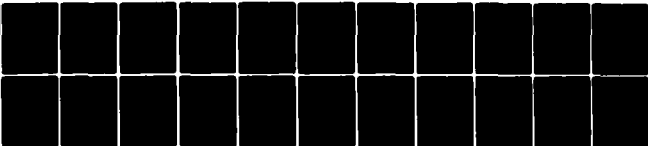


AD-A118 484 NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER SAN D--ETC F/G 5/9
VALIDATION OF NAVAL ACADEMY SELECTION PROCEDURES FOR FEMALE MID--ETC(U)
JUL 82 I NEUMANN, N M ABRAHAMS
UNCLASSIFIED NPRDC-TR-82-54 NL

[OF]
AD A
118484



END
DATE
FILMED
110-82
DTIC

AD A513484

NO. 102

UNITED STATES GOVERNMENT
FEDERAL BUREAU OF INVESTIGATION

APPROVED FOR PUBLIC RELEASE
DISTRIBUTION UNLIMITED



DTIC
ELECTE
AUG 23 1982
S D

**VALIDATION OF NAVAL ACADEMY SELECTION PROCEDURES
FOR FEMALE MIDSHIPMEN**

Idell Neumann
Norman M. Abrahams

Reviewed by
Martin F. Wiskoff

Accession For	
NTIS GPO	☒
DTIC TAB	☐
Unannounced	☐
Justification	☐
By _____	
Distribution/	
Availability Codes	
Avail and/or	
Dist	Special
9	



Released by
James F. Kelly, Jr.
Commanding Officer

Navy Personnel Research and Development Center
San Diego, California 92152

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER NPRDC TR 82-54	2. GOVT ACCESSION NO. AD-A118 484	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) VALIDATION OF NAVAL ACADEMY SELECTION PROCEDURES FOR FEMALE MIDSHIPMEN		5. TYPE OF REPORT & PERIOD COVERED Final FY80-81
		6. PERFORMING ORG. REPORT NUMBER 12-82-6
7. AUTHOR(s) Idell Neumann Norman M. Abrahams		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Navy Personnel Research and Development Center San Diego, California 92152		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 62763N ZF-63-521-001
11. CONTROLLING OFFICE NAME AND ADDRESS Navy Personnel Research and Development Center San Diego, California 92152		12. REPORT DATE July 1982
		13. NUMBER OF PAGES 29
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Selection Prediction USNA (United States Naval Academy) Female midshipmen Interest measurement Voluntary resignation		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Current U.S. Naval Academy selection procedures were developed for the exclusively male population that existed there before July 1976. This research was initiated to assess the appropriateness of these procedures for female midshipmen and to revise the procedures if the system was found ineffective. Male and female midshipmen in the classes of 1980 through 1983 were compared to determine whether differences existed in mean predictor and performance scores and to assess the validity of predictors. The high voluntary registration rate for females, which was ineffectively predicted, led to the		

DD FORM 1473
1 JAN 73EDITION OF 1 NOV 69 IS OBSOLETE
S/N 0102-LF-014-6601

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

construction and validation of an interest inventory disenrollment scale that would better identify female midshipmen who would resign from the Naval Academy. Two experimental scales were constructed that were considerably more effective than the operational disenrollment scale. However, these scales were negatively related to academic and military performance.

S/N 0102- LF- 014- 6601

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

FOREWORD

This effort was conducted in support of the Women's Research and Development program under task area ZF63-521-001 (Selection Tests for Women Officers). Its purpose was to evaluate the United States Naval Academy selection system for female midshipmen and to revise areas where deficiencies in predictive efficiency were identified. Results are intended primarily for use by the Naval Academy.

The assistance of the Naval Academy throughout all phases is gratefully acknowledged. The support and cooperation of Dean Robert W. McNitt and his staff were essential for the successful completion of this work. Mr. Gene Hillman, Naval Academy Statistical Evaluation Officer, was particularly helpful in expediting collection of the data used in this investigation.

JAMES F. KELLY, JR.
Commanding Officer

JAMES J. REGAN
Technical Director

SUMMARY

Problem

The current United States Naval Academy (USNA) selection system, developed for the exclusively male population that existed before July 1976, may not be appropriate for selecting women. If not, alternative procedures should be investigated to ensure selection of successful female midshipmen. Because relatively large samples are needed to ensure the stability of results, evaluation of the effectiveness of the selection system for females has not been possible until recently.

Objectives

The objectives of the effort reported here were to evaluate the current USNA selection procedures for female midshipmen and, if results indicated that these procedures were less valid for females than for males, to attempt to develop and validate new or improved measures.

Approach

Male and female midshipmen who entered the Naval Academy between 1976 and 1979 (the classes of 1980 through 1983) were compared to determine whether differences existed in mean predictor and performance scores, and to assess the validity of individual predictors as well as the candidate multiple (the weighted composite of predictors). After identifying the main area of concern, the higher voluntary resignation rate for females, attempts were made to construct and validate a Strong-Campbell Interest Inventory (SCII) women's scale to aid in identifying women who would be less likely to resign from the program. Two experimental SCII scales, KYW and KYWR, were constructed and validated on the female midshipmen in the combined classes of 1981 through 1983. These scales were evaluated in the context of the entire prediction system to determine their effect on other measures, such as academic and military performance. A content analysis was performed on the SCII item responses that discriminated between women who remained in USNA and those who resigned.

