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UTILITY OF DEMOGRAPHIC AND PSYCHOLOGICAL MEASURES FOR THE PREDICTION OF ARMY SEPARATION

by

Marlene M. Tate

A Dissertation Presented to the
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The purpose of the investigation was to analyze the ability of a combination of physical measures, psychological measures, & demographic information to predict separation from the Army over the period of time defined as entry level status. A secondary purpose was to analyze the relationship of the variables with the type of separation. It is important to attempt to identify the causes of recruit attrition during training so that procedures for decreasing this attrition can be developed and implemented. In view of the finding & conclusion presented, the following recommendations were made: The psychological constructs used should be considered for inclusion in the new tests for the prediction of attrition and further study for the verification of the correlation between the psychological measures and attrition/non attrition status for individuals with a low-level physical conditioning should be encouraged.

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CHAPTER I

THE PROBLEM AND ITS IMPORTANCE

With the termination of the draft as of June 30, 1973, the U.S. military force became the All-Volunteer Force. The President's Commission on an All-Volunteer Armed Force, 1970, known as the Gates Commision, set two main objectives for the all volunteer force: to meet the peacetime military manpower requirements without conscription and to attract persons of adequate quality to meet the demands of the job (Hunter & Nelson, 1982).

The first objective has essentially been achieved as the services have been within 1.5 percent of Congressional mandated manpower requirements since the draft ended (Cooper, 1982). It is generally accepted that high unemployment rates in the youth civilian population and the adoption of increased military pay scales have contributed to this achievement. There is less agreement on the status of the second objective. As there is a lack of some absolute standard, the definition of quality for the All Volunteer Force is determined by comparing recent data to the statistics accrued during the years in which the draft was in effect.

From 1974 to 1980, the overall quality of All-Volunteer Force recruits service-wide, as measured by the scores on the Armed Forces

Qualification Test (AFQT) and the number of high school graduates, was broadly similar to the service population during the draft years of 1967 to 1973 (Binkin, 1984). (The AFQT is a composite score which is derived from the standard Armed Services Vocational Battery Test administered to all prospective volunteers. Scores are ranked from group I, the highest, to group V, and group III is about average for the United States population as a whole. Individuals scoring in category V are not accepted for military service.) The Army recruits during this 1974-1980 period, however, were an exception to this overall Armed Forces average as a change in the social and educational composition occurred (Cooper, 1982).

The nature of this change is illustrated by a comparison of Army recruits to the general population. From the end of the draft through 1981, among Army recruits, 65 percent of male Blacks and 57 percent of male Whites possessed a high school diploma. In contrast, for the same period and age group, 55 percent of Blacks and 78 percent of Whites in the male civilian population were high school graduates. In the 5 year period before the war in Vietnam, 33 percent of Army entrants placed in the upper mental categories. In the 5 year period since 1977, the corresponding figure has been 19 percent (Moskos, 1982). Additionally, the percentage of minorities increased. In 1977, Blacks represented almost 30 percent of the total Army active duty recruits although only 9 percent of the youth qualified for military service at that time were Black (Binkin, 1984). The decline in quality of Army recruits and the change in the minority representation during the late seventies was undoubtedly influenced by an unfavorable ratio of military to civilian

pay, a decrease in White youth unemployment rates, and the unfavorable change in educational benefits for the military.

The situation for Army recruits has since been reversed. The percentage of Army recruits having at least a high school education increased to 85 percent in 1981-83 (Binkin, 1984). This can be attributed both to a growth in the proportion of young Americans completing high school and the higher priority placed by the Army on attracting graduates as well as congressional legislation.

Quality ceilings mandated by Congress in 1980 limited the proportion of new Army recruits who scored in mental category IV to 25 percent and the proportion of new Army recruits without a high school degree to 35 percent; a 20 percent ceiling in mental category IV was further mandated for 1982.

The economic situation was also a contributing factor in the improvement of recruit "quality." Sizeable pay raises for the military enacted by Congress in 1980 and 1981 resulted in the pay of the armed forces being raised by roughly one-third in a two year time period.

Pay raises combined with an increase in unemployment rates, an improved educational benefits program, and intensified recruiting efforts by the Army, resulted in a marked improvement in the qualitative characteristics of recruits beginning in 1981. Binkin (1984) estimates that during 1981-83, 31 percent of Army recruits were in AFQT category I and II (above average), 49 percent in category III (average), and 20 percent in category IV (below average). The trend towards large racial imbalance also appeared to turn down in the early 1980s. After reaching an all-time high nearly 37 percent in 1979,

the proportion of Black Army recruits started to drop in 1980 and was down to 22 percent by 1983 (Binkin, 1984). Although this still exceeds the proportion of the eligible Black population, it is a reversal of the trend of 1973-1979.

The early 1980s have been a success for the Army and the Armed Forces in terms of the number and quality of recruits obtained. Dwindling birthrates in the United States since the mid-60s, however, will be affecting the supply of manpower for higher educational institutions and civilian labor forces as well as the Armed Forces. Assuming the size of the Armed Forces does not change, military entrance standards remain the same, and a constant proportion of high school graduates pursues higher education instead of enlisting, it is estimated that the Armed Forces will need to recruit 55 percent of the available manpower pool in 1990 compared to 42 percent during 1981-1983 (Binkin, 1984).

The interactive effect of economic factors and the quantity/quality of recruits has been recognized. There has been concern that military service has been redefined as an occupation rather than an institution by the All-Volunteer Army. Moskos (1982) stresses that the All-Volunteer Force need not be correlated with an occupational model but that the designers of the All-Volunteer Force have chosen this as their paradigm. This redefinition has resulted "in a policy of discharging people who are perceived to be unfit for service or unhappy with service and as a result attrition rates among first termers rose markedly" (White & Hosek, 1982, p. 68).

Procedures for the early discharge of trainees who demonstrated unsatisfactory performance and/or conduct were established with the

advent of the All-Volunteer Force. Originally known as the Trainee Discharge Program (TDP), the name of the program was changed to Entry Level Separation (ELS) in July 1984.

The Entry Level Separation Program applies to the initial active duty period (180 days for Regular Army). It is administrated under the provisions of Army Regulation (AR) 635-200, "Personnel Separations - Enlisted Personnel," Chapter 11, "Entry Level Performance and Conduct" (Note 1). Enlisted women who become pregnant while in training status are usually separated under the Entry Level Separation Program.

Although ELS discharges are the least cumbersome of the discharge categories, other Army discharge procedures, when warranted, can also be applied during the first 180 days. The majority of the studies dealing with attrition from the Armed Forces define attrition as discharge or separation from the Army for any reason.

