



REPORT NUMBER 597

THE RELATIONSHIP OF BACKGROUND VARIABLES
TO ATTRITION IN BASIC ENLISTED SUBMARINE SCHOOL

by

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Research Work Unit MF12.524.002-9004.03

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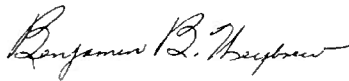
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**SUBMARINE MEDICAL RESEARCH LABORATORY
NAVAL SUBMARINE MEDICAL CENTER REPORT NO. 597**

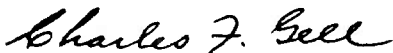
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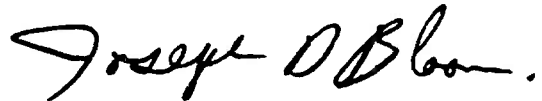
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SUMMARY PAGE

THE PROBLEM

The purpose of this study was to examine the relationships between selected items of biographical data and psychological attrition of enlisted volunteers for Basic Submarine School.

FINDINGS

A number of variables pertaining to civilian school history, family background, and socio-economic level significantly differentiated between the two groups.

APPLICATION

The findings suggest that data collected by means of a specifically designed Background Questionnaire would provide valuable information which would be useful in the identification of submariner candidates having maximum probability of graduating from Submarine School.

ADMINISTRATIVE INFORMATION

This investigation was conducted as a part of Bureau of Medicine and Surgery Research Work Unit MF12.524.002-9004 — Selection and Retention of Submarine and Diving Personnel. The present report is No. 3 on this work unit. The manuscript was approved for publication on 24 September 1969 and designated as SubMedResLab Report No. 597.

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ABSTRACT

The purpose of this study was to investigate the predictive relationships between selected items of biographical data and psychological attrition in Basic Enlisted Submarine School, at the Naval Submarine Base at Groton, Connecticut.

The drop, or attrition group was characterized: (1) by a higher incidence of parents with a history of divorce or separation; (2) tended to be from lower socio-economic families, with less educated parents; and (3) their mothers were more likely to have worked full-time. Moreover, in high school, the drops made lower grades, held fewer elective offices, had a higher incidence of playing hooky and being expelled and had a different preference for school subjects. Finally, the drop group indicated that they had more personal problems, both at the time of enlistment into the Navy and at the time they entered Submarine School, had less self-confidence and started smoking at an earlier age. The results of this study indicate the value of biographical information of this kind in the identification of potential Submarine School drops.

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THE RELATIONSHIP OF BACKGROUND VARIABLES TO ATTRITION IN BASIC ENLISTED SUBMARINE SCHOOL

INTRODUCTION

One of the purposes of this study was to investigate the efficacy of personal background variables as an aid in the prediction of success or failure in an academic situation such as that provided by the Basic Enlisted Submarine School. Previously selected background variables have formed a basis for prediction of success or failure in Submarine School. For example, age and level of education are variables which have proven to be useful predictors, with the successful Submarine School candidates being older and having a higher level of education. Basic Battery Tests (GCT, ARI and MECH) have also been useful predictors, again with the successful candidates having higher scores on these tests, (Weybrew, 1957). In addition, an experimental psychiatric screening test has been used to predict failure in Submarine School (Weybrew & Youniss, 1957), and a test for motivation for submarine duty has been shown to be related to success in Submarine School (Rubin & Parker, 1961).

Background variables have been used successfully in other situations as aids in the prediction of behavior. It was found, for example, that such items of biographical data as education, family stability, and age, contributed significantly to the prediction of adjustment to Navy and Marine Corps life within a low ability group (Plag, 1968). Moreover, it was found that patterns of background variables constituted a factor identifying delinquent from non-delinquent groups undergoing basic training (Greer, 1956). It was also discovered that educational achievement was the best single predictor of military effectiveness for Naval enlistees, and that the predictability was significantly increased by the addition of other biographical variables (Plag & Goffman, 1967). In yet another type of study, it was reported that there was a specific identifiable life history pattern related to individual differences in performance under stressful situations (Walker & Meeland, 1956). Finally, Epstein (1962)

showed that age, pay grade, and marital status were correlated with the adjustment ratings of enlisted submariners during prolonged submerged cruises aboard Ballistic Missile type (SSBN) submarines.

METHODS AND PROCEDURE

Subjects

The total population sample consisted of 279 enlisted Submarine School candidates randomly selected from a "pool" of 800. The successful or graduate group consisted of 220 graduates of Basic Enlisted Submarine School. The failure or drop group, on the other hand, consisted of 59 men who did not complete Submarine School for reasons of a non-medical nature. Included in this group are psychological failures, academic failures, individuals who stated that they were no longer volunteers for the Submarine Service and individuals who refused to participate in the pressure test and escape training.

Personal History Questionnaire

This experimental questionnaire* consisted of 50 multiple choice items designed to secure useful information regarding past military experience, job and educational history, as well as information pertaining to socio-economic and family background. The protocols were scorable by means of mark-sensed equipment, though, for the purposes of the present study, punched card methods proved most useful. A copy of this questionnaire is included as Appendix A.

RESULTS

While this study focused upon the predictive relationships of background variables to Submarine School attrition, certain additional differences between the criterion

*The planning, design and early "field testing" of this questionnaire was conducted by Mr. Edward Kanter, formerly a member of the staff of the Submarine Medical Research Laboratory.

TABLE I. Aptitude and Background Variables of the Submarine School Graduate and Drop Group.

	Graduate (N=220)	Drop (N=54)	t
GCT	M= 60.28 SD= 6.04	M= 53.12 SD= 6.16	6.28**
ARI	M= 59.95 SD= 5.15	M= 53.05 SD= 6.53	6.77**
MECH	M= 56.62 SD= 6.83	M= 50.96 SD= 7.24	3.96**
AGE	M= 20.09 SD= 2.31	M= 18.30 SD= .98	4.30**
EDUCATION	M= 12.12 SD= .64	M= 11.24 SD= 1.27	5.59**
PIB	M=114.44 SD= 57.67	M=141.96 SD= 79.26	2.080*
SMQ	M=141.51 SD= 54.38	M=127.77 SD= 45.30	1.398 n.s.

