15	69
150	1	7	68	100	0	11	73	202	3	18	67
151	1	8	66	101	0	1	70	203	0	18	66
152	1	9	64	102	3	14	67	204	2	20	64
153	0	9	62	103	2	16	65	205	0	20	63
154	0	9	60	104	2	18	61	206	0	20	62
155	5	14	58	105	4	22	58	207	1	21	61
156	3	17	56	106	3	25	55	208	0	21	59
157	5	22	53	107	5	30	51	209	0	21	58
158	9	31	51	108	11	41	48	210	3	24	56
159	1	32	49	109	9	50	45	211	1	25	55
160	5	37	47	110	6	56	42	212	1	26	53
161	3	40	45	111	7	63	39	213	3	29	52
162	6	46	43	112	2	65	36	214	3	32	50
163	2	48	41	113	5	70	33	215	2	34	50
164	3	51	39	114	9	79	31	216	2	36	47
165	1	52	37	115	5	84	29	217	2	38	47
166	3	55	34	116	4	88	26	218	2	40	45
167	3	58	29	117	2	90	24	219	6	46	44
168	6	64	30	118	3	93	22	220	3	49	42
169	7	71	29	119	1	94	20	221	6	55	41
170	4	75	27	120	4	98	18	222	1	56	39
171	4	79	25	121	1	99	17	223	2	58	38
172	4	83	23	122	3	102	15	224	4	62	36
173	1	84	22	123	3	105	13	226	7	69	33
174	3	87	20	124	5	110	11	228	7	76	31
175	3	90	19	125	6	116	10	230	1	77	28
176	5	95	17	126	0	116		232	6	83	26
177	5	100	16	127	6	122		234	7	90	24
178	1	101	15	128	1	123		236	3	93	22
179	1	102	13	129	4	127		238	7	100	20
180	3	105	12	130	1	128		240	5	105	18
182	8	113	11	132	2	130		245	7	112	14
184	3	116	10	134	1	131		250	6	118	11
186	1	118		135				255	3	121	8
>188	12	130						260	5	126	
								265	2	128	

Note. There were no academic attritees in this school sample.

[a] In an unrestricted recruit population.

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