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## The Utilization of Biographical Information for the Reduction of Motivational Attrition in the NROTC Scholarship Program

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**The Utilization of Biographical Information for the  
Reduction of Motivational Attrition in the  
NROTC Scholarship Program**

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<p>Voluntary resignation (motivational attrition) from the Naval Reserve Officer Training Corps (NROTC) is approximately 26 percent. Selecting out candidates with potential high risk of attrition would save the Navy millions of dollars annually. Unfortunately, the current selection composite is not predictive of motivational attrition. The objective of this effort was to investigate the usefulness of existing biographical information items (biodata) for predicting motivational attrition.</p> <p>Students from the entering classes of 1982 and 1983 served as subjects for the study. Analyses of the biodata revealed that graduates were more certain about their chosen careers, participated in more athletic events, and were more active in their high school student governments than motivational attritees. Graduates came into the scholarship program with lower measured aptitude scores in mathematics. In college, however, they had higher grades in naval science courses, and earned higher naval officer aptitude scores than did motivational attritees. Continuing research is needed for the development of a detailed biodata questionnaire to predict motivational attrition from the NROTC scholarship program.</p>			
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## FOREWORD

This report is a summary of the findings of an effort to identify biographical information (biodata) in student files that differentiate those students who graduate from those who attrite for motivational reasons from the Naval Reserve Officer Training Corps (NROTC) scholarship program. Continuing research effort in this area is expected to lead to the development of a detailed biodata questionnaire to increment the validity of the present selection composite for the prediction of motivational attrition. If the effort is successful, the Navy will benefit by reducing educational expenses for candidates whose probability of attrition is high.

This research has been funded by the Office of the Chief of Naval Research, and would be of interest to the Chief of Naval Education and Training (CNET), Code N31, and the Head, Education Programs, OP-114.

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## SUMMARY

### Problem

Voluntary resignation (motivational attrition) from the Naval Reserve Officer Training Corps (NROTC) is approximately 26 percent. Selecting out candidates with potential high risk of attrition would save the Navy millions of dollars annually. Unfortunately, the current selection composite is not predictive of motivational attrition.

### Objective

The objective of this effort was to investigate the usefulness of existing biographical information items (biodata) for predicting motivational attrition.

### Background

Biographical information has been successfully used to predict attrition from the armed services and from colleges. Biodata for NROTC scholarship students are available in the American College Test (ACT) and Scholastic Aptitude Test (SAT) Student Profiles that are part of the application. Thus, an effort to identify items that differentiate graduates and motivational attritees was feasible and, if successful, could lead to the development of a more detailed biodata questionnaire.

### Approach

Students from the entering classes of 1982 and 1983 were divided into graduates, those who became commissioned officers; and motivational attritees, those who resigned voluntarily from the NROTC scholarship program. Responses of their ACT and the SAT Student Profiles were analyzed with a key construction computer program. Self-reported aptitudes were also compared to measured aptitudes for the purpose of verifying the accuracy of the self-reports.

### Results and Conclusions

Five out of 75 responses on the SAT and 11 out of 172 responses on the ACT Student Profiles differentiated graduates and motivational attritees. Graduates were more certain about their chosen careers, participated in more athletic events, and were more active in their high school student governments than motivational attritees. Graduates came into the scholarship program with lower measured aptitude scores in mathematics. In college, however, they had higher grades in naval science courses, and earned higher naval officer aptitude scores than did motivational attritees. Continuing research is needed for the development of a detailed biodata questionnaire to predict motivational attrition from the NROTC scholarship program.

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## INTRODUCTION

### Problem

Approximately 26 percent of the students who are awarded a Naval Reserve Officer Training Corps (NROTC) scholarship voluntarily resign (motivational attrition) from the program prior to commissioning (Borman, Owens-Kurtz, Mattson, & Peterson, 1988). This high attrition rate is costly for the Navy; thus, it is imperative to identify and select out applicants with a high risk of attriting before they are accepted into the NROTC scholarship program. Unfortunately, the current selection composite is not predictive of motivational attrition.