*Significant at .05

**Significant at .001

M=Mean

SD=Standard Deviation

groups should be pointed out at the outset.† Table I presents these data.

Confirming a well-established finding in the literature, the "drop" group in this sample showed significantly lower mean Basic Test Battery (BTB) scores. In addition, the success group admitted less symptomatology on the Personal Inventory Barometer (PIB), (Weybrew & Youniss, 1957) and earned higher scores‡ on a test designed to measure motivational intensity (Weybrew & Molish, 1959). Finally, the graduate group tended to be older and to have completed more years of formal education.

†Following completion of Submarine School, data pertaining to qualification (or failure to qualify) were obtained for the graduate group. But these data were too sparse to allow for a meaningful investigation of the relationships between the biographical data and the qualify-disqualify criterion.

‡This difference was only a trend as the confidence level for the T-test was only 7% (one failure).

Military Background

Present Military Status (I-1).§ This item was intended to secure special qualification information of the Submarine School candidates. At the outset there was no significant** difference in the proportion of those with USN-USNR designations in the Drop-Graduate categories.

The men with NEC's (Navy Enlisted Classifications) 9901/9902 are designated for duty aboard the Nuclear Submarines of the Fleet. Table II presents the data in the appropriate breakdown.

§I-1 refers to item number "1" in the Experimental Background Questionnaire.

**For the purpose of this study, significant will refer to the rejection of the nul hypothesis at the 5% confidence level or less.

TABLE II. Incidence of 9901/9902 Designation of Submarine School Candidates.

Designation	Graduate Group		Drop Group	
	f	%	f	%
9901/9902	89	40.6	4	6.8
Non-9901/9902	130	59.4	55	93.2
Total	219		59	
Chi-square			22.34	
p(1df)			<.001	

These data indicate that relatively few of the 9901/9902 designated men fail to graduate (4%) as compared to 30% for the men with the non-nuclear NEC's.

Other special categories not included in Table II, for example STAR (Selective Training and Retention) and SCORE (Selective Conversion and Retention) had too little frequency to be considered in this analysis.

Time on Active Duty (I-2). Data pertaining to the question of the optimal amount of active duty time to be required of a volunteer for the Submarine Service were so obtained by this question (Table III).

TABLE III. Time Served on Active Duty for Graduate and Drop Groups.

Time on Active Duty	Graduate Group		Drop Group	
	f	%	f	%
Less than 6 months	16	7.3	23	39.7
6—12 months	126	57.3	25	43.1
13—24 months	48	21.8	6	10.3
More than 24 months	30	13.6	4	6.9
Total	220		58	
Chi-square			40.42	
p(3df)			<.001	

Table III clearly shows the disproportionately large number of individuals in the drop group in the "less than 6 months" category. Two categories listed in the questionnaire, "25-48" months and "more than 48 months" had cell frequencies too small to analyze by Chi-Square and were combined into the

"more than 24 months" category. This variable indicates the fact that the graduate group has, as a whole, been on active duty longer and had the benefit of more time to adjust to the Navy system.

Last Duty Station (I-4). Since the frequencies of personnel falling into some of the categories listed in the questionnaire proved to be small, some of the categories had to be pooled. For example, the categories "Recruit Training" and "Home" were pooled into a new category as were "Fleet" and "Shore." Table IV illustrates the differences between

TABLE IV. Previous Duty Station of Submarine School Graduates and Drops

Duty Station	Graduate Group		Drop Group	
	f	%	f	%
Recruit Training Home	21	9.5	23	39.0
Fleet and Shore	34	15.5	11	18.6
Service School	165	75.0	25	42.4
Total	220		59	
Chi-square			33.10	
p(2df)			<.001	

the two groups quite clearly. The drops had 39% of their group reporting to Submarine School directly from "Boot Camp" and "Home" while only 9.5% of the graduate group came from this source. On the other hand, 75% of the graduates, as compared to 42% of the "drops" reported directly to Submarine School after completing a Navy school. Computing the proportion failing Submarine School for each "duty station" source group makes the implications of this Table quite clear; namely, that the younger recruit with less time in service has 3 to 4 times the probability to be dropped from Submarine School as do those volunteers with service school background.

Marital Status (I-5). The marital status distributions (Table V) were not significantly different for the two groups. Most of the individuals in both groups had never been married. In the graduate group, 14.5% were married as opposed to 5.1% of the drop

TABLE V. MARITAL STATUS.

	Never Married		Married		Separated		Divorced	
	f	%	f	%	f	%	f	%
Graduates	184	83.6	32	14.5	1	.5	3	1.4
Drops	53	89.8	3	5.1	3	5.1	0	0

group. This would be expected since the graduate group was significantly older than the drop group. It is noteworthy that within the drop group, while only 5.1% of the group were married an equal number (5.1%) were separated from their wives at the outset of the Basic Submarine Training.

Incidence of Personal Problems, (I-6, I-7). In order to examine the incidence of problems existing at the time of enlistment (I-6), two categories, "yes" and "undecided" were combined, as shown in Table VI.

TABLE VI. Incidence of Problems Admitted at Time of Enlistment.

Response	Graduate Group		Drop Group	
	f	%	f	%
Yes, Undecided	15	6.9	12	20.3
No	203	93.1	47	79.7
Total	218		59	
Chi-square			7.91	
p(1df)			.005	

The grouping procedure was based upon the assumption that the "undecided" response meant that the individual, at the time of enlistment did have some type of problem but that it was not considered serious or that the nature of the problem was such that it did not fit the categories "personal" or "family." Accordingly, the drop group did admit to more problems than the graduate group. Obviously, the questionnaire data provided little or no hint of the nature of the problems alluded to by the respondents. However, the data suggest the possibility of more instability (family or otherwise) in the background of the candidates who eventually fail Submarine School.