After ELS discharges, the most common type of separation during the initial active duty period is Existed Prior to Service (EPTS) medical discharges. This discharge applies to trainees who were medically qualified at the Military Entrance Processing Stations and were later determined to have a disqualifying medical condition presumed or known to have existed prior to service, and who were then medically discharged. In a study conducted by the Surgeon's Office, Training and Doctrine Command, it was reported that 55 percent of the EPTS discharges were for orthopedic reasons, and that this percent has been rather consistent between training centers and from year to year (U.S. Army, 1985). A similar percent was also obtained in a study of Navy recruits (Landau and Farkas, 1978). It is believed that many of the

factors which lead to a discharge under the Entry Level Separation program are similar to those which determine whether an orthopedic problem is treatable or nontreatable (U.S. Army, 1985a). Most of the separations during the training period are under the Entry Level Separation program or the EPTS medical separation program.

Figures complied by the Deputy Chief of Staff for Personnel, Administration, and Logistics, Headquarters, Training and Doctrine Command (TRADOC), indicated a 8.2 percent Entry Level Separation attrition rate during basic training, the first 8 weeks, for fiscal year 1984 (FY 84). For FY 84, the EPTS medical discharge rate in the total Army was 3.9 percent overall (U.S. Army, 1984a).

During fiscal year 1985 (FY 85), the Commanding General of the Training and Doctrine Command (TRADOC), emphasized the need to reduce attrition rates. As Entry Level Separations require approval of the installation training commander or his representative, rates decreased considerably as a result of Headquarters emphasis. The Entry Level Separation rate for FY 85, for example, dropped to 3.5 percent for basic training. This was somewhat offset by an increase in the EPTS medical rates. EPTS medical rates increased from FY 84 to FY 85; and, during the first four months of FY 86, EPTS medical rates were 4.6 percent (U.S. Army, 1986a). (These overall averages include attrition in the Regular Army, the U.S. Army Reserve, and the Army National Guard.)

Background

A major concern with the All-Volunteer Forces has been the high rate of attrition before the end of the first enlistment period. First term attrition for the 1974 cohort of young men entering the military

was 37 percent but a focused effort reduced this to 29 percent during 1979 (Cooper, 1982). The Army in 1979, however, failed to meet their established strength objectives for the only time in the volunteer era (Hunter & Nelson, 1982). Attrition rates have varied among the services with the Army being the highest. When education is held constant, however, attrition rates are about the same for the various services (Moskos, 1982).

It was previously determined that the possession of a high school diploma was the best single measure of a person's potential for adapting to life in the military. In the seventies, high school graduates were twice as likely as high school dropouts to finish their enlistments, and this finding was unchanged when mental aptitude, as measured by test scores, was held constant (Moskos, 1982). Although the percentage of Army recruits having a high school diploma has increased considerably in the eighties, a reduction in attrition rates has not occurred.

Other categories have also been examined for an explanation of factors related to the attrition problem. On the basis of race, it has been found that Blacks in the lower aptitude levels perform more successfully in terms of retention than their White counterparts (Moskos, 1982). It may be that the Army is a conventional means for Blacks to achieve societal goals. There is also the push of high unemployment rate among Black youth. Binkin, Eitelberg, Schexnider, and Smith (1982) state that "unless economic recovery is unusually vigorous, relatively more--not fewer--black youth can be expected to find the military an attractive option" (p. 132).

That attrition might be associated with personal characteristics has been examined. An Army study found that answers to standard autobiographic questions on prior achievement, disciplinary problem history, self-image, and other items were correlated with higher attrition probability (Erwin & Herring, 1978). Farkas (1980) found that a significant difference in attitudes measured at the beginning of Navy recruit training between graduates and attrites. (This study was built on results obtained by Landau and Farkas in 1978 which concluded that individual-type variables were more significant predictors of attrition than were organizational variables.) The importance of individual variables is somewhat supported by the results of Coleman's study, "Equality of Educational Opportunity" in 1966. Although this study has been challenged, Coleman determined that attitude variables of self-concept and control of the environment accounted for more variance for both White and Black students than any of the other variables in the study (Kerlinger, 1973).

Several Marine Corps studies have concentrated on the measuring of stress combined with a psychological "locus of control" orientation. Knowledge of what to expect does seem to increase retention and reduce stress. Under experimental conditions, Navaro, Cook and Sarason (1981) determined a videotape entitled "Making It" had a positive effect on the expectations and the adjustment of Marine Corps recruits. Since the demands of recruit training are fixed and are established by formal policy regarding standard operating procedure, they felt that stress reduction in this environment could result by intervention aimed at increasing stress coping skills.

With a multiple regression design, Kowal et al. (1979) analyzed the ability of a combination of personal and physical measures to discriminate between basic training dropouts and graduates in the Army. They found that both male and female attrites had significantly lower levels of strength (as measured by an isometric strength devise), had a greater tendency for psychosomatic illness, and had fewer psychological mechanisms to deal with situational stress. Kowal et al. felt the results of their study could be improved upon if the sample could be followed into advanced individual training.

In 1984, the Commanding General of the U.S. Army Training and Doctrine Command (TRADOC) approved a Trainee Discharge Program Study Group to review the Army's Trainee Discharge Program. This study group attempted to identify the factors that have contributed to Entry Level Separation and also to recommend specific strategies for the solution of the problem. The data collected included structured interviews of drill sergeants and, whenever possible, interviews with service members who were awaiting final outprocessing before discharge. Summary training discharge statistics complied for each of the Army Training Centers were also analyzed. In the final report, Review and Analysis of the Army's Trainee Discharge Program (U.S. Army, 1984b), it was suggested that a need existed for reliable psychological testing as many soldiers were discharged for attitudinal/motivational reasons or due to their inability to adjust.

As a result of the Trainee Discharge Program Study Group recommendations, the Soldier Physical Fitness School assisted by the Directorate of Soldier Advocacy, U.S. Army Soldier Support Institute, Fort

Benjamin Harrison, Indiana, was tasked to develop an assessment instrument to predict motivationally and physically deficient soldiers. As a primary purpose of the study was intervention, the Soldier Physical Fitness School was also asked to develop a program of instruction for the identified individuals.

The study completed by the Soldier Physical Fitness School, known as the Fitness Unit Training Study, involved a preliminary study completed in early 1985. This pilot study sample was composed of approximately 400 males and 300 females. Physical measures were taken, recruits were asked to rank their success level for completion of basic training on a scale of one to ten, and pen-and-pencil motivational/ psychological tests were completed.

Based on the analyses of the preliminary study, scores on the selected measures were used to identify individuals having "high attrition risk" in a larger sample of approximately 1,800 males and 900 females. (This data was collected during April - May, 1985.) Approximately half of the soldiers identified by these measures were randomly selected and placed into a special Fitness Training Unit. Individuals in the Fitness Training Unit completed 3 weeks of extra training with a new program of instruction before the regular basic training was initiated. (Additional information on this study is reported at the end of Chapter II, Review of the Literature.)