### Objective

The objective of this effort was to conduct an exploratory study of the usefulness of available biographical information (biodata) in differentiating between graduates of the NROTC scholarship program and motivational attritees. Through the identification of valid items, a comprehensive, tailor-made biodata questionnaire for use with NROTC applicants can be developed to supplement the current selection composite.

### Background

Approximately 2,000 students enter the NROTC scholarship program annually. Students leave for a variety of reasons, the largest proportion (over 50%) for motivational reasons, followed by academic reasons (approximately 40%).<sup>1</sup> Approximately 90 percent of the attrition occurs during the freshmen year. After the first year, students are obligated to the Navy in terms of years of active duty service equivalent to the number of years of scholarship support that they received as an exchange for their educational expenses while in the NROTC scholarship program. The educational expenses incurred by the Navy include the full tuition paid to the host institution (the amount varies by school), \$100 per month stipend, and the administrative expenses of running the NROTC scholarship program. Each year these expenses average close to \$7,000 per student. At that rate, the total cost of motivational attrition alone is approaching three and a half million dollars annually.

None of the components of the current NROTC selection composite is predictive of motivational attrition. Thus, an instrument to identify potential attritees is badly needed (Mattson, Neumann, & Abrahams, 1986). The utilization of biodata may be helpful in this effort, since such items have been used successfully to predict attrition from the armed services and from the Naval Academy. The Armed Services Applicant Profile (ASAP) is a valid predictor of attrition from enlisted service during the first year of duty (Trent, 1988), and involvement in sport activities differentiated the successful students and motivational attritees at the Naval Academy (Abrahams & Neumann, 1973). A variety of other studies are germane also. Hilton (1982) and Ramist (1981), in separate studies of college dropouts, found that demographic, motivational, academic, and personal characteristics of students are predictive of disenrollment. Hutchison and Johnson (1980) examined academic measures, economic variables, social involvement, and demographic variables to predict academic and voluntary attrition from a small college. They defined voluntary attrition as leaving school with good academic standing, similar to our definition of motivational attrition. The authors found that voluntary attritees are

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<sup>1</sup>Based on the analysis of 1982 and 1983 student files.

difficult to differentiate from persisters (graduates). The four variables identified by the authors were only able to predict 39 percent of the voluntary attritees, while they predicted 80 percent of the academic dropouts.

The present study examined biodata available in the SAT and ACT Student Profiles as potential predictors of motivational attrition. Although these biodata items are not as detailed, focused, and comprehensive as are most biographical inventories, they provide a starting point in identifying important biographical information pertinent to motivational attrition. Because of the exploratory focus of this effort, variables identified as discriminating between motivational attritees and graduating candidates will be interpreted as content areas that should be tapped if a more detailed biodata questionnaire is to be developed.

## APPROACH

### Sample

Thirty-six hundred and four students who entered into the NROTC scholarship program in 1982 and 1983 constituted the subject pool for the study. These entering classes were selected because they had SAT and/or ACT Student Profiles data, and the students had a chance to complete their academic program by 1987 (with the exception of the 5-year engineering students who entered in 1983). Only students who answered at least 163 out of 172 questions on the ACT and 61 out of 75 questions on the SAT Student Profiles were selected to participate. A total of 2,574 students, representing graduates (N = 1,634) and motivational attritees (N = 940), comprised the final sample. Students who attrited for other reasons (i.e., academic failure, medical reasons) had missing attrition codes, or were still in school were excluded from the sample (N = 1,030). The majority of the students had taken the SAT (N = 2,041), fewer students had taken the ACT (N = 599). Sixty-six students had both SAT and ACT scores and are represented in both samples.