The submariner volunteers were asked if they had any serious problems "now," to refer to the time when the questionnaires were completed, that is, at the onset of the Basic Submarine School course (I-7). Table VII contains these data.

TABLE VII. Incidence of Problems at the Time of Taking the Test Battery.

Response	Graduate Group		Drop Group	
	f	%	f	%
Yes, Undecided	16	7.3	13	22.0
No	204	92.7	46	78.0
Total	220		59	
Chi-square			9.49	
p(1df)			.005	

The response distributions for this item were similar to those obtained from the previous item and, as a result, the same grouping procedure was employed, namely, combining the "yes" and "undecided" responses. Consistent with the findings in Table VI, significantly more of the "drops" indicate having problems at the onset of Submarine School. These results may be expected in view of the fact that most of the individuals in both groups had served less than one year on active duty, it might be expected that problems such as broken homes, deaths, etc., would quite possibly not have been resolved prior to their volunteering for the Submarine Service.

The data from the next question (I-8), which was concerned with the individual's activities prior to their entering Submarine School could not be evaluated by the Chi-square method, because of the lack of sufficient frequency in some of the cells and the

inability to logically group the categories (See I-7, Appendix A). One of the reasons for inclusion of this item in the questionnaire was to get some indication of the number of individuals who might have volunteered for Submarine School as an escape from an undesirable Navy job or from a duty station they considered unpleasant. The percentage of men who stated that they had been working in a Navy job they disliked was 0.9% for the graduate group and 3.4% for the drop group. It should be pointed out that the majority of both the graduate and drop groups came from either a "Boot Camp" or a Navy school and, at the time of admission into Submarine School had not occupied a Navy billet long enough to form strong attitudes toward the Navy. It is possible that the item could have been stated in a less structured manner so as to obtain more useful information regarding the circumstances existing at the time the decision to volunteer for the service was made.

Along the same lines, Item No. 8 was designed to assess the attitudes of submariner candidates' parents toward their son's volunteering for the service. At the outset, it may be stated that there were no significant differences between the total response distributions of the grads and drops. However, the most remarkable finding was the similarity of the two groups in the positive attitudes of the submariner candidates' parents toward their son's joining the Submarine Service (SS). Exactly 61% of each group's parents were in favor of submarines. Though the Chi-Square analysis proved insignificant, some trends in the data were noted, for example, more of the graduates' parents indicated that they did not care either way (20.6%, as opposed to 13.6% for the "drops"). On the other hand, more of the "drop" group's parents expressed a negative attitude toward their sons joining the SS (25.4%, as opposed to 18.4% for the graduates).

Education and Work Experience

High School Subjects Most and Least Liked (I-9, I-10). In the Chi-Square analysis of these items, the response categories

"Social Sciences" and "English/Languages" were grouped together, as shown in Table VIII.

TABLE VIII. Preference of High School Subjects.

Subjects	Graduate Group		Drop Group	
	f	%	f	%
Science, Math	123	55.9	16	30.2
Social Sciences, English, Languages	45	20.5	13	24.5
Manual Arts, Shop Courses	52	23.6	24	45.3
Total	220		53	
Chi-square				13.174
p(2df)				.005

The disproportionately large preference of the graduate group for Math and Sciences, and a similar finding for the drop group with respect to Manual Arts and Shop courses is to be noted. Also of interest is the similarity of the two groups in relation to the Social Science/English/Languages category.

High School Subjects Least Liked.

Data pertaining to the least preferred high school courses (I-11) are contained in Table IX.

TABLE IX. Least Liked Subject in High School.

Subjects	Graduate Group		Drop Group	
	f	%	f	%
Science, Math	16	8.1	10	18.5
English, Languages	140	71.1	36	66.7
Social Sciences	41	20.8	8	14.8
Total	197		54	
Chi-square				5.27
p(2df)				>.05 - <.10

To be noted at the outset is the necessity of dropping the category "manual arts" because of too little frequency in that cell of the contingency table. While the 5% significant criterion was not met, some trends do appear in the data. Thus, disproportionately, more individuals in the drop group stated that their least liked subject was Math or

Science, 18.5% as opposed to 8.1% for the grads. Both groups were similar in their dislike of English and languages (66.7% drops and 71.1% grads). Finally, the social sciences category evoked more negative responses from the "grad" group (20.8%) than from the drops (14.8%).

Reasons for High School Dropout (I-12). The response distributions for this item are contained in Table X.

TABLE X. Reason for Leaving High School.

Reason	Graduate Group		Drop Group	
	f	%	f	%
Difficult school work	1	3.8	0	0
Interest loss	9	34.6	9	27.3
Had to work, not enough money at home	11	42.3	5	15.2
To enter Service	4	15.5	11	33.3
Family or personal problems	1	3.8	8	24.2
Total	26		33	

Perhaps the most significant finding in these data is the fact that only 11.8% of the Submarine School grads were high school dropouts, whereas 55.9% of the Submarine School drop group did not finish high school. The data in Table IX indicate the number in each group who dropped out of high school for various reasons.

A Chi-Square was not used for analysis of this variable again, because of the small cell frequencies. It is obvious from the percents

in Table X that the personal motivation and circumstances associated with the decision to leave high school for the two groups were noticeably different. Many from each group gave "lost interest" as a reason. The largest, single group of grads quit because the family needed money. Of the drops, a full third quit high school to join the Navy and nearly one quarter quit because of family or personal problems.

One might interpret the data to indicate that, of the Submarine School grad group, a large proportion quit high school from necessity, while the drops quit by their own accord.

High School Grades (I-13).

Because of a sparsity of frequency in certain of the cells, the five response categories were grouped into three categories: "good-excellent" "fair," and "poor." Table XI contain these data.

TABLE XI. High School Grades.