The psychological constructs selected for use by the Soldier Physical Fitness School in this 1985 study were stress, achievement, conformity, locus of control, and mood. These constructs were selected after a review of previous military research. As the psychological

tests available appeared unsatisfactory for the problem and the military population, the scales for stress, achievement, and conformity were constructed by an Army clinical psychologist; the Mood Scale developed by the Navy was used to measure mood disposition; and the Rotter I-E scale, used in previous military research, was utilized to determine "locus of control" orientation. In an evaluation of these testing instruments by the Army Research Institute for the Behavioral and Social Sciences (Walker, personal communication, July 1985), it was recommended that, although these measures showed promise, the measures be evaluated over a longer period of time than basic training.

The importance of a variety of measures for the prediction of attrition has been acknowledged by researchers for the Armed Forces. Presently, a biographical screening test and a job performance predictor test are in the developmental stage ("New Tests", 1986).

The Problem

Basic training, the first 8 weeks of Army service, is a period of rapid resocialization and enculturation occurring in a structured environment. Discipline, motivation, physical conditioning, and the development of weapons skills are the goals of basic training. The requirements for discipline, motivation, and physical conditioning are continued in advanced individual training (usually 8 to 14 weeks) and are further combined with the requirements of learning various skills. (When basic training and advanced individual training occur at the same location, the program is known as One-Station Unit Training or OSUT.)

Attrition rates, due to early discharge during basic training or advanced individual training, and before the completion of the first

term enlistment, have totaled more than 30 percent of the number of new recruits. For data collected in late 1970s, statistical analyses have indicated that attrition was tied to educational level. Since the attrition rates have not decreased as the percentage of high school graduates has increased, this conclusion may no longer be valid. Achievement and conformity tendencies, stress levels, self-concept, control of the environment orientation, self-reported mood levels, and physical conditioning have been suggested as possible factors for the purpose of distinguishing "successful" recruits from individuals receiving discharges during the training period.

In prior studies, particularly when attrition/non-attrition status has been assessed at the end of basic training, the attrition group has been small relative to those who remained on active duty resulting in a skewed criterion variable. This skewness is related to lower correlations. As a reference point, the maximum biserial correlation which can be obtained with normally distributed, continuous, predictor variables correlated with a highly skewed, dictotomous criterion variable is approximately .47 (Guilford, 1950).

The size of the attrition group in previous studies, therefore, has limited the size of the correlations; in order to increase the size of the attrition group, the definition of separation in most studies has been separation for any reason; separate analyses for medical, administrative, or other types of separations have not been feasible. A second method of increasing the number of separations would be an increase in the criterion period in which separations are compiled.

Purpose of the Study

The purpose of the present investigation was to analyze the ability of a combination of physical measures, psychological measures, and demographic information to predict separation from the Army over the period of time defined as entry level status (180 days of continuous active duty for the Regular Army recruits). The physical and psychological measures used were collected from Army recruits at the Fort Dix Reception Station by the Soldier Physical Fitness School, Fort Ben Harrision, Indiana, as part of the Fitness Training Unit Test (U.S. Army, 1986b). The present investigation analyzed this data over a longer time period, thus increasing the size of the attrition group, and included additional demographic variables of educational level, AFQT percentiles scores, and race.

A secondary purpose was to analyze the relationship of the variables with the type of separation. As the majority of separations during the entry level period (180 days) are Entry Level Separation administrative discharges and Existing Prior to Service medical discharges, the data was further analyzed with the medical discharges eliminated from the sample. The results of the analyses with medical discharges eliminated resulted in a criterion measure of non-medical separations. Comparison of the results from the two criterion methods enabled the relationship of the variables with medical discharges to be inferred.

Importance of the Study

The Army makes a substantial investment in training, time, equipment, and related expenses when a person enters military service.

Separations prior to completion of an obligation term of service are wasteful as they result in the loss of this investment and generate a requirement for additional recruits. The manpower resources of the country are not unlimited and premature losses represent a large percentage of the available manpower. Although a ceiling on allowable recruit training attrition could be mandated, this could also result in higher attrition or increased disciplinary problems at a later point in the enlistment. Therefore, it is important to attempt to identify the causes of recruit attrition during training so that procedures for decreasing this attrition can be developed and implemented.

The recent study conducted by the Soldier Physical Fitness School analyzed the ability of psychological and physical measures to predict attrition during basic training. It was previously mentioned that the Army Research Institute recommended lengthening the criterion period to 180 days in order to verify the validity of the measures. This period of time represents the entry level period and includes all initial training for most individuals. The present study, which has a longer criterion period, will provide additional and important information for possible policy decisions by the Army.

Population of Interest

All individuals enlisting in the Regular Army, the U.S. Army Reserve, or the Army National Guard, process through an Military Enlisted Processing Station. At this time, recruits take tests, have a medical exam, and select their military occupational speciality. Individuals with detectable medical defects are rejected from the Army at this time. When initial active duty begins, the recruits attend

either basic training or OSUT. (OSUT or One Station Unit Training includes basic training and advanced individual training at the same location.) Individuals in basic training also attend advanced training upon completion of the 8 week course. The advanced individual training may, however, be at a different location.

The length of basic training is 8 weeks; the length of OSUT is 14 weeks. But, the length and location of other advanced individual training courses vary; they are dependent upon the speciality for which the individual is being trained. The average time range is 8 to 14 weeks although some highly technical specialities such as electronics may require up to a year of training. Individuals in the Regular Army normally begin advanced individual training within a week after basic training, although some variation may exist depending upon geographic location and class start-up dates.

Army National Guard and Army Reserve recruits have the option of split training; i.e., completing advanced individual training at some later date. Since this analysis was concerned with a continuous 180 days of training, the population of interest was restricted to the Regular Army component. During FY 84, 146,153 recruits entered the Army. Sixty-five percent or 94,970 of these accessions were in the Regular Army component.

Research Questions

The objective of the research was to examine the relationship of the measures (demographic, physical, and psychological) with the attrition status during the first 180 days of continuous active duty

for Regular Army recruits. In this context, the following questions were formulated:

1. Based on acceptable statistical significance ($p < .05$), did each set of variables correlate with attrition/non-attrition status?
2. What was the contribution (in terms of proportion of variance) of the different sets of variables?
3. Which individual variables exhibited statistically significant correlations ($p < .05$) with attrition/non-attrition status?
4. When medical discharges were eliminated from the sample with the resulting criterion measure of non-medical separations, were similar results obtained?
5. How effective were the discriminant functions obtained from the variables in correctly classifying men and women soldiers as to attrition/non-attrition status?