### Measures

#### Biographical

Biodata from the ACT and SAT Student Profiles were used as the independent variables in this investigation. Seventy-five questions from the SAT and 172 questions from the ACT Student Profiles were selected for the analyses based on their perceived relevance to successful completion of the NROTC scholarship program. Although the two questionnaires differ somewhat, they both are comprised of demographic information: type, location, and size of high school attended; questions pertaining to the number of courses taken in different disciplines, honors courses participated in, and grades earned in those courses; participation in extracurricular activities, athletics, community activities, and student government. Educational objectives and preferences are also reported, as well as self-rating of skills in various disciplines. For both the ACT and SAT, biographical information is collected from the examinee when the aptitude portions of the tests are administered. Candidates are instructed to complete all information and to answer every question. The biodata information and test scores are released to the educational institutions that the candidates designate.

### College Aptitude

The ACT and SAT college entrance exams each contain components designed to measure verbal and mathematical aptitude. For this effort, these scores were used to assess the relationship between voluntary resignation and aptitude. They also were used to determine the accuracy of the self-reported aptitudes of the motivational attritees, which were higher than those reported by graduates.

### Criteria

The primary criterion for this investigation was motivational attrition vs. graduation. Candidates are classified as graduates if, at the end of the 4- or 5-year program, they became commissioned USN/USNR or USMC officers. Motivational attritees are students who voluntarily leave the scholarship program because they dislike travel, the NROTC cruise, and the military generally. They also leave for financial and personal reasons, or to enter another field.

Secondary criteria were also utilized (i.e., college grade point average (GPA), naval science grades, and naval officer aptitude scores). These variables were examined to determine whether the higher self-reported aptitudes of the motivational attritees on the ACT and SAT Student Profiles converted into higher achievement scores in college. College GPAs are average grades earned in all college classes, generally reported on a 4.0 point scale, but may vary from school to school. Naval science grades are earned in the required (one course per semester) and elective courses taken while a student is in the NROTC scholarship program. Naval officer aptitude scores are a combination of academic/cruise grades and naval science instructors' ratings of the candidate's aptitude to become a naval officer. This score is intended to reflect the candidate's potential as a naval officer. All of these grades were standardized within colleges ( $M = 50$ ;  $SD = 10$ ) to equate the different scales used by various institutions.

### Data Analysis

Subjects were divided, three-fifths into analysis sample ( $N = 1,577$ ) and two-fifths into verification sample ( $N = 1,063$ ), based on the last digit of their social security numbers. The biodata from the Student Profile sections of the SAT and ACT were analyzed by a key-construction computer program (Abrahams, Neumann, & Rimland, 1973). Using the analysis sample, the percentage differences in endorsement rates between the criterion groups were determined for each response option. A five percentage point or larger difference in the endorsement rates was considered to be discriminating between the criterion groups. The differences found in the analysis sample were validated on the verification sample, and only items that maintained the five percent level difference were retained. The t-test program in the SPSSX software package was used to compare ACT and SAT academic scores, GPAs, naval science grades, and naval officer aptitude scores between the primary criterion groups.

## **RESULTS**

Table 1 presents the items from the SAT Student Profile that differentiated graduates and motivational attritees. The percentage of candidates endorsing the response option in each of the criterion groups in the analysis sample are in the last columns of the table. A minimum of a five percentage point difference in the endorsement rates between the criterion groups had to exist in both the analysis and verification samples for the item to be included in the table.

Table 1  
 SAT Student Profile Variables Differentiating Graduates  
 and Motivational Attritees in the NROTC  
 Scholarship Program

SAT Item Number	Content	Response Option	Percentage Endorsing Item	
			Graduates	Motivational Attritees
409	High school class rank	Top 10%	60.6	67.5
		Next 10%	27.1	22.1
419	Mathematics grade	A	56.6	67.8
		B	37.3	27.2
420	Foreign language grades	A	57.5	63.9
		B	34.3	28.8
448	Educational objective	MA, MS	37.0	42.2
493	Mathematics skills	Top 1%	33.2	43.1

Five out of 75 questions on the SAT Student Profile differentiated graduates and motivational attritees. Based on the self-reported scores, the graduates rated themselves lower in mathematical skills and fewer reported being in the top 10 percent of their high school class than did motivational attritees. Graduates also reported fewer A's in mathematics and foreign languages. Another difference between graduates and motivational attritees was reflected in their educational objectives. A lower percentage of the graduates had aspirations of earning Master degrees than did motivational attritees (33.2 and 43.1%, respectively).