High School Grades	Graduate Group		Drop Group	
	f	%	f	%
Good/Excellent	89	43.2	10	19.6
Fair	111	53.9	26	51.0
Poor	6	2.9	15	29.4
Total	206		51	
Chi-square				40.63
p(2df)				.001

Prior to grouping the data, it was noted that 3.9% of the graduate group stated that

TABLE XII. SCHOOL BEHAVIOR

Expelled?					Played Hooky?				
	Graduates		Drops			Graduates		Drops	
	f	%	f	%		f	%	f	%
Yes	13	6.0	12	20.3	Never	100	47.4	16	27.1
					A Few				
No	205	94.0	47	79.7	Times	105	49.8	31	52.5
					Frequently	6	2.8	12	20.3
TOTALS	218		59			211		59	
With df = 1, p of Chi-Square = .005					With df = 2, p of Chi-Square = .001				

they had excellent grades, while none of the "drops" indicated that they were in this category. The graduates composed 39.3% of the "good" category, while only 19.6 of the drops were in that category. There was no difference in the "fair" category (53.9% for graduates, 51.0% for drops). The last category, "poor" showed the most striking differences as only 2.9% of the graduates stated that they had poor grades, while 29.4% of the drops stated they had poor grades.

School Behavior (I-16, I-17)*

Differences in school behavior, in terms of the proportions of both groups having been expelled and having played "hooky" is depicted in Table XII.

In each group, approximately half stated that they had played hooky a few times (49.8% for graduates, 52.5% for the drops). Forty-seven percent of the graduates had never played hooky, while only 27.1% of the drops fell into this category. In contrast, 20% of the drops "frequently" played hooky, as compared to 3% of the graduates. Similarly, disproportionately more (20%) of the "drops" had been expelled from school as compared to the same value of 6% for the "graduates." In short, the data in Table XII clearly demonstrates that the educational history of the drops was much less favorable than that of the Submarine School graduates.

The response distributions for Item 17, (Did you work while in high school?) for the two groups were quite similar, in that the vast majority of the members of both groups did hold part-time, summer, or in some cases, full-time jobs.

Similarly, the responses to Item 18 dealing with inter-school transfers during the adolescent and pre-adolescent years suggested that the "drop group" changed schools more frequently than did the graduate group, though the magnitude of the between-group differences did not meet the 5% confidence criterion. For example, 30% of the grads, as compared to 17% of the drops, had no

*Items 14 and 15 dealing with college training, were omitted, since less than 2% of either group had, in fact, attended college.

changes, while 58% of the drops and 48% of the grads had changed 3 or more times.

Consistent with the general findings regarding the superior educational achievement of the Submarine School grad group is the major finding from Item 21† (Did you hold any elected office in high school?), that 40% of the graduates and 18% of the drops held an elected office in high school, (confidence level for Chi-Square (df=1) = .005). Along similar lines, 8% of the grad group, as compared to 5% of the drop group, indicated that they had received a Scholarship award while in high school (I-22). This difference was not statistically significant however.

Sociological and Demographical Variables

Home and Family. There were no differences between the drop and grad groups in terms of the size and type of community in which the group members spent their developmental years (I-23).

However, differences in other related variables did appear. Table XIII presents data pertaining to the marital status of the submariner candidates' parents (I-24).

TABLE XIII. Status of Natural Parents.

	Graduate Group		Drop Group	
	f	%	f	%
Married and living together	152	90.5	27	56.3
Separated, divorced, living apart	16	9.5	21	43.7
Total	168		48	
Chi-square				28.14
p(1df)				.001

To be noted at the outset is the fact that several of the response categories were grouped in a reasonable manner in the interest of obtaining sufficient cell frequency to conduct the significance tests of interest is the larger number of intact families indicated by the grad group, 90% as compared to 56% for the drop group. There were more

†Items 19 and 20, dealing with job history since leaving school, produced insufficient data to analyze since most of the sample came directly into the Navy after leaving school.

than four times as many broken families in the drop group than in the graduate group. The term "broken families" is referred to in the sense of the combined categories, "married, but living apart," and "legally separated or divorced." The two categories "father deceased" and "mother deceased" were dropped as irrelevant since the subject's age at that period in his development was unknown, an item of biographical data believed to be important in interpreting such events.

Item 27, pertaining to the age of the subject's father at the time of his marriage, produced group differences (significance level of Chi-Square with 3 df of .02). Accordingly, more than one-third of the drop group indicated that their father married at an age of 20 or less. The comparable value for the grad group was 18%.

Group differences in the amount of formal education of their fathers may be seen from the response distributions to Item 28.

TABLE XIV. Father's Education.

	Graduate Group		Drop Group	
	f	%	f	%
Grade School and less	45	21.2	19	36.5
Attended High School	42	19.8	16	30.8
Completed High School	75	35.4	13	25.0
Attended or completed College	50	23.6	4	7.7
Total	212		52	
Chi-square			12.92	
p(3df)			.005	

The categories "attended college" and "completed college" were combined because of the relatively few responses in these categories within the drop group. It is interesting to note that the largest number of responses of the drop group fell into the "grade school" category. Thirty-six per cent had only a grade school education or less. In contrast, the largest category of responses of the graduate group was "completed high school," amounting to 35.4%.‡

‡In contrast, it should be noted that there were no significant differences between the education level of the graduates as compared to the mothers of the drop group, (I-34).

Socio-economic Variables. Data pertaining to the occupation of the submariner candidates' fathers were obtained from a list of ten occupational categories, with examples of specific jobs provided for each category (Items 29, 30). The men were asked to designate their father's chief occupation from one of these categories. While the variability of the response distributions was sizable, there were too few cases in some cells to analyze by Chi-square. However, several trends did appear (Table XV).

TABLE XV. Father's Occupation.