Sample Methodology and Definition of Terms

Basic training for the Army is conducted in eight locations. Fort Dix, New Jersey, is one of the largest Army Training Centers. Physical and psychological/motivational data on all recruits processing into Fort Dix during April 12 to May 23, 1985, were collected by the Soldier Physical Fitness School with the assistance of the Directorate of Soldier Advocacy, Fort Ben Harrison, Indiana. (This is a representative time period; the number of Army recruits is fairly constant during the year with the exception of December and June.) The sample for the present investigation was the Regular Army component of that group and was composed of approximately 1200 males and 600 females. A

representative from Soldier Physical Fitness School supervised the collection of physical measures, and a representative from Directorate of Soldier Advocacy administered the pen-and-paper instruments. Interviews with extreme scorers were also conducted in order to eliminate the possibility that scores were invalid due to difficulties in reading comprehension.

Individual demographic data of AFQT score, education level, and race were obtained by matching the social security numbers of the individuals in the sample with the Enlisted Master File maintained at Training and Doctrine Command Headquarters.

The matched social security numbers were then used as input to the Worldwide Post Locator maintained by United States Army Record and Evaluation Center, Fort Ben Harrision, Indiana; this process provided a current address or a separation designator, thus determining the soldiers' attrition/non-attrition status. In order to assure that the majority of the individuals in the sample had completed the time period during which Entry Level Separations can occur (180 days of continuous active duty), the information was obtained in January, 1986. This time period allowed for the 180 days for all individuals plus several weeks to process records.

The Enlisted Separation File, also maintained at the United States Army Record and Evaluation Center, was then examined to determine the reason for each separation.

Description of Analysis

Hierarchial multiple regression analysis and disciminant analysis were selected as the statistical procedures for the data.

(The correlation in these procedures are equivalent when the dependent variable is dichotomous.) Using this method, a series of simultaneous regressions were obtained with each containing an additional set of variables. This procedure allowed each set of variables as well as the total regression to be tested for statistical significance ($p < .05$). Additionally, the significance of each variable was analyzed. Data were analyzed using the Statistical Package for the Social Sciences.

After determination of a significant correlation ($p < .05$) between predicted values and actual results, the effect of the independent variables on different groups was examined. The groups chosen for blocking were respectively educational level, age, and race.

This analysis was restricted to four psychological/motivational variables; i.e., stress, conformity, achievement, and locus of control. The Mood Questionnaire, a list of 40 descriptive adjectives (such as happy, sad, angry) which recruits checked as being applicable to themselves, was not used for several reasons: (a) in pilot study data the measure was highly correlated with stress; (b) the total mood score in the Navy Study (La Rocco et al., 1978) was not significant; only the sub-score representing depression was significant; and (c) pilot study data indicated the mood score was not reliable across time. This analysis was also restricted to physical measures found significant during the analysis of this data by the Soldier Physical Fitness School at the end of basic training period.

In order to provide evidence for the adequacy of the prediction, the original sample was divided with two-thirds designated as a screening sample for determining the regression equation and the other

one-third representing the calibration sample used for purposes of cross-validation.

Definition of Terms

The primary terms used in this investigation are defined in this section. Definitions for military terminology and the independent variables are included. Operational definitions for the independent variables are provided in the Instrumentation Section in Chapter III.

Achievement Scale. A twenty-item scale reporting approach tendencies in generalized goal attainment and/or level of prior goal attainment.

Advanced Individual Training. Training, given to enlisted personnel subsequent to completion of basic training, enabling them to qualified for the award of a military occupational specialty.

AFQT Scores. Armed Forces Qualification Scores, a composite taken from the standard test, the Armed Services Vocational Apt tude Battery Test, including word knowledge, arithmetic reasoning, paragraph comprehension, and numerical operations. The AFQT scores are divided into five categories determined by percentile scores. The various categories are listed for reference:

Category	Percentile Score
I	93-100
II	65-92
III	31-64
IV	10-30
V	below 9

Attrition. A reduction resulting from individuals separating from the Army before the completion of their first enlistment.

Attrition/Non-attrition Status. The separating of individuals into two groups; i.e., individuals separating from the Army before the completion of their first enlistment versus those completing their obligation.

Basic Training. The training, in basic military subjects and fundamentals of basic infantry combat, of newly inducted and enlisted Active Army, U.S. Army Reserve, and Army National Guard components personnel without prior military service.

Calibration Sample. One-third of the sample resulting from the selection of the third record every third record thereafter. Used for the validation of the regression equations obtained in the screening sample.

Conformity Scale. A twenty-item scale measuring the inclination to accept prevailing standards or customs with regard to authority, family, and peers.

Criterion Measure. The determining of attrition status due to a particular type of separation; i.e., Entry Level Separation, medical separation, or all separations.

Criterion Period. The period of time, in terms of an individual's enlistment, for assessing attrition status.

Entry Level Separation Program. The involuntary separating of an Army member in entry level status when warranted by unsatisfactory performance and/or minor disciplinary infractions as evidenced by inability, lack of reasonable effort, or failure to adapt to the military environment. (Formerly called the Trainee Discharge Program.)

Entry Level Status. The time period representing the first 180 days of continuous active duty for the Regular Army component, or the first 180 days of continuous active duty following a break of more than 92 days.

Existing Prior to Service (EPTS) Medical Discharges. The discharging of individuals who were originally medically qualified at the Military Entrance Processing Stations (or elsewhere for some National Guard), who were discovered to have a disqualifying medical condition, presumed or known to have existed prior to service, after entering the service. (The medical condition must be identified within 4 months of the individuals' initial entrance on active duty.)

Fitness Training Unit. An additional 3 weeks training for soldiers judged deficient, primarily in physical skills. (The training is completed before the beginning of basic training.)

Fiscal Year (FY). The 12-month period for the transacting of business. (In the United States, the government fiscal year legally ends 30 September.)

Locus of Control. Believing in predominately an external or a internal control over the consequences of one's behavior, measured by a twenty-nine item scale developed by Rotter. (Ability and effort are classified as internal determinants of action while task difficulty and luck are classified as external determinants of success or failure. Externality is the perception of an individual that a reinforcement is the result of luck, chance, fate, as under the control of powerful others, or as unpredictable due to the great complexity of forces. Internality is the perception by an individual that a reinforcement

is the result of some action of his/her own individual behavior or permanent characteristics.)

Mood Questionnaire. A checklist of forty single adjectives describing emotional states, used in prior research. (Rocco et al., 1977, using factor analysis, developed six subscales as follows: Happiness, Activity, Depression, Fear, Anger, Fatigue.)

One Station Unit Training (OSUT). The combining of basic training and advanced individual training at the same location.