Eleven of the 172 questions in the ACT Student Profile differentiated graduates and the motivational attritees. Table 2 summarizes the differences between the criterion groups. Graduates were more sure of their occupational choices than those who disenrolled, and they were also more interested in ROTC, NROTC, and AFROTC courses. A higher percentage of graduates reported participation in the following activities while in high school: student government, special interest groups, varsity athletics, and assisting the handicapped.

Graduates were less interested than motivational attritees in "credit by examination in English" and participating in scientific contests or talent searches. In high school, graduates were enrolled in more natural science courses than motivational attritees. More of the graduates preferred medium size colleges (5,000 to 10,000) as opposed to large schools (10,000 and over). The motivational attritees showed a slight preference in the opposite direction.

Table 2  
 ACT Student Profile Variables Differentiating Graduates  
 and Motivational Attritees in the NROTC  
 Scholarship Program

SAT Item Number	Content	Response Option	Percentage Endorsing Item	
			Graduates	Motivational Attritees
15	Occupational choice	Very sure	33.5	27.4
		Fairly sure	51.5	56.8
18	Interested in NROTC course	Yes	85.0	72.8
36	English by exam	Yes	49.8	57.5
42	Participation in student government	Yes	51.1	42.9
54	Interest in clubs	Yes	84.6	78.2
70	Preferred college size	Medium	43.1	33.6
		Large	20.0	28.7
87	Years of high school science	>4 years	63.9	58.6
109	Varsity athletics	Yes	74.8	67.8
157	Varsity teams	Yes	75.5	67.1
156	Science contest	Yes	14.2	20.1
168	Assist handicapped	Yes	20.6	14.5

The SAT biodata indicated higher self-reported aptitude in mathematics among the motivational attritees than graduates of the scholarship program. To verify the accuracy of these self-reported aptitudes and skills, the ACT and SAT aptitude scores of graduates and motivational attritees were compared. The mean differences between the two groups were evaluated with t-tests. Significance level for the difference of the self-reported scores was set at  $p < .05$  by convention. Table 3 summarizes the results of these analyses. Graduates had lower mathematics scores than did the motivational attritees on the SAT ( $M = 645$  and  $M = 656$ , respectively) and on the ACT ( $M = 28.9$  and  $M = 29.5$ , respectively). Differences in self-reported mathematics aptitude for graduates and motivational attritees correspond to measured differences obtained from the aptitude portions of ACT and SAT. There was no difference between the verbal scores of graduates and motivational attritees on the SAT, but differences were found on the verbal section of the ACT, with attritees scoring higher.

Table 3  
Average SAT and ACT Scores

Scores	Graduates			Motivational Attritees			t-Value
	N	Mean	SD	N	Mean	SD	
SAT mathematics	1168	645	68	707	656	64	3.64*
SAT verbal	1168	564	72	707	568	72	1.79*
ACT mathematics	324	28.9	3.5	236	29.5	3.5	2.02*
ACT verbal	324	23.7	3.5	236	24.5	3.2	2.21*

\*p < .05.

To better understand the relationship between motivational attrition and academic performance, the first two years' GPA, naval science scores, and naval officer aptitude scores of the NROTC scholarship students were also examined. Table 4 is the summary of those standardized scores (M = 50; SD = 10). Although motivational attritees came into the NROTC scholarship program with higher SAT and ACT scores than graduates, there was no difference in their GPAs during the first 2 years of college. Comparison of naval science grades reveals a gap between graduates and motivational attritees, with graduates having higher scores. The differences between the two groups, however, were more pronounced in their naval officer aptitude scores. The graduates' aptitude scores exceeded those of motivational attritees by about half of a standard deviation (M = 52.20 vs. M = 46.40, respectively).