Occupation	Graduate Group (%)	Drop Group (%)
Military	7.9	7.1
Public Service	4.6	5.4
Sales	3.7	5.4
Semi-skilled and Unskilled	19.9	37.5
Skilled	34.8	30.4
Clerical	7.4	1.8
Wildlife and Agriculture	7.4	7.1
Business	7.4	.0
Semi-professional	2.3	1.8
Professional	4.6	3.5

The "military" category did not reflect any difference between the two groups. However, this category was not broken down into officer and enlisted categories. The "Public Service" and "Sales" categories did not differentiate between the groups. The next category, "semi-skilled" or "unskilled worker" did reflect a major difference between the groups. Nineteen and nine-tenths percent of the fathers of the graduate group were listed in this category as opposed to 37.5% for the drop group. The fathers of the graduates included in the "skilled worker" category equaled 34.8%, as compared to a comparable value of 30.4% for the "drop" group. Moreover, in the "clerical worker" category, the graduates' fathers equaled 7.4% as opposed to 1.8% for the fathers of the drops. None of the fathers of the drops were listed in the "business" grouping; whereas, in contrast, the graduate group's fathers had 7.4% of their members in this category. Finally, no

significant differences were noted in the last two categories, "semi-professional" and "professional." As a whole, the data suggest that the fathers of the graduates, more frequently held skilled and white collar jobs, and more frequently either owned or managed businesses than did the fathers of the "drop" group. At the same time, the graduates' fathers were less likely to have held unskilled jobs, as compared to the frequency of the drops' fathers holding jobs of this nature.

It may be well at this point to comment on the distribution differences obtained from Item 35 ("Did your mother have a job outside the home?") since this information is often assumed, not only to be related to the socio-economic level of the home, but also to be a contributory factor to the child's early development. In brief, the response distributions were significantly different (1% confidence level, Chi-Square, 2 df), largely as the result of the fact that disproportionately more (52%) of the drop group reported their mothers had a full-time job than did the grads (31%).

While the occupation of the father is assumed to be an indication of the family's socio-economic level, the income of the father is often considered to be a more direct indicator. The income of the fathers of the subjects proved to be a significant item that discriminated between the graduate and drop group at the .005 level, using the Chi-Square technique.

TABLE XVI. Father's Income.

Income	Graduate Group		Drop Group	
	f	%	f	%
Less than \$3,000	8	3.8	6	11.3
\$3,000—\$5,000	58	27.4	24	45.3
\$5,000—\$8,000	101	47.6	16	30.2
More than \$8,000	45	21.2	7	13.2
Total	212		53	
Chi-square				13.288
p(3df)				.005

It is immediately apparent that nearly three times as many of the fathers of the

drop group were in the lowest income category listed (under \$3,000 per year) as compared to the graduates' fathers. Similarly, 1½ times as many of the drops are in the \$3,000-\$5,000 category as compared to the fathers of the graduates. As expected, the majority of the graduates (68.8%, as compared to 43.4% of the drops is found in the higher income categories. Again, a trend is seen, even more clearly delineated by income than by occupation, namely that the members of the drop group are more likely to have come from a lower socio-economic background than are the graduates.

The next question (description of father) required the subjects to pick both a positive statement describing their father (considerate, like a buddy, etc.) and a negative statement (weak, moody, etc.), again describing their father from the possibilities presented. It was believed that the information derived from this question was unreliable since many subjects refused to make a response altogether, or would respond to a positive description, but not the negative. Many subjects stated that none of the possibilities listed were applicable in describing their fathers, but they would pick one even if it was meaningless. For information in passing and as a matter of record, the modal response of both groups to the positive list was "understanding." The modal response to the negative list was "strict."

Miscellaneous Variables

Several of the items on the Experimental Personal History Questionnaire were designed either to "tap" certain attitudes or to gain biographical information about aspects of the home environment which, hypothetically at least, may have affected attitudinal development.

While there were no significant differences in the response distribution for the grads as compared to the drops, it may be well to mention the nature of some of the non-discriminative items. First, the men were asked to check the word(s) out of a list of ten that best describes their father (Items 32 and 33) and mother (Items 36 and 37). Secondly, the relationship of birth order to the Drop/Grad criterion was found to be in-

significant based upon the data obtained from Item 38. Third, two items designed to obtain information about intra-familial relationships during the man's early developmental years showed no between-group differences insofar as parental discipline (Item 39) and the frequency of shared family activities (Item 40). Fourth, items numbered 46, 47 and 48 were aimed at obtaining information regarding delinquent or criminal history. As might be expected, there were too few admissions of past activity of this kind from either group, to warrant even a limited analysis.

There were however, significant differences between the response distributions of the drops and grads to several other, quite heterogeneous, items. First, and again quite possibly reflecting something about family stability during the formative years, when asked, "Have you ever run away from home?" (Item 45), the proportion of the drop group responding "Yes" was four times greater than the comparable value for the grad group (p of Chi-Square = .005, $df=1$). Secondly, information pertaining to characteristic smoking habits of the two groups was obtained from the response distributions to Items 43 and 44. Briefly, there were no significant differences in the proportions of the two groups who indicated they did or did not smoke (Item 43), but more of the drop group (27%) as compared to the graduate group (13%), admitted that they started smoking before they were 13 years of age.

Two items were designed to obtain information related to a man's self-esteem, an aspect of personality assumed, for the purposes of this study at least, to be valuable information in predicting individual differences in potential to adjust optimally to submarine conditions. Accordingly, item 41 quite directly asks for a man's own estimate of his self-confidence.* Table XVII presents the response distributions for the two groups.

It should be noted at the outset that in Item 41, the men were asked to indicate how

TABLE XVII. Confidence in Ability.