Physical Measures. Physical measures contributing to the variance between attrition and non-attrition groups at the end of basic training used as physical measures for this study. (In this study, pushups for men and pushups combined with hang-time for women were used.)

Race Category. The categories identifing an individual's race. (For the Armed Services, the categories are Caucasian, Negro, Other, Red, Yellow, and Unknown. For the purposes of this investigation, the categories are discussed as White, Black, and Other.)

Screening Sample. Two-thirds of the sample resulting from the elimination of every third individual. (Used for the calculation of regression equations.)

Trainee Discharge Program. See Entry Level Separation Program.

Stress Scale. A twenty-item scale reporting self-assessed anxiety experienced on a fairly regular day-to-day level. (Items included evaluation of self-confidence and symptoms of depression such as guilt, worry, sadness, sleep disturbances, and the inability to concentrate.)

Assumptions and Delimitations

Limitations to the study and methodological assumptions are further provided in Chapter III.

Delimitations

1. The sample was delimited to Regular Army recruits processing into the U.S. Army at Fort Dix, New Jersey, during the time period of April 12 to May 23, 1985.
2. As the present investigation is a continuation of prior research independent variables were restricted to those previously used and to demographic information available from military records.

Assumptions

1. Basic to multiple regression analysis is the assumption that the relationship between the dependent variable and independent variables is linear.
2. It is assumed that the selection of the type of advanced individual training is independent of the measures in the study.

Orientation to the Study

A summary of previous research related to the population being considered is found in Chapter II. The Fitness Training Unit Study, which provided the basis for this investigation, is described and discussed at the end of this chapter. In Chapter III, the design of the study is discussed in detail. A discussion of the basic model, the instruments used, and the statistical hypotheses are presented. Results of the research and possible interpretations based on these outcomes are discussed in Chapter IV. Chapter V consists of a summary and the conclusions and recommendations suggested by the findings.

CHAPTER II

REVIEW OF THE LITERATURE

Numerous studies and summary statistical reports dealing with attrition in the Armed Forces have been published. The studies differ widely in theoretical perspective, methodology, population analyzed, and their findings. Army data, for example, often contain a composite result of the various components, e.g., Regular Army, Army National Guard, and the U.S. Army Reserve. The population of Army recruits also may differ from those of other services.

In addition to differing populations, another dimension which can vary is the criterion period for which attrition is measured. Attrition rates are usually compiled at various completion stages. Some representative time frames are at the end of basic training, after completion of advanced individual training or the combination of basic training and advanced individual training, after 180 days of active duty service, after the first year or the first enlistment.

A third confounding element is the definition of attrition used when the data is compliled. Some studies define attrition as meaning separation from the service for any reason; other studies eliminate medical discharges or examine only one type of discharge. Delineation of these differences, whenever relevant, is presented in this review.

Demographic Data

Interest in predicting premature losses from the services existed before the All-Volunteer Forces and dates back at least to the early 1960s. Lockman and Warner (1977) report that before the All-Volunteer Force, researchers in the Navy, Army and Air Force found the best pre-service predictors were, in order, level of education, mental ability, and age. The multiple correlation of these three predictors with various measures of attrition was about .35 for all the services.

Permanent military records include demographic data such as age, race, educational level, and scores on the AFQT. These variables have, therefore, been analyzed in many post-hoc studies. As the number of women in the Armed Forces has increased, many reports and studies also contain statistics on the basis of gender.

Education

A high school diploma has traditionally been considered to be the best demographic predictor of attrition. The Office of the Assistant Secretary of Defense ("Report on the All-Volunteer Army," 1978) states, "Recruits who enter any of the services with a high school diploma have one-half the attrition rate of those who do not" (p. 68). That individuals without a high school diploma are at a higher risk to be separated from the service before the completion of their enlistment is a consistent finding in almost all attrition studies with attrition defined as separation from the service for any reason. Coleman (1982) analyzed the data from the 1981 and 1982 Regular Army cohort with the attrition limited to Trainee Discharge Program separations. For this group, however, he found a different result; a greater percentage of

high school graduates than non-high school graduates were discharged under the Trainee Discharge Program. (The program is now called Entry Level Separation.) Examination of separation statistics for non-medical reasons in FY 84 and FY 85 during the basic training period, however, suggest that non-high school graduates are still a higher risk category. This is displayed on Table 1.

Table 1

Percent Entry Level Separation for the Total Army in Basic Training/OSUT and Advanced Individual Training With and Without High School Diploma in FY 84 and FY 85

	Educational Level	
Type Training	High School Diploma	Non-High School Diploma
Basic Training/OSUT Combined		
FY 84	6.7	10.2
FY 85	3.0	5.5
Advanced Individual Training		
FY 84	2.3	4.1
FY 85	1.9	3.9

Source. Office of the Deputy Chief of Staff for Personnel, Administration, and Logistics, Headquarters, U.S. Army Training and Doctrine Command, Fort Monroe, Virginia.

Individuals having a General Education Certificate (GED) are typically included with non-high school diploma graduates. This is also standard policy in Marine Corps statistics (Carrigan & Frantz, 1982). Thomas (1984) found that non-high school graduates outperformed

the GED holders in every category for the FY 79 Regular Army accessions during the first enlistment. (His criterion categories included performance measures, such as promotions, as well as length of service.) In analyzing the larger variance in the GED subsample, Thomas concluded that the large deviations might be explained by the "variance" between tests available for the awarding of the GED certificate.

Undoubtedly guided by the fairly consistent finding that non-high school diploma graduates are a higher risk category, Congress imposed restrictions on the recruiting of non-high school diploma graduates by the services. In the Department of Defense Authorization Act for 1981 (Sec 30[illegible] 94 Stat 1082) enacted in 1980, the Army was limited to no less than 65 percent high school diploma graduates. (Also in this Authorization Act were restrictions on mental aptitude.) At the same time, Congress enacted sizeable increases in pay and benefits intended to shore up inadequate military wages and assist the recruitment of higher quality youth. A further pay raise occurred in FY 81. The effect of these pay increases coupled with a rise in youth unemployment has resulted in a dramatic increase in the number of high school diploma graduates in the Army. Binkin (1984) reported that Army recruits having at least a high school diploma averaged 55 percent in 1974-1976, 62 percent in 1977-1980 and 85 percent in 1981-1983. This level has been maintained. Data provided by the Deputy Chief Staff for Personnel, Administration, and Logistics, Headquarters, U.S. Army Training and Doctrine Command (TRADOC), indicate an average of 80 percent for FY 84 and FY 85. The average for the Regular Army component, however, was 90 percent.

It was anticipated that as the number of high school diploma graduates increased, there would be a decrease in the overall attrition rate. That this has not happened has been a source of concern.