Results

For female midshipmen in the combined classes of 1980 to 1983, the validities of relevant selection variables in predicting academic and military performance and choice of major were acceptable. However, the validities for predicting voluntary and involuntary disenrollment of females were not acceptable.

The voluntary resignation rate during the plebe year was considerably higher for females than for males. For predicting female voluntary resignation, the validities of the KYW and KYWR scales were higher than those of the operational disenrollment scale. Although both experimental scales were superior in predicting voluntary resignation, they were significantly and negatively related to academic and military performance.

Content analysis performed on the discriminating SCII item responses revealed three clusters of interest items that were more frequently endorsed by women who remained in USNA than by those who resigned: (1) items related to mechanical interest, (2) items related to athletic interest, and (3) items that are characteristically of interest to a "realistic" personality type.

Conclusions

1. The present method of predicting USNA plebe-year academic performance, military performance, and choice of major is effective for female midshipmen.
2. The present method of predicting plebe-year voluntary and involuntary disenrollment is ineffective for women.
3. Differences between scores for men and women in academic and military performance are minimal. However, there is a large difference between the percentages of males and females who choose technical majors.
4. The voluntary resignation rate during the plebe year is considerably higher for females than for males.
5. Although the two experimental scales constructed and validated on the combined classes of 1981 and 1983 predict voluntary resignation for women better than does the presently used disenrollment scale, they relate negatively to academic and military performance.

Recommendations

1. The present USNA admissions system should continue to be used for selecting female midshipmen until more valid measures are identified.
2. Efforts to improve the prediction of voluntary resignation for females should continue, using larger samples.
3. When sufficient numbers of female midshipmen have completed their education, validation of the USNA selection procedures should be repeated using 4-year criteria instead of plebe-year criteria.
4. The use of a background questionnaire, being developed at NAVPERSRANDCEN as a potential selection measure, should be investigated as a possible approach to the problem of reducing resignation of female midshipmen.

CONTENTS

	Page
INTRODUCTION	1
Problem and Background	1
Objectives	1
APPROACH	1
Sample	1
Predictors	2
Criteria	3
Samples and Analyses	4
Scale Construction	4
Scale Evaluation and Content Analysis	4
RESULTS AND DISCUSSION	5
Male-Female Differences	5
In Criterion Validity	5
In Mean Predictor Scores	6
In Mean Performance Scores	6
Scale Evaluation	7
Content Analysis	11
CONCLUSIONS	11
RECOMMENDATIONS	12
REFERENCES	13
APPENDIX--VALIDITY OF SELECTION VARIABLES BY SEX AND CLASS	A-0
DISTRIBUTION LIST	

LIST OF TABLES

	Page
1. Male and Female Midshipmen by USNA Class	2
2. Plebe-year Validity of Selection Variables for Combined Classes of 1980-1983	5
3. Plebe-year Mean Performance Scores for Combined Classes of 1980-1983	7
4. Means, Standard Deviations, and Validity Coefficients of Disenrollment Scales for the Cross-validation Sample	8
5. Validities of Disenrollment Scales and Selection Composites with Four Performance Criteria in the Cross-validation Sample	9
6. Mean Criterion Scores by Candidate Multiple (CM) and KYWR Scale for the Cross-validation Sample	10

INTRODUCTION

Problem and Background

In July 1976, a 131-year-old tradition was broken at the United States Naval Academy (USNA). No longer would classes be composed exclusively of male officer candidates in training. By order of Congress, 81 women were admitted to the class of 1980. In June 1980, this class completed 4 years of training at the Naval Academy and 55 women were commissioned as officers. By then, four sexually integrated classes, including a total of 357 women, had been admitted to the Naval Academy.

Before 1976, validation of all USNA selection procedures was necessarily limited to males. Because validity data were not available for females when they were first admitted, the same selection procedures had to be used for both sexes.

When, at the request of USNA, the Navy Personnel Research and Development Center (NAVPERSRANDCEN) examined performance and validity data for the initial class of female midshipmen, it became apparent that the selection measures were not as effective for females as they were for males. It was further noted that the resignation rate was considerably higher for females than for males by the end of their final year (30 vs. 15%). These results suggested that selection procedures might have to be modified to improve their effectiveness for female midshipmen. However, because of the possible instability of results obtained with the relatively small number of women enrolled in the class of 1980, thorough evaluation of existing selection procedures was not possible until several more classes had been admitted and evaluated. Furthermore, the development and validation of new measures or composites requires large samples before changes can be recommended with confidence. By June 1980, enough women had been admitted to USNA to form an experimental sample for validation study.

Objectives

The objectives of this effort were to evaluate the present USNA selection procedures on female midshipmen and, if results indicated that these procedures were less valid for females than for males, to attempt to develop and validate new or improved measures.