	Graduate Group		Drop Group	
	f	%	f	%
Average or less than average	75	34.7	33	55.9
More than average	116	53.0	18	30.5
Considerably more than average	27	12.3	8	13.6
Total	219		59	
Chi-square				10.278
p(2df)				.01

much confidence they had in their ability to succeed at a task. The task was undefined. To be noted also is the fact that the "average" and "less than average" categories were combined because of scarcity of responses from the graduate group in the "less than average" category. Over half of the graduate group (53.0%) apparently considered themselves to have more than average ability, while only 30.5% of the drops indicated this attitude. On the other hand, more than half of the drops considered themselves as having average or less than average ability (55.9%). Only 34.7% of the graduate group responded this way, with a much higher percentage being in the original "average" category. It should be emphasized at this point that these data pertaining to the enlisted volunteer's self-esteem were collected prior to the onset of Submarine School and therefore, reflect self-attitude quite possibly affecting his performance in the service. Obviously, data of this nature collected, for example, following a frustrating experience (such as failure in Submarine School), would have a distinctly different meaning.

Items were also introduced into the Experimental Questionnaire to obtain information pertaining to the interest patterns of the enlisted input into the Submarine Service. Accordingly, preferences for off-duty activity were inferred from the response distributions to Item 48.

Two categories were combined — "social drinking" and "playing cards" — the other categories were left intact. The largest, single group of the graduates stated that

*Only Item 41 is discussed here, since Item 42, aimed at identifying areas of "ego-weakness" produced response distributions not significantly different for the two groups.

TABLE XVIII. Off-Duty Activities

Activity	Graduate Group		Drop Group	
	f	%	f	%
Reading	101	45.9	14	25.0
Radio/Television	72	32.7	33	58.9
Social Drinking, Playing cards	30	13.7	5	8.9
Shop Work	17	7.7	4	7.2
Total	220		56	
Chi-square				13.52
p(3df)				.005

they devoted their time to reading (45.9%), while the largest group of drops spent their time watching television, or listening to the radio (58.9%). It is interesting to note in Table XVIII that a higher percentage of the graduate group (13.7%) spent their time drinking and playing cards than did the drops.

Finally, the characteristic interests of the two groups were further assessed, rather simply perhaps, by directly asking for activity and hobby preferences (Items 49 and 50). Table XIX contains the response distribution for the two groups.

TABLE XIX. Interests and Hobbies.

Interests and Hobbies	Graduate Group (%)		Drop Group (%)	
Music	9.7		13.0	
Ride motorcycles, etc.	11.1		13.0	
Nature study, gardening	4.0		2.6	
Art	6.2		11.3	
Collecting	8.5		2.6	
Dramatics, Debating	4.1		1.7	
Writing or Journalism	2.6		0.9	
Religious Activities	3.5		6.1	
Outdoor Team Sports	24.1		19.2	
Outdoor Individual Sports	26.2		29.6	

It is immediately apparent that the relatively large number of cells in Table XIX precluded any meaningful analysis of statistical significance. Nevertheless, interesting trends in the data remain. As is seen in

Appendix A, the men were asked to check all the activities in the list of ten in which they were interested and to which they had devoted a considerable amount of their time. At the outset, it is seen that the two groups were quite similar in their interest patterns, although the graduate group showed more interest in collecting-type activities, dramatics, debating and outdoor team sports. Finally, the drop group tended to show a greater preference for music, art, religious activities and outdoor individual sports than was seen for the graduate group.

SUMMARY AND DISCUSSION

There are many variables which are related to success or failure in the Enlisted Submarine School. When comparing the two groups of Submarine School candidates, we find first the obvious differences: as a group, the graduates earn higher scores on the Basic Test Battery, are older, and achieve a higher level of education. The scores on a psychiatric symptom type personality test are higher (more symptomatic) for the drop group and scores on a custom-tailored motivation test are lower (less well-motivated) for the drops.

Items of background information related to the man's service record that discriminated between Submarine School "drops" and "grads" were: the graduates had more nuclear-designated individuals in their group; had served more time on active duty; had more frequently come from "A" School; and less frequently had come directly from Boot Camp. Obviously, these findings are highly interrelated. An individual completing an "A" School would, of necessity, have had more time on active duty than someone from Boot Camp. A group with 75% of the members graduating from an "A" School would contain more nuclear-designated personnel. In brief, the successful members of the present sample have had more active duty and more specialized training.

A higher percentage of the graduate group were married. Again, this would be expected, since members of that group were older. A significantly greater proportion of the drops admitted to more problems, both at

the time of taking the battery of tests and at the time they joined the service.

The response distributions to seven background questionnaire items related to the school and educational backgrounds of the men differentiated between the two groups: (1) more of the graduate group preferred science and math courses; (2) more than half of the drop group did not complete high school, the largest single reason for quitting was to join the service. Of the graduates who did not complete high school (11.8%), the most typical reason was that they had a job to earn support money. Perhaps the most significant aspect of this question is not the reason for leaving school, but rather, the differences in the groups themselves in terms of the number who did not complete high school; (3) the graduate group earned higher grades in high school and showed more evidence of leadership ability at that educational level. For example, about 40% of the graduate group had held an elected office while in high school, as compared to 18% for the same value for the "drop" group.

The response distributions obtained from several biographical questionnaire items related to family background were significantly different for the two groups. The marital status of the parents of the two groups were different in that the majority of the graduate group had parents still married and living together, while, for the drops, about 43-44% had parents who were divorced, separated or not living together. It was also noted that the fathers of the drops tended to marry at a younger age and to have less formal education than did the fathers of the graduates. The level of the mothers' education did not seem to be related to the graduate-drop criteria, but the fact that she occupied a full-time job was significantly related in the direction of a greater likelihood for the mothers of the drops to fall in this category.

Questionnaire response patterns dealing with attitudes, interests and early developmental history also discriminated between the groups. For example, the drop group had less confidence in their ability to succeed, were more likely to have a history of running away from home and to have started smoking

at an earlier age. Preference for off-duty activities of the two groups also differed in that the graduate group preferred reading, while the drops preferred radio and television.