Age

Thomas (1984) completed an extensive analysis of the relationship of age to attrition. He analyzed the FY 79 cohort file maintained by the Defense Manpower Data Center at Monterey, California; criterion measures included all types of discharges and other performance measures, such as promotions, over the first enlistment period. In this group, he found that ". . . as age increases (at time of entry) from 17 to 19 years, total service (performance) increases followed by a leveling off in the 19 to 24-year range. Performance decreases as age increases from 24 to 29 years old" (Thomas, 1984, p. 61). Generalization of this finding may be questionable as FY 79 was an unusual year in terms of recruitment. Coleman (1982) found similar results for the FY 80 and FY 81 cohort when the attrition criterion was limited only to Trainee Discharge Program separations. He reported, "The highest Trainee Discharge Program losses of male cohorts during FY 80 and FY 81 were among those who were 17 years old (13.9 percent and 13.3 percent) and those who were 22 (13.6 percent and 13.8 percent) and in the 23 and over group (15.9 percent and 15.6 percent)" (Coleman, 1982, p. 6). Both of these studies dealt with the Regular Army component only.

Examination of the relationship between age and attrition risk has resulted in contradictory conclusions in other branches of the Armed Forces. Carrigan and Frantz (1982) concluded that the older the Marine Corps enlistee, the higher the attrition rate. In Navy recruit

training, however, Farkas (1980) concluded the opposite result. Lockman (1977a) also found that the younger Navy recruits had higher attrition rates when attrition was measured at the end of the first year of enlistment. Stolzenberg and Winkler (1983), in summarizing many attrition studies, suggested that those who enlist at the earliest possible age are more likely to attrite than those who enlist later although this generalization may not hold across all assignments, locations, or occupational specialities.

Mental Ability

Since the beginning of World War II, the mental aptitude of new accessions has been measured by scores received on the Armed Services Vocational Aptitude Battery Test (ASVAB). A portion of the ASVAB scores is converted to a standardized test score known as the AFQT. Based on AFQT percentile scores, enlistees are classified into one of five mental categories with I being the highest. The average score is 50, which divides mental category III.

The comparison of All-Volunteer Force years to draft years is distorted by quotas imposed by Congress on the Armed Forces during the Vietnam period. "Project One Hundred Thousand was an experimental program intended to rehabilitate the nation's poor; it provided for the annual induction of 100,000 men who would not normally qualify for military service" (Birkin, 1984, p. 9). As a result, there was a relatively high proportion of Category IV recruits in the Army during this period.

Studies completed between 1976 and 1980 also contain distorted AFQT data. The quality of the All-Volunteer Forces, as measured by

AFQT scores, became a major concern in 1980 with "the discovery that the written tests used to screen applicants for enlistment had been mis-normed" (Cooper, 1982, p. 165). This error had occurred with the introduction of a new version of the standardized test in 1976; it resulted in the acceptance of many recruits who would have otherwise been ineligible. The Army was the most seriously affected, particularly in 1979, a difficult recruitment year for all services. Although comparisons across years is only valid when test scores have been renormalized, conclusions within a particular year between 1976 and 1980 have validity since all scores were calculated in the same manner.

Quotas were imposed by Congress to reduce the controversy concerning the quality of the Armed Forces. As part of the 1981 Department of Defense Authorization Act enacted in 1980, Congress limited to 25 percent the proportion of new recruits who scored in category IV. For 1982, Congress limited each service to no more than 25 percent category IV recruits. This was further reduced to no more than 20 percent for FY 83 (Hunter & Nelsen, 1982).

For the Navy and the Marine Corps, higher AFQT scores have been found to be associated with a higher probability of completion of the initial term of service (e.g., Mobley et al., 1979; Lockman 1977a,b; Fletcher & Giesler, 1981; Landau and Farkas, 1978). This result was also found for the Army and Air Force (Buddin, 1981); and Thomas (1984) verified this result for the FY 79 Regular Army component. In examining only one type of separation; e.g., Trainee Discharge Program separations, Coleman (1982), however, found a lower rate of attrition for category IV recruits. That an increase in the mental aptitude of

recruits had not resulted in a decrease in Trainee Discharge Program rates was concluded in the study conducted by Headquarters, U.S. Army Training and Doctrine Command (TRADOC) in 1984 (U.S. Army, 1984b). A comparison of the percentages in the upper mental categories (I-IIa) with Trainee Discharge Program attrition rates for FY 81 through FY 83 indicated an increase in both measures.

Gender

As women have become a larger percentage of the Armed Forces, separate statistics for gender are available. The number of women allowed to enlist is controlled by administrative totals. Women currently represent ten percent of the Regular Army. The lowest representation of women after World War II was 1.1 percent of total military strength; recruitment during the first five All-Volunteer Force years brought the figure up to 6.2 percent in 1978 (Coffey, 1979). Originally, higher education and mental aptitude standards were required for women. Although a high school diploma has not been required since 1979, due to sufficient supply most women recruits are high school graduates.

The education level and aptitude scores of women have, in effect, raised the educational and aptitude profile of the total Army during the first decade of the All-Volunteer Force. Birkin (1984) reports that, during the most difficult recruitment period in 1979, women constituted 12 percent of new Army recruits but accounted for approximately 18 percent of all high school graduates and 16 percent of all the category I recruits. As more qualified men have entered the service since the early 1980s, this effect has been lessened.

On the negative side, the attrition rate for females has been higher than that of males. For example, in FY 84, the EPTS medical discharge rate was 4.9 percent for female and 3.4 percent for males (U.S. Army, 1984a). The Deputy Chief of Staff for Personnel, Administration, and Logistics, Headquarters, TRADOC reported the FY 84 ELS rate during basic training and OSUT was 9.2 percent for females and 7.1 percent for males.

The attrition rate for Black females, however, is lower than that of White females and is more comparable to that of White males (Moskos, 1985; Enloe & Jordan, 1985).

Race

Empirical studies of military separations have come to differing conclusions concerning race effects. Most of the ambiguity, however, exists in studies dealing with Navy and Marine Corps recruits. Youngblood et al. (1980) reported bivariate statistics and multiple regression analyses demonstrating that Blacks are more likely to separate than non-Blacks in the Marine Corps. W. H. Sims of the Center for Naval Analysis, in the development of a Profile of a Successful Marine for use as a tool for the Marine Corps Recruiting Service (1977), found a different result. Sims concluded that once education level, mental aptitude, and age of a recruit have been determined, both minority and majority racial groups have idential chances of success.

Conflicting results are also presented in Navy studies. Lockman (1977a) reports higher attrition rates for Blacks than Whites in the first year of service but an absence of race effect in subsequent years. His study analyzed the 1973 cohort. For the 1974

cohort, he found no racial differential even in the first year. In a later study, Lockman (1977b) found race highly correlated with education and he eliminated race from his analysis. Another Navy study by Greenberg et al. (1977) found that Blacks are more likely to attrite than non-Blacks.