APPROACH

Sample

The sample used in this research included all the midshipmen--male and female--who entered USNA between 1976 and 1979--the classes of 1980 through 1983 (see Table 1). For all midshipmen, selection score data were obtained at the time they applied. Performance score data, representing their standing on relevant measures, were obtained at the end of their plebe year (1st year of attendance).

Table 1
Male and Female Midshipmen by USNA Class

Class	Females	Males
1980	81	1200
1981	90	1237
1982	96	1267
1983	90	1313
Total	357	5017

Predictors

The following predictor scores were available for sample members.

1. Verbal aptitude (SAT-V). This score, which ranges from 200 to 800 (mean = 500, standard deviation (SD) = 100), represents verbal aptitude as measured in the two national competitive testing programs designed for college admissions and scholarship awards--the Scholastic Aptitude Test (SAT) administered by the Educational Testing Service and the American College Testing (ACT) program.

2. Math aptitude (SAT-M). This score, which is parallel to the SAT-V, represents the candidate's quantitative aptitude.

3. Rank in class (R/C). This is a standardized score that ranges from 200 to 800 (mean = 500, SD = 100) and is based on high school academic rank.

4. Recommendations (RECS). This score, based on school officials' ratings, is designed to estimate potential for success at USNA. High school English and math teachers are asked to evaluate the candidates' interpersonal relations, personal conduct, and participation in extracurricular activities. The scores derived from these evaluations range from 0 to 999.

5. Extracurricular activities (ECA). Each USNA applicant is asked to complete the candidate activities record (CAR), an extensive form that provides comprehensive information on participation in high school extracurricular activities. This information is used to generate an ECA score that ranges from 200 to 800.

6. Strong-Campbell Interest Inventory (SCII). In support of a research program conducted by NAVPERSRANDCEN to investigate the use of interest inventories for USNA selection, the Strong Vocational Interest Blank for Men (SVIB) was administered to entering classes and applicant populations from 1967 through 1976. In 1974, the Stanford University Press introduced the Strong-Campbell Interest Inventory (SCII), a 325-item form that merged the SVIB forms designed for men and for women. Since 1977, USNA has administered the SCII to all applicants and used results to compute scores on the following two scales:

a. Disenrollment scale (DISR). This scale has two components--motivational and academic. SCII item responses that discriminate between midshipmen who resign voluntarily and those who remain in the program make up the motivational component; and responses that differentiate between midshipmen who disenroll for academic reasons and those who remain, the academic component. The item responses from the two components are combined into a single scale, calibrated on data from an earlier class to produce a score with a mean of 500 and an SD of 100.

b. Engineering-science scale (E-S). The engineering-science (E-S) scale was constructed by NAVPERSRANDCEN and has been used at the Naval Academy since 1974 to identify applicants who are likely to choose an engineering or science major (Neumann & Abrahams, 1974). Like the DISR, the E-S scale was normed on a previous class to produce a score with a mean of 500 and an SD of 100.

7. Candidate multiple (CM). The candidate multiple is a weighted composite based on the preceding seven predictors (Neumann & Abrahams, 1976). The empirically derived weights, first used to select the class of 1980, are monitored annually and adjusted as necessary to maintain performance of future classes.

Criteria

As noted previously, sufficient sample sizes are needed to ensure stability of results. Although using data from the class of 1983 increased the number of subjects available, it restricted the analyses to plebe-year (first-year) criteria for all four classes. The academic performance measure is relatively stable across the 4 years, but measures on other performance criteria, particularly resignation, are not. The following performance criteria were used to evaluate predictor validities:

1. Academic quality point ratio (AQPR). The AQPR used in this research is the cumulative grade-point average earned by each midshipman at the end of the plebe year. For example, for midshipmen enrolled in the class of 1981, the June 1978 AQPR would represent the cumulative grade-point average earned at the end of the first year. If a midshipman in this class disenrolled before June 1978, the last available AQPR was used.

2. Military quality point ratio (MQPR). The MQPR is assigned to each midshipman at the end of every semester by the company officer. It is computed from the ratings made by the squadron leader, the platoon leader, peers, and upperclassmen on the midshipman's attitudes, leadership, potential as an officer, bearing, and dress. A cumulative MQPR is computed for each midshipman, using all the semester grades assigned.

3. Choice of major (MAJOR). A dichotomous criterion was established to represent a midshipman's choice of major. Everyone selecting an engineering or science major was considered in a single group, referred to as an E-S major and assigned a score of one, while everyone selecting a humanities or social science major was designated as an "other" major and assigned a zero score.¹

4. Voluntary resignation (VR). Midshipmen are permitted to withdraw voluntarily from USNA only during the first 2 years. There are a number of reasons for voluntary resignation, such as personal or family problems, disenchantment with a Navy career, or

¹See Neumann and Abrahams (1974) for a more detailed description of the majors included in both categories.

poorer performance than a midshipman is willing to tolerate. Typically, 15 percent of a class resigns voluntarily during the first 2 years.

5. All disenrollment (ADS). All disenrollment includes midshipmen disenrolled for any reason except medical discharge. In the past few classes, 26 to 28 percent of each class has disenrolled, either voluntarily or involuntarily, during the 4-year program.

Samples and Analyses

The male midshipmen in the sample (N = 5017) were compared to the female midshipmen (N = 357) in terms of zero-order validities and mean predictor and performance scores using plebe-year criteria.

To develop experimental disenrollment scales for women, SCII responses for 271 of the 276 women admitted to the classes of 1981 through 1983 were used (responses for five women were eliminated because of their reasons for disenrollment). Since women admitted to the class of 1980 had completed the SVIB instead of the SCII, their responses were not included in the experimental scales. The 271 women were classified into (1) a high-criterion group (N = 199), consisting of the women who remained at USNA in June 1980, and (2) a low-criterion group (N = 72), consisting of the women who had voluntarily resigned from USNA by June 1980. High- and low-criterion group members were then randomly assigned to a scale-construction sample (N = 145; 106 high and 39 low) and a cross-validation sample (N = 126; 93 high and 33 low).

Scale Construction

Because of the high voluntary resignation rate of female midshipmen and the inability of present selection procedures to predict such resignations, an attempt was made to develop a new measure to identify female voluntary losses. Such a measure, if successful, would have a high potential payoff. To develop this measure, the SCII item responses made by members of the scale-construction sample (N = 145) were examined to identify the items that best differentiated between the women who remained at USNA (high-criterion group; N = 106) and those who had voluntarily resigned (low-criterion group; N = 39). The 75 item responses that best differentiated the two groups (minimum difference = 14.3%) were then unit-weighted and combined into an experimental disenrollment scale for women, hereafter referred to as the KYW scale. An additional scale, referred to as the KYWR scale, was developed by removing the item responses that exhibited large differences between male and female midshipmen from the KYW scale. The purpose of constructing the KYWR scale was to increase the possibility that the experimental scale, if useful for females, might also be useful for males.

Scale Evaluation and Content Analysis

All the women in the cross-validation sample (N = 126) were scored on the two experimental scales, KYW and KYWR, and scores were correlated with the voluntary resignation (VR) criterion to obtain an estimate of their validity. Correlation coefficients were then compared with those showing the validity of the present disenrollment scale (DISR) to determine whether the new scales better identified women who would choose to complete the USNA program. The experimental scales were then examined in combination with the other predictors to assess their ability to predict the remaining performance measures.

To better understand the differences between female midshipmen who remained with the program and those who resigned, a content analysis was performed on the discriminating SCII item responses.

RESULTS AND DISCUSSION

Male-Female Differences

In Criterion Validity

The zero-order criterion validities calculated for the predictors used to select the male and female midshipmen in the combined classes of 1980 through 1983 are presented in Table 2 and discussed below. (See appendix for separate information for each class.)

Table 2
Plebe-year Validity of Selection Variables
for Combined Classes of 1980-1983

Predictor Variable	Sex	N	Mean	SD	Criterion Validities				
					AQPR ^a	MQPR ^a	MAJOR ^b	VR ^c	ADS ^c
SAT-V	M	5013	517	72	.32	.20	-.21	.04	.09
	F	357	604	69	.33	.22	-.16	-.09	-.04
SAT-M	M	5013	663	67	.41	.19	.18	.03	.09
	F	357	657	64	.37	.16	.32	-.16	-.14
R/C	M	5017	572	107	.46	.28	.08	-.01	.07
	F	357	649	99	.44	.20	-.02	-.15	-.13
RECS	M	5003	846	116	.08	.11	.04	.05	.06
	F	357	871	94	-.13	.00	.07	.08	.07
ECA	M	4999	522	70	-.04	.05	-.09	.08	.06
	F	357	516	78	.01	.07	-.07	.00	.01
DISR	M	4969	534	83	.00	.03	.06	.07	.07
	F	355	528	75	-.12	-.05	.01	.09	.03
E-S	M	4970	529	74	.12	.05	.39	.06	.06
	F	355	524	64	.09	.03	.48	.18	.13
CM	M	4990	62770	4250	.51	.29	.17	.06	.13
	F	357	64393	3597	.43	.23	.24	-.10	-.10

^aPearson $r = .08$ (males), $.14$ (females); $p < .01$.

^bBiserial $r = .12$ (males), $.18$ (females); $p < .01$.

^cBiserial $r = .14$ (males), $.21$ (females); $p < .01$.

1. Academic quality point ratio (AQPR). As shown in Table 2, the prediction of AQPR by SAT-V, SAT-M, and R/C is adequate for both male and female midshipmen (ranging from an r of .32 to .46). CM is also very predictive of AQPR ($r = .51$ and .43 for males and females respectively). The remaining variables tend to be negatively related or unrelated to AQPR, except for the E-S scale, the validity of which is low but positive for both sexes.

2. Military quality point ratio (MQPR). Results obtained in the prediction of MQPR are generally lower but similar in pattern to those obtained for AQPR.

3. Choice of major (MAJOR). E-S and SAT-M are the most valid predictors of MAJOR, regardless of sex, with larger validities in each instance for the females. It is interesting to note that E-S is highly predictive of MAJOR for females ($r = .48$), even though no females were involved in its development. CM is somewhat less effective but still adequate for predicting MAJOR for both male and female midshipmen.

4. Voluntary resignation (VR). In previous NAVPERSRANDCEN research, voluntary resignation has always been the most difficult criterion to predict. The academic predictors (SAT-V, SAT-M, and R/C) correlate essentially zero with VR for males and are negatively related for females. The biserial correlations of the remaining predictors vary between .05 and .08 for males and .00 to .18 for females. Since the academic predictors tend to be negatively related to VR and since they receive approximately 60 percent of the weighting in the composite multiple, it is not surprising that the validity of CM is low.

5. All disenrollment (ADS). None of the selection variables is separately predictive of ADS, either for males or for females. However, when combined into CM, their validity is significant at the .05 level for males and thus somewhat effective. However, as with VR, a biserial ADS correlation of -.10 for the females reiterates the most pressing problem identified in this investigation: Although the separate predictors and CM are acceptable in identifying women likely to perform successfully with respect to academic and military performance and choice of major, the system is not acceptable in identifying women likely to complete the USNA program.

In Mean Predictor Scores

An effort was made to identify differences in the selection system that might contribute to an understanding of the differential validity displayed in Table 2. As shown, differences are minimal in male and female means for all predictor variables except SAT-V, R/C, and CM. For these variables, the mean score for females is significantly higher than for males---.5, almost .75, and .4 standard deviation units for SAT-V, R/C, and CM respectively.

In Mean Performance Scores

Table 3, which presents mean performance scores, shows that differences between the sexes in academic and military performance, as measured by AQPR and MQPR, are minimal. However, there is a large difference in the choice of major (MAJOR): Eighty-two percent of the males in the sample selected a technical major, compared to only 66 percent of the females. Finally, the VR and ADS rates are much lower for males than for females: 9 vs. 16 percent for VR and 11 vs. 17 percent for ADS. This high resignation rate for women directed attention to the need for improving female selection procedures. When the VR and ADS rates for women are compared (16 vs. 17%), it is obvious that the majority of women who leave USNA do so voluntarily.

Table 3
Plebe-year Mean Performance Scores for
Combined Classes of 1980-1983

Criterion	Males (N = 5017)		Females (N = 357)	
	Mean	SD	Mean	SD
AQPR	2.65	.56	2.58	.58
MQPR	3.03	.53	3.04	.70
MAJOR	0.82	.39	0.66	.48
VR	0.09	.27	0.16	.36
ADS	0.11	.31	0.17	.38

Scale Evaluation

Because the disenrollment scale (DISR) was developed and adopted when there were only males at USNA and because the female resignation rate was most in need of improved prediction, efforts were focused on developing a measure to identify more efficiently the female midshipmen likely to disenroll. Table 4 presents the means, SDs, and validity coefficients of the two experimental scales--KYW and KYWR--for the cross-validation sample. The present disenrollment scale, DISR, is included in the table for comparison purposes.

It can readily be seen from Table 4 that both the KYW and KYWR scales are more valid (biserial $r = .22$ and $.24$ respectively) for predicting voluntary resignation for female midshipmen than is the DISR (biserial $r = .10$). Table 5, which was prepared to evaluate the impact of all three scales on other performance measures, shows that, while KYW or KYWR both predict voluntary resignation much better than does DISR, they relate negatively with academic and military success. These negative relationships would result in adverse impact on academic and military performance. DISR, on the other hand, has essentially a zero relationship with all four criteria.

Table 4
Means, Standard Deviations, and Validity Coefficients of
Disenrollment Scales for the Cross-validation Sample

Scale	Criterion Group ^a	N	Mean	SD	Validity ^b
KYW	High	93	472	103	.22*
	Low	33	437	65	
	Total	126	463	95	
KYWR	High	93	469	102	.24*
	Low	33	431	64	
	Total	126	460	95	
DISR	High	93	533	73	.10
	Low	33	521	68	
	Total	126	530	72	

^aThe high-criterion group (N = 93) consisted of women who remained at USNA in June 1980; and the low-criterion group (N = 33), of those who had voluntarily resigned by June 1980.

^bCoefficients are biserial correlations.

*p > .05.

Table 5
Validities of Disenrollment Scales and Selection Composites with
Four Performance Criteria in the Cross-validation Sample
(N = 126)

Item	Criterion Validities			
	AQPR ^a	MQPR ^a	MAJOR ^b	VR ^b
<u>Disenrollment Scale:</u>				
DISR ^c	.01	.03	.07	.10
KYW	-.23**	-.13	.10	.22*
KYWR	-.22**	-.12	.15	.24*
<u>Selection Composite:</u>				
CM ^c (with DISR)	.44**	.28**	.34**	-.10
Experimental CM (with KYW)	.36**	.23**	.36**	-.02
Experimental CM (with KYWR)	.37**	.24**	.38**	-.01

^a Coefficients are Pearson correlations.

^b Coefficients are biserial correlations.

^c Validities differ from Table 2 because cross-validation sample includes all voluntary resignees, instead of being limited to plebe-year resignees.

*p < .05.

**p < .01.

As a further check on the potential usefulness of KYW or KYWR, each scale was substituted for DISR in the candidate multiple (CM) composite. Table 5 shows the results when these experimental composites were correlated with each of the relevant performance criteria in the cross-validation sample. As might be expected from the zero-order validities produced by the disenrollment scales, the validity of the composite in predicting AQPR is reduced from the .44 obtained when DISR is used in CM to .36 and .37 respectively when the KYW and KYWR scales are substituted. Similar results are shown for MQPR--the CM validity is reduced from .28 with DISR to .23 and .24 respectively for the KYW and KYWR scales. Although there is a slight improvement in predicting choice of major when the experimental scales are included in the composites, it is hardly sufficient to justify use of these new scales. Finally, in prediction of voluntary resignation, even though the use of KYW or KYWR results in a validity change in the right direction, the obtained increases--from -.10 to -.02 or -.01--are insufficient for practical significance.

Since both experimental scales yielded essentially the same validities, the KYWR scale was used alone to explore further its influence coupled with the CM. (The KYWR scale was selected to increase the possibility that the experimental scale, if useful for

women, might also be useful for men). The KYWR scale and the CM scores were dichotomized in the cross-validation sample. Mean criterion scores were computed for each of the quadrants as well as for the marginal categories. Results, which are presented in Table 6, clearly show that female midshipmen in the upper half of the CM distribution score higher in AQPR, MQPR, and MAJOR than do those in the lower half. However, 30 percent of women scoring in the upper half resign from USNA, compared to only 22 percent of those in the lower half.

The marginal results for the KYWR scale indicate just the opposite results, except for choice of major. However, the difference in the percentage of women who resign is considerably greater: 16 percent in the upper half of the KYWR distribution as opposed to 36 percent in the lower half.

Table 6
Mean Criterion Scores by Candidate Multiple (CM) and
KYWR Scale for the Cross-validation Sample
(N = 126)

Criterion ^a		KYWR-- Upper Half	KYWR-- Lower Half	CM ^b Total
CM--Upper Half	AQPR	2.70 (30)	3.02 (26)	2.85 (56)
	MQPR	2.86 (30)	3.07 (26)	2.96 (56)
	MAJOR	.73 (30)	.65 (26)	.70 (56)
	VR	.19 (32)	.42 (31)	.30 (63)
CM--Lower Half	AQPR	2.38 (29)	2.48 (31)	2.43 (60)
	MQPR	2.81 (29)	2.77 (31)	2.79 (60)
	MAJOR	.62 (29)	.38 (32)	.49 (61)
	VR	.13 (30)	.30 (33)	.22 (63)
KYWR Total ^b	AQPR	2.54 (59)	2.73 (57)	2.63 (116)
	MQPR	2.83 (59)	2.90 (57)	2.86 (116)
	MAJOR	.68 (59)	.50 (58)	.59 (117)
	VR	.16 (62)	.36 (64)	.26 (126)

Note. Ns for each subsample are in parentheses.

^aAQPR, MQPR, and MAJOR criteria were calculated using only plebe-year scores; VR calculations included all women who resigned at any time between July 1976 and June 1980.

^bNs differ because some women with SCII scores used in the KYWR cross-validation sample did not receive criterion scores. Of the 126 women in the cross-validation sample, ten resigned before the end of the first semester and thus did not receive AQPR scores. Nine women resigned before choosing a major.

Because of the small sample sizes in the quadrants, the results presented in Table 6 are tenuous. However, it would be useful to observe the performance of female midshipmen in the categories defined by these quadrants as future classes increase the

sample sizes. If the results prove to be stable, then either selecting women whose scores place them in the upper left-hand quadrant or rejecting those in the lower right-hand quadrant should improve the performance of future classes over the present rate.

Content Analysis

To better understand the females who choose to remain with the USNA program, a content analysis was performed on the KYW scale items. These items were examined to identify interest patterns (i.e., item clusters) that differentiate the women who remain at USNA from those who resign voluntarily. Inspection of these items indicated that three clusters of interest items were endorsed more frequently by female midshipmen who remained than by those who resigned: (1) items related to mechanical interest, (2) items that include athletic and sports activities, and (3) items that are characteristically of interest to people described as "realistic types." Holland's (1966) vocational theory identifies six major personality types--realistic, investigative, artistic, social, enterprising, and conventional--for which scales were developed using SVIB items (Campbell & Holland, 1972) and SCII items (Campbell, 1974).

Since almost half the items on the SCII realistic scale also appear on the KYW scale, a brief description of the "realistic type" may lead to a better understanding of the female midshipmen who remain with the program or, conversely, those who leave voluntarily. The extreme model of the realistic type, as described in the Manual for the SVIB-SCII, is stable, natural, rugged, practical, and somewhat aggressive. This personality type has good motor coordination but frequently lacks verbal and interpersonal skills, prefers concrete to abstract problems, and rarely performs creatively in the arts or sciences (Campbell, 1974).

Holland asserted that, in academic settings, the "realistic and enterprising types tend to do poorly because the match between their dominant characteristics and the dominant characteristics of academic environments is poor" (Campbell, 1974). This assertion is consistent with the results presented in Tables 5 and 6: Female midshipmen who score high on the KYW scale are more likely to remain in USNA, but they earn lower academic and military performance scores than do women who score low on this scale.

Results indicating that female midshipmen who remain at USNA endorse mechanical, athletic, and realistic-type items are useful for identifying topic areas in which to pursue the development of future predictors.

CONCLUSIONS

1. The present method for predicting plebe-year academic and military performance at USNA is effective for female midshipmen. Verbal and math aptitude, rank-in-class, and the candidate multiple are the most valid of the presently used admission measures for predicting AQPR and MQPR (r 's vary between .16 and .44). Math aptitude, the SCII E-S scale, and the candidate multiple are predictive of major choice for females (biserial r 's range from .24 to .48).

2. The present method for predicting plebe-year voluntary and involuntary disenrollment is ineffective for females (biserial r 's range from -.16 to .18).

3. Differences in scores for men and women in academic and military performance are minimal. However, there is a large difference between the percentages of male and female midshipmen who choose technical majors (82 vs. 66%).

4. The voluntary resignation rate during plebe year is considerably higher for females than for males (16 vs. 9%).

5. The two experimental disenrollment scales, KYW and KYWR, which were constructed and validated on the combined classes of 1981 to 1983, are better predictors of voluntary resignation for females (biserial $r = .22$ and $.24$) than is the presently used disenrollment scale (biserial $r = .10$). However, they have a negative impact on academic and military performance.

RECOMMENDATIONS

1. The present USNA admissions system should continue to be used for selecting female midshipmen until more valid measures are identified.

2. Efforts to improve the prediction of voluntary resignation for females should continue using larger samples.

3. When sufficient numbers of female midshipmen have completed their training, validation of USNA selection procedures should be repeated using 4-year criteria instead of plebe-year criteria.

4. The use of a background questionnaire, being developed at NAVPERSRANDCEN as a potential selection measure, should be investigated as a possible approach to the problem of reducing female midshipmen resignations.

REFERENCES

- Campbell, D. P. Manual for the SVIB-SCII. Stanford, CA: Stanford University Press, 1974.
- Campbell, D. P., & Holland, J. L. A merger in vocational interest research: Applying Holland's theory to Strong's data. Journal of Vocational Behavior, 1972, 2, 353-376.
- Holland, J. L. The psychology of vocational choice. Waltham, MA: Blaisdell, 1966.
- Neumann, I., & Abrahams, N. M. Identification of Naval Academy applicants with engineering and science interests (NPRDC Tech. Rep. 75-7). San Diego: Navy Personnel Research and Development Center, October 1974. (AD-787 062)
- Neumann, I., & Abrahams, N. M. Empirical weighting of predictors for the Naval Academy selection program (NPRDC Tech. Rep. 76-37). San Diego: Navy Personnel Research and Development Center, June 1976. (AD-A027 275)

APPENDIX
VALIDITY OF SELECTION VARIABLES BY SEX AND CLASS

Table A-1
Validity of Selection Variables by Sex and Class

Class	Sex	Variable	N	Mean	SD	Validities				
						AOPR ^a	MQPR ^a	MAJOR ^b	VR ^b	ADS ^b
1980	M	SAT-V	1199	566	79	.38	.17	-.20	.08	.14
	F		81	604	75	.15	.15	-.22	-.10	-.08
	M	SAT-M	1199	660	70	.45	.15	.18	.06	.09
	F		81	649	52	.17	.24	.42	-.17	-.19
	M	R/C	1200	570	111	.46	.25	.11	.04	.06
	F		81	646	86	.36	.09	-.06	-.24	-.24
	M	RECS	1198	798	132	.30	.23	.11	-.03	.03
	F		81	847	100	.14	.04	.25	.09	.12
	M	ECA	1195	510	70	-.08	.03	-.12	.07	.07
	F		81	482	73	.06	.05	.03	-.20	-.18
	M	DISR	1170	536	86	.00	.00	.08	.10	.11
	F		79	532	80	-.23	-.09	-.01	-.03	-.08
	M	E-S	1179	542	85	.12	.00	.41	.12	.09
	F		79	525	72	-.06	-.03	.57	.26	.20
1981	M	SAT-V	1235	568	70	.32	.17	-.28	.05	.09
	F		90	608	67	.29	.13	-.23	-.15	-.18
	M	SAT-M	1235	662	65	.35	.11	.19	.03	.07
	F		90	662	71	.29	.04	.35	-.38	-.44
	M	R/C	1237	569	107	.49	.28	.04	.06	.13
	F		90	652	101	.51	.31	.17	-.11	-.07
	M	RECS	1230	844	113	.08	.16	.05	.18	.19
	F		90	853	85	-.12	.19	.04	.13	.18
	M	ECA	1231	522	73	.00	.08	-.16	.11	.09
	F		90	517	82	.02	.24	-.15	.20	-.19
	M	DISR	1228	533	82	-.01	.05	.08	-.04	-.02
	F		90	531	72	-.23	-.10	.11	.27	.20
	M	E-S	1228	522	73	.07	.05	.38	-.04	-.03
	F		90	517	65	.02	.02	.61	-.09	-.15

^aCorrelation coefficients are Pearson product-moment.

^bCorrelation coefficients are biterial.

Table A-1 (Continued)

Class	Sex	Variable	N	Mean	SD	Validities				
						AQPR ^a	MQPR ^a	MAJOR ^b	VR ^b	ADS ^b
1982	M	SAT-V	1266	573	71	.31	.19	-.25	.02	.02
	F		96	611	65	.44	.23	-.21	-.10	-.10
	M	SAT-M	1266	670	68	.43	.18	.13	.07	.15
	F		96	659	62	.49	.07	.32	-.08	-.08
	M	R/C	1267	575	107	.47	.29	.13	-.02	.07
	F		96	644	102	.51	.23	-.05	-.05	-.05
	M	RECS	1264	859	105	-.03	.06	-.03	-.01	.02
	F		96	876	102	-.19	.06	.09	.18	.18
	M	ECA	1265	527	68	-.07	.05	-.02	.10	.07
	F		96	538	69	-.23	.00	.20	.02	.02
	M	DISR	1266	537	81	-.02	.02	.00	.07	.10
	F		96	523	68	-.15	-.01	.24	-.14	-.14
	M	E-S	1266	527	69	.16	.09	.39	.04	.08
	F		96	528	55	.31	.15	.45	.11	.11
1983	M	SAT-V	1313	576	69	.30	.27	.12	.00	.09
	F		90	593	71	.34	.33	.00	-.03	.13
	M	SAT-M	1313	662	63	.39	.31	.21	-.06	.06
	F		90	657	67	.42	.34	.23	-.07	.07
	M	R/C	1313	575	103	.43	.29	.05	-.11	.00
	F		90	654	105	.37	.24	-.24	-.25	-.18
	M	RECS	1311	880	99	-.02	.01	-.02	.06	.03
	F		90	906	77	-.27	-.13	.03	-.11	-.17
	M	ECA	1310	530	71	-.01	.04	-.07	.03	.03
	F		90	522	78	.06	.08	-.18	.30	.29
	M	DISR	1306	531	85	.02	.04	.06	.14	.11
	F		90	528	82	.06	.04	-.18	.28	.14
	M	E-S	1306	528	69	.14	.09	.40	.11	.11
	F		90	527	64	.12	.07	.18	.41	.32

^aCorrelation coefficients are Pearson product-moment.^bCorrelation coefficients are biserial.

DISTRIBUTION LIST

Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics)
Executive Secretary, Defense Advisory Committee on Women in the Services (DACO-WITS)
Principal Deputy Assistant Secretary of the Navy (Manpower and Reserve Affairs) (OASN(M&RA))
Director of Manpower Analysis (ODASN(M))
Deputy Assistant Secretary of the Navy (CPP/EEC)
Chief of Naval Operations (OP-01), (OP-11), (OP-12) (2), (OP-13), (OP-14), (OP-15), (OP-110), (OP-115) (2), (OP-140F2), (OP-987H)
Chief of Naval Material (NMAT 00), (NMAT 05)
Deputy Chief of Naval Material (Technology)
Chief of Naval Research (Code 200), (Code 440) (3), (Code 442), (Code 448)
Chief of Information (OI-213)
Chief of Naval Education and Training (02), (N-2), (N-5), (N-121)
Chief of Naval Technical Training (016)
Commandant of the Marine Corps (MPI-20)
Commander in Chief, United States Naval Forces, Europe (2)
Commander in Chief U.S. Atlantic Fleet
Commander in Chief U.S. Pacific Fleet
Commander Fleet Training Group, Pearl Harbor
Commander Naval Air Force, U.S. Atlantic Fleet
Commander Naval Air Force, U.S. Pacific Fleet
Commander Naval Surface Force, U.S. Atlantic Fleet
Commander Naval Surface Force, U.S. Pacific Fleet
Commander Naval Military Personnel Command (NMPC-013C)
Commander Navy Recruiting Command
Commander Submarine Force, U.S. Atlantic Fleet
Commander Submarine Force, U.S. Pacific Fleet
Commander Training Command, U.S. Atlantic Fleet
Commander Training Command, U.S. Pacific Fleet
Commanding Officer, Naval Regional Medical Center, Portsmouth, VA (ATTN: Medical Library)
Commanding Officer, Office of Naval Research Branch Office, Chicago (Coordinator for Psychological Sciences)
Director, Naval Civilian Personnel Command
Officer in Charge, BUMED East Coast Equal Opportunity Program Detachment
Officer in Charge, BUMED West Coast Equal Opportunity Program Detachment
President, Naval War College (Code E114)
Superintendent, Naval Postgraduate School
Superintendent, U.S. Naval Academy
Secretary Treasurer, U.S. Naval Institute
Commander, Army Research Institute for the Behavioral and Social Sciences, Alexandria (PERI-ASL)
Chief, Army Research Institute Field Unit, Fort Harrison
Commander, Air Force Human Resources Laboratory, Brooks Air Force Base (Scientific and Technical Information Office)
Commander, Air Force Human Resources Laboratory, Williams Air Force Base (AFHRL/OT)
Commander, Air Force Human Resources Laboratory, Wright-Patterson Air Force Base
Superintendent, U.S. Air Force Academy
Superintendent, U.S. Coast Guard Academy
Superintendent, U.S. Military Academy
Defense Technical Information Center (DDA) (12)

END

DATE
FILMED

10-82

DTIC