In brief, the results of this study indicate the importance of background variables in a training performance situation such as provided by the Basic Enlisted Submarine School. The group which did not perform adequately showed evidence of unstable family backgrounds, and problems in other performance areas (high school). The history of the Submarine School drops showed that fewer had completed a Class A School, that fewer of the group were nuclear-designated as compared to the graduate group. The latter group tended to come from a higher socioeconomic level, and tended to have different interest patterns than did the drop group.

The evidence presented in this study suggests that a properly constructed Personal History Questionnaire could provide data of considerable value for the Submariner Selection Program. Combined with personality and motivational test data, background information could more effectively identify the potential Submarine School failures.

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APPENDIX A
PERSONAL HISTORY

General Background--Military

1. What is your present military status? (Check all that apply)
 - a. USN
 - b. USNR (2 year)
 - c. USNR (10 week and 2 week)
 - d. 9901 and 9902
 - e. Other (STAR, SCORE)
2. Indicate total active duty time served up to the present
 - a. Less than 6 months
 - b. 6 - 12 months
 - c. 13 - 24 months
 - d. 25 - 48 months
 - e. More than 48 months
3. Indicate your last permanent duty station
 - a. Great Lakes or San Diego Recruit Training Stations
 - b. Fleet
 - c. Shore
 - d. Service School (A, B, or C schools)
 - e. Home (Reservists)
4. What is your marital status?
 - a. Never married
 - b. Married
 - c. Separated
 - d. Divorced
5. Did you have any serious personal or family problems at the time you enlisted in the service? (i.e., family illness, death, broken home, etc.)
 - a. Yes
 - b. No
 - c. Undecided
6. Do you now have any serious personal or family problems? (i.e., family illness, death, broken home, etc.)
 - a. Yes
 - b. No
 - c. Undecided
7. Before coming to Submarine School, which of the following were you doing?
 - a. Working at a Navy job you liked
 - b. Working at a Navy job you disliked
 - c. Attending school
 - d. Recruit Training
 - e. None of these

APPENDIX A

8. How did your parents feel about your joining the Submarine Service?
- Strongly in favor of it
 - Somewhat in favor of it
 - Didn't particularly care one way or the other
 - Somewhat opposed to it
 - Very much opposed to it

Schooling and Work Experiences

9. Which one of the following subjects did you like the most in high school?
- Did not attend high school
 - Sciences and Mathematics (i.e., Physics, Chemistry, Algebra, etc.)
 - English or Languages
 - Manual Arts (Shop work, Drafting, etc.)
 - Social Sciences (History, Geography, Civics, etc.)
10. Which one of the following subjects did you like the least in high school ?
- Did not attend high school
 - Sciences and Mathematics (i.e., Physics, Chemistry, Algebra, etc.)
 - English or Languages
 - Manual Arts (Shop Work, Drafting, etc.)
 - Social Sciences (History, Geography, Civics, etc.)
11. If you did not graduate from high school, why did you leave?
(Please list the MOST important reason)
- Found school work difficult
 - Just lost interest
 - Had to work as there was not enough money at home
 - To enter the service
 - Because of other personal or family problems
12. Generally, how were your high school grades? (leave blank if you did not attend high school)
- Excellent
 - Good
 - Fair
 - Poor
 - Don't know

SKIP TO ITEM #15 IF YOU DID NOT ATTEND COLLEGE

13. Which of the following subjects did you enjoy the most in college? (Mark only one)
- Math or Physical Sciences
 - English or Languages
 - Social Sciences (Psychology, Sociology, History, etc.)
 - Business Courses (Accounting, Management, etc.)
 - Other
14. Why did you leave college? (Please mark the MOST important reason)
- Found college work difficult
 - Just lost interest
 - Had to work, as there was not enough money at home
 - To enter the service
 - Because of other personal or family problems

APPENDIX A

15. Which one of the following best describes your school behavior?
 - a. I never played hooky
 - b. I played hooky a few times
 - c. I frequently played hooky
16. Were you ever expelled from school for any reason?
 - a. Yes
 - b. No
17. Did you work while in high school?
 - a. No
 - b. Usually had a part-time job or summer job
 - c. Occasionally had a part-time job
 - d. Worked full-time, and went to school part-time
 - e. Did not go to high school
18. While you were in grade and high school, how many times did you change schools?
 - a. None
 - b. Once or twice
 - c. 3 to 5 times
 - d. 6 times or more
19. Did you obtain a job after leaving school?
 - a. No
 - b. Worked part-time for six months or less
 - c. Worked part-time for more than six months
 - d. Worked full-time for six months or less
 - e. Worked full-time for more than six months
20. How many jobs have you quit because you didn't like them?
 - a. One
 - b. Two
 - c. Three
 - d. Four or more
 - e. None
21. Did you hold any elected office while you were in high school? (i.e., student body president, junior class president, student council, captain of the football or basketball teams, a social or academic club president, etc.)
 - a. Yes
 - b. No
 - c. Did not attend high school
22. Did you win any scholarship awards while you were in high school?
 - a. Yes
 - b. No
 - c. Did not attend high school

APPENDIX A

Home and Family

23. Up to age 18, what type of community did you live in, for the most part?
- a. On a farm
 - b. In the country (or a village of less than 2500 people, but not a farm)
 - c. In a small city (2500 to 25,000)
 - d. In a city (25,000 to 100,000)
 - e. In a large city (More than 100,000)
24. Which of the following describes the status of your natural parents? (mark all that apply)
- a. Both alive and living together
 - b. Married, but living apart
 - c. Legally separated or divorced
 - d. Father deceased
 - e. Mother deceased

ANSWER EITHER #25 OR #26

25. Until the age of 18, with whom did you live MOST of the time?
- a. Both natural parents
 - b. Father only
 - c. Mother only
 - d. Stepfather and mother
 - e. Stepmother and father
- 26.
- a. Stepfather only
 - b. Stepmother only
 - c. Legal guardian
 - d. With other relatives
 - e. Other (friends, foster parents, etc.)

Please answer the following questions in terms of THE PEOPLE WHO RAISED YOU, regardless of whether you were raised by your real parents, step parents, foster parents or legal guardian.

27. How old was your father when your parents married?
- a. Don't know
 - b. Younger than 18
 - c. 18 - 20
 - d. 21 - 29
 - e. 30 or older
28. How far did he go in school?
- a. Completed grade school
 - b. Attended high school
 - c. Completed high school
 - d. Attended college
 - e. Graduated from college

APPENDIX A

ANSWER EITHER ITEM #29 OR #30

29. What was your father's CHIEF occupation while you were growing up?
- a. Military (Army, Navy, Marines, Coast Guard, Air Force)
 - b. Public Service (Policeman, Fireman, Federal Agent, etc.)
 - c. Sales (Salesman, Store clerk)
 - d. Semi-skilled or unskilled worker (miner, factory worker, truck driver, watchman, etc.)
 - e. Skilled worker (machinist, mechanic, shop foreman, electrician, locomotive engineer, etc.)
30. a. Clerical worker (office clerk, bookkeeper, secretary, office supervisor, etc.)
b. Wild life and Agricultural (farmer, a ranch owner or worker, forester, fisherman, etc.)
c. Business (small store owner, store manager, factory owner, manager, etc.)
d. Semi-professional (artist, musician, entertainer, draftsman, technician, etc.)
e. Professional (Physician, Lawyer, Scientist, Engineer, Teacher, Pharmacist, etc.)
31. What were your father's average yearly earnings while you attended high school?
- a. Less than \$3000
 - b. From \$3000 - \$5000
 - c. From \$5000 - \$8000
 - d. More than \$8000

MARK ONE IN BOTH ITEM #32 and #33

32. Which of the following BEST describes your father or male guardian as you knew him?
- a. Considerate
 - b. Understanding
 - c. Efficient
 - d. Like a buddy
 - e. Didn't know him well enough
33. a. Strict
b. Stubborn
c. Moody
d. Weak
e. Disorganized
34. How far did your mother go in school?
- a. Completed grade school
 - b. Attended high school
 - c. Completed high school
 - d. Attended college
 - e. Graduated from college
35. Did your mother have a job outside the home?
- a. She had a full-time job most of the time
 - b. She occasionally had a full-time job
 - c. She had a part-time job most of the time
 - d. She occasionally had a part-time job
 - e. She didn't work at all

APPENDIX A

Answer ONE in both #36 and #37

36. Which of the following BEST describes your mother as you knew her?
- a. Considerate
 - b. Understanding
 - c. Efficient
 - d. Like a companion
 - e. Didn't know her well enough
- 37.
- a. Strict
 - b. Stubborn
 - c. Moody
 - d. Weak
 - e. Disorganized
38. In your family, were you
- a. the only child?
 - b. the oldest child? (of 2 or more)
 - c. the youngest child? (of 2 or more)
 - d. a middle child? (neither oldest nor youngest of 3 or more)
39. When you were growing up, how strict were your parents about the companions you chose?
- a. More strict than most parents
 - b. About as strict as other parents
 - c. Less strict than most parents
40. How often did your entire family go out together? (to a movie, picnic, etc.)
- a. Never (less than 3 times a year)
 - b. Less than once a month
 - c. More than once a month, but less than once a week
 - d. About once a week
 - e. More often than once a week

Miscellaneous

41. Generally, how much confidence do you have in your ability to succeed at a task?
- a. Somewhat less than average
 - b. Average
 - c. More than average
 - d. Considerably more than average
42. In which ONE of the following personal characteristics do you feel it is MOST necessary for you to improve?
- a. Speech or language ability or habits
 - b. Personal habits (i.e., smoking, drinking, neatness, etc.)
 - c. Relations with others
 - d. Education or general knowledge
 - e. None of these

APPENDIX A

43. Mark the statement that most nearly applies .
- a. I do not smoke
 - b. I am an occasional smoker (smoke at parties, when offered, etc.)
 - c. I am a light smoker (1/4 pkg cigarettes, or 2 pipefuls, or one cigar per day)
 - d. I am a moderate smoker (1-1 1/4 pkgs cigarettes, or 10 pipefuls, or 8 cigars per day)
 - e. I am a heavy smoker (2 or more pkgs cigarettes, or more than 10 pipefuls, or more than 8 cigars per day)
44. If you do smoke, how old were you when you started smoking?
- a. 13 years old or younger (before high school)
 - b. 13 - 18 years (while in high school)
 - c. 18 years to present (after high school)
45. Have you ever run away from home and remained away (not with relatives) for one night or more?
- a. Yes
 - b. No
46. Have you ever been placed on probation?
- a. Yes
 - b. No
47. Have you ever been arrested and confined for more than 30 days?
- a. Yes
 - b. No
48. To which ONE of the following activities do you devote most time during your off-duty hours?
- a. Reading
 - b. Playing cards
 - c. Listening to the radio or watching TV
 - d. Working in a shop (mechanics, woodworking, laboratory, etc.)
 - e. Social drinking (service clubs, bars, private parties)

Mark as many as apply in Items #49 and #50

49. In which of the following activities or hobbies have you been so interested that you have devoted considerable time and energy to them?
- a. Music (playing an instrument, singing in choirs, etc.)
 - b. Ride motorcycles, fly planes, sail boats
 - c. Nature study or gardening
 - d. Art (drawing, painting, etc.)
- 50.
- a. Taking part in dramatics or debating
 - b. Writing or Journalism (stories, school paper or yearbook)
 - c. Religious activities (other than choir singing)
 - d. Outdoor team sports (football, baseball, basketball, etc.)
 - e. Outdoor individual sports (golf, tennis, hunting, fishing, etc.)

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The purpose of this study was to investigate the predictive relationships between selected items of biographical data and psychological attrition in Basic Enlisted Submarine School. The results of this study indicate the value of biographical information of this kind in the identification of potential Submarine School drops.		

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