A different picture is portrayed in the Army both in terms of representation of Blacks and their attrition rate. In the Atlantic Monthly, Moskov (1985) reports:

> Since the end of the draft the proportion of high school graduates among Blacks entering the Army has consistently exceeded that among Whites, although the gap narrowed in the 1980s with the overall improvement in recruiting. In 1985, 95.4 percent of Black men joining the Army had high school diplomas, in comparison with 87.6 percent of Whites. Indeed, the Army's enlisted ranks are the only significant social arena in which Black educational levels (though not test scores) surpass those of Whites.
>
> In one important respect Black soldiers do significantly better than White soldiers; making it through the initial enlistment. Since 1978 about one White male soldier in three has been prematurely discharged for reasons of undisciplined behavior, lack of aptitude, psychological problems, or the like. The figure for Black male soldiers is one in four.
>
> Even among soldiers of similar educational background, Blacks are more likely than Whites to complete their enlistments. For women soldiers, the racial contrast in attrition rates is even more striking. Blacks now make up 42 percent of enlisted women (who account for 10 percent of the enlisted ranks overall). Black females have been far more likely to complete their enlistments than White females.

These conclusions appear to be consistent over the Army's All-Volunteer Force history. Erwin amd Herring (1977) found lower crude rates of separation for Blacks than Whites in the Army. Buddin (1981) found little race effect on attrition in the Army and Air Force overall; Blacks, however, did achieve a lower attrition rate in Army combat arms career management fields. (The combat arms fields are military occupational specialities with high attrition rates.)

Other Individual Variables

It is common terminology to explain the attrition problem as the result of motivational and attitudinal problems on the part of the individual. Landau and Farkas (1978) in their analysis of 4,483 Navy recruits found the administrative reasons for attrition during recruit training predominately reflect motivation and attitudinal problems. In studying Navy attrition, Yeller (1975) concluded that "attrites" had a negative attitude towards authority and discipline, a general disregard for law and order, and a lack of motivation or drive. That personality characteristics, attitudes, and past performance could identify enlistees with a high attrition potential has been the basis for various studies. These measures have had varying success.

Life History and Mood

In 1975, the Army implemented, on a limited basis, a Military Aptitute Predictor (MAP-75). Designed to be completed by non-high school graduates, the required information included an autobiographical questionnaire reporting extra curricular activities and sport participation in high school, civilian job experience, etc. Other variables considered were age, education level, AFQT scores, and the number of physical leg lifts a recruit was able to accomplish. Seeley, Rosen, and Stroud (1978), the developers of the MAP-75, felt the suspension of testing was partially due to the difficulty that recruiters had in scoring the autobiographical information. In the sample, the Early Experience Questionnaire had the highest zero-order correlation with attrition during basic training (r = .28 for high school graduates and r = .29 for non-high school graduates and GED).

Also exploring autobiographic information, La Rocco, Ryman and Biersner (1977) administered a Mood Questionnaire and a Life History Questionnaire to 1,292 U.S. Navy recruits beginning recruit tra ning. Utilizing factor analysis, the 29 biographic items on the Life History Questionnare were separated into three factors defined as social participation, family characteristics, and antisocial behavior. From the 40-item mood adjective checklist, six scales with required validity and reliability were developed. The scales were Happiness, Activity, Depression, Fear, Anger, and Fatigue. In multiple regression analysis, two of the Life History factors, Antisocial Behavior and Social Participation, and one of the Mood scales, Depression, were found to contribute significantly and uniquely to the regression. La Rocco et al. concluded that although the self-reported depression scale at the start of recruit training was shown to be effective in predicting success or failure in recruit training, this scale would be most useful in identifying individuals for counseling and remedial programs.

Motivation/Expectation

Landau and Farkas (1978) had 4,483 recruits complete questionnaires on motivations for joining the Navy. Data on intentions, expectations, attitudes, and a locus of control personality measure were collected. They analyzed this information and examined organizational factors as well. It was determined that the best predictor of attrition behavior was the stated intention to complete one's enlistment. Other significant attrition predictors were the intention to complete boot camp and specific general attitudes held concerning the Navy. Landau and Farkas also concluded that individual factors were more

important predictors of attrition than organizational factors at this early point in the enlistment.

Locus of Control

The locus of control personality scale, developed by J. B. Rotter in 1966, was administrated in the 1978 study described above. The scale, widely used in psychological research since its publication in "Generalized Expectancies for Internal vs External Control of Reinforcement", Psychological Monograph 80, no. 1, has exhibited high correlation with delinquency in teenage boys. (For more detail, see Definition of Terms in Chapter I.) Cook, Novaco and Sarson (1980) found a significant relationship between locus of control scores and the attrition rates. Reported attrition rates were 17 percent for externals, 13 percent for a mid-range group, and 7 percent for internals. Externals were also more negative in their self appraisals. In addition, recruits who were discharged for psychological/behaviorial reasons were significantly more external than either those who were graduated or who were discharged for other reasons. In spite of the significances of the locus of control measure, it was concluded that the predictive ability of this measure was small.

Landau and Farkas (1978) found no relationship for the locus of control items with attrition or non-attrition status. They concluded that differences may not have been detected because most individuals responded on an "internal" direction, thus skewing the distribution of scores. It was also pointed out that the items in the Rotter scale may have elicited responses that individuals felt were most socially acceptable.

Stress

The ability to deal with stress has also been hypothesized as a variable capable of predicting attrition from the services. Investigation of psychological functions in wartime was originally a key impetus to general research on human stress. That basic training is a stressful environment is fairly accepted. The recruits are exposed to intensive demands continuously with a high degree of supervision; they are isolated from all previous sources of social support, status, and self-esteem; and their behavior is highly constrained. Self-reports from recruits suggest that stress contributes to attrition from training (Mobley et al., 1979).

Navaco, Cook and Sarason (1981) developed and evaluated a coping intervention to assist Marine recruits in dealing with stress. This was a documentary of six actual Marines completing basic training, and its message was twofold. First, it conveyed that fear, anger, disappointment, and worry are perfectly normal and quite common reactions among recruits; it then portrayed the proper model for accomplishment of future tasks emphasizing the components of mental attitude, input, judgement, response, and results. They found that groups viewing the film module entitled "Making It" had higher expectations on how they would perform on these tasks; the recruits additionally experienced less trouble adjusting to the demands of drill sergeants than those who had not seen the film. The analysis also indicated that the coping skill module had differential effects according to locus of control orientation. Externals, who were shown in a prior study (Cook, Novaco & Sarason, 1980) to have a higher attrition rate, benefited the most.