Table 4  
Average Standardized GPAs, Naval Science Grades, and  
Naval Officer Aptitude Scores for the First  
2 Years of the Program

Scores	Graduates (N = 1634) Means	Motivational Attritees (N = 940) Means	t-Value
GPA	51.65	50.73	1.30
Naval science grades	50.97	49.30	2.67*
Naval officer aptitude scores	52.20	46.40	5.95*

\*p < .05.

## DISCUSSION

There are several issues encountered when interpreting the results of the analyses on the SAT and the ACT Student Profiles. First, the biodata in the ACT and SAT Student Profiles are too limited in scope to allow definitive conclusions on the usefulness of biodata for the prediction of motivational attrition. Second, while the literature indicates that biodata are useful in predicting attrition from college and/or the military, NROTC scholarship program attrition seems to be somewhat different. Withdrawal from the program in most cases is not equivalent to dropping out of college, since these attritees may remain in school and continue their academic careers. Motivational attrition may be viewed as a change in the students' professional aspirations. The present attrition coding system used by the NROTC units, however, does not differentiate between students who drop out of both the scholarship program and school, versus those that leave the scholarship program but remain in school. This shortcoming of the present data base limits conclusive inferences to be drawn from the results.

Despite the limitations, several interesting results surfaced during the analyses. Graduates reported being more sure of their career choices than did motivational attritees. They also reported more interest in ROTC type courses. These combined findings may suggest a higher level of motivation to become naval officers. Motivation may also explain the fact that graduates consistently earned higher naval officer aptitude scores and received higher grades in naval science courses. Additional support for the motivational explanation came from the comparison of the overall expected performance in college, based on aptitude scores and actual performance. Although the ACT and SAT scores are highly predictive of academic success in the first year of college, graduates slightly out-performed motivational attritees in college despite their lower ACT and SAT scores.

Graduates also reported more participation in high school athletics than did motivational attritees. This is similar to Abrahams and Neumann's (1973) findings among Naval Academy students. The authors reported that, among other variables, the involvement in sport activities differentiated successful candidates and motivational attritees. Since both the NROTC program and the Naval Academy place great emphasis on physical fitness, it makes sense that students with athletic interests will be more successful in finishing the program than the ones with less involvement in sports.

Another finding pertains to leadership behaviors. Graduates were more likely to have participated in high school student government than did motivational attritees. Since leadership is integral to being a naval officer, it follows that past experience in leadership roles should be predictive of future exhibition of similar traits.

Motivational attrition from the NROTC scholarship program may have two explanations. First, during year one of their academic careers, students may withdraw from the program without any obligation to the Navy. The underlying motivation for some candidates to enter the NROTC scholarship program may be to receive financial assistance at least during the first year of their education. Second, some students entering the program (i.e., those who become motivational attritees) may have unclear expectations of what the program and a military career require of them. Once they experience the military life style, some may find it too strenuous and restrictive, and decide to withdraw. These hypotheses should be explored with interviews of motivational attritees. The interviews may validate some of the inferences drawn from the results of the data analyses and may uncover other reasons for attrition not previously considered. The content areas of these analyses and the interviews may serve as bases for the development of a comprehensive biodata questionnaire.

## CONCLUSIONS

Based on the analyses of the ACT and the SAT Student Profiles, the following insights about the NROTC attrition problems have been gained.

1. Graduates of the NROTC scholarship program exhibited the following characteristics. In comparison to motivational attritees they showed:
  - a. Greater certainty about the chosen field.
  - b. Higher interest to pursue college courses in that field.
  - c. Greater involvement in high school sports.
  - d. More participation in leadership roles in high school.
2. Self-reported high school rank and scholastic aptitude scores alone are not good predictors of successful completion of the NROTC scholarship program.

## RECOMMENDATION

The investigation into motivational attrition is continuing and may result in greater insight into the reasons for the attrition. When more information becomes available, a detailed biodata inventory should be constructed and administered experimentally. Such an instrument could add to the validity of the present selection composite for the prediction of motivational attrition.

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