Attempting to identify sources of stress, Wallick et al. (1982) investigated stress in Marine Corps basic training. They concluded that the recruits' perception of stress centered around six factors which are described below; and these factors, despite the uniqueness of recruit training, were very similar to those found for other organizational settings. Besides stress created by performance pressures, recruit interaction, and lack of personal freedom, the recruits' perception of the Drill Instructors appeared to include three critical determinants of stressful reactions. The clarity with which the Drill Instructor communicated instructions, the extent to which the Drill Instructor was considered an expert, and the recruits' perception of the support provided by the Drill Instructors were these potentially stress causing situations.

The ways in which people cope with stress is thought to affect their psychological, physical, and social well-being (Antonovsky, 1979). McCarroll, Kowal, and Phair (1981) concluded that "there may be a psychological dimension to ill health and non-adaptation to the military in the form of a heightened vulnerability to stress" (p. 467). They administrated a Health Opinion Survey to 1,462 Army recruits at the beginning of basic training. This 20-item questionnaire elicited responses on items such as "Have you ever felt you were going to have a nervous breakdown?" and "Are you ever troubled with sick headaches?" It was found that females scored higher than males on the Health Opinion Survey and had a higher relative risk of incurring an illness or injury during training than did males. High scorers of both sexes had about twice the relative risk of trying to complete basic training

as did low scorers. Hoiberg, Hysham, and Berry (1973) had included a somewhat similar scale in their study of Navy recruits called the Recruit Temperament Scale. They included other variables such as years of education and scores for the AFQT in a multiple regression analysis, but they found that the most powerful predictor was the 17-item temperament scale.

Physical Measures Combined with Other Variables

Although basic training is a physically oriented time period, relatively few studies have included physical measures in the analysis of attrition. Prescreening on physical conditioning has sometimes already occurred, however. The Marine Corps prescreens applicants to determine each recruit's level of physical fitness. Those failing to perform 2 chin-ups, 35 situps in 2 minutes, and/or to run 1-1/2 miles in 13-1/2 minutes are transferred to a Physical Conditioning Platoon. In the Army, Fort Jackson, South Carolina, and Fort Knox, Kentucky, have used a pushup test to determine if a soldier should be placed in a remedial physical training program (U.S. Army, 1986b).

Several Army studies have examined physical measures in combination with other assessments. In the sample used to develop the Army's Military Aptitude Predictor (Seeley et al., 1978), the number of leg lifts completed were found to be a significant discriminator between those completing basic training and those discharged.

Under the auspices of the U.S. Army Research of Environmental Medicine, the importance of physical measures and psychological measures was examined in a comprehensive study (Kowal et al., 1979). Physical measures obtained included isometric strength tests, aerobic

tests, height, weight, body fat, and lean body mass. In addition, recruits rated themselves on their prior physical activity using a scale of one to five. Other measures obtained were age, education level, responses to the Health Opinion Survey (discussed in the Stress subsection), and a Response to Life Problems Survey which purported to assess an individual's ability to cope with environmental or situational stress. Age, self-assessed fitness level, and the Health Opinion Survey were found to be significant predictors of attrition for both men and women. Isometric trunk and leg strength measures were also significant discriminators for women; for men, lean body mass and the "stress" coping measure were significant. Although a separate analysis of medical discharges versus administrative discharges was planned, this was not done. The authors felt that "to further subdivide the dropouts resulted in a drastic reduction in the sample size" (Kowal et al., 1979, p. 9). It was stated that the predictive ability of these measures would be improved if the sample could be followed into the second phase of training.

Fitness Training Unit Study

In 1985, the Soldier Physical Fitness School, Fort Benjamin Harrison, Indiana, was tasked to develop, refine, and validate an assessment instrument suitable for identifying trainees as candidates for a special Fitness Training Unit. In a preliminary exploratory study, the Soldier Physical Fitness School evaluated a sample of 399 males and 274 female recruits as they processed into the Army at the Fort Dix Reception Station during January 9-24, 1985. Twenty-one different measures were obtained for each new soldier. In addition to

reporting age, sex, and attainment/non-attainment of a high school diploma, the inductees completed written questionnaires consisting of five subtests (described in Definition of Terms, Chapter I), estimated their anticipated success for completion of basic training on a scale of 1-10, and were measured on 11 physical attributes. At the end of basic training, successful soldiers again completed the motivational questionnaires and were assessed on the physical criterion. The relationships between Reception Station measures and basic training outcome, in terms of physical performance and the completion of basic training, were analyzed. On the basis of this analysis, five measures were selected for further study. These were: (a) percent body fat; (b) number of pushups; and (c) number of pullups for men or flexed arm hang time for women; (d) the self-reported success expectancy score; and (e) the total score from the five part questionnaires. A level of acceptability, i.e., cutoff criteria, was established for these measures.

During the major phase of the Fitness Training Unit Study by the Soldier Physical Fitness School, all soldiers processing through the Fort Dix Reception Station from April 12 to May 23, 1985, were tested in these five measures. During April 12 to May 3, half of those who did not meet the established criterion level on two of the five categories were placed in experimental fitness training units; it was further required that one of the deficiencies be physical. The other half who did not meet the established criterion level on two of the five categories were designated as a control group and proceeded with the regular basic training program.

In the analysis of this data, the number of pushups was found to be a significant predictor of failure to complete basic training for males. For females, pushups were not significant as a large number of the sample could accomplish few or no pushups. Flex-arm hang time was also not significant. Flex-arm hang time, however, when restricted to the females who could not perform any pushups, was significant.

The Soldier Physical Fitness School (U.S. Army, 1986b) reported that the use of certain additional items, both physical and motivational, did in many instances permit better identification of failures but at unacceptable misprediction costs. Failure in this analysis included those discharge from the Army for any reason (i.e., both medical and administrative discharges); and recruits who did not graduate from basic training but who were not separated from the Army. These individuals were recycled; i.e., repeated the basic training course.

The data collected by the Soldier Physical Fitness School were used in the present investigation. The main differences are:

1. Recycled individuals were not included as "failures." The attrition group was composed of those who were discharged from the Army. The reason for each discharge was also obtained, and a second analysis was completed with medical discharges eliminated.

2. The individuals assigned to the Fitness Training Unit were not considered in present analysis as their experience was not comparable to the other recruits in that they received a additional 3 weeks of training before the start of basic training.

3. Additional demographic information was added to the data. This information was obtained from military records.

The number of individuals in each of the Fitness Training Units was approximately 70; there were separate Fitness Training Units for males and females. Examination of the discharge (or recyle) rate in the Fitness Training units compared to the control group indicates that the assessment measures and the revised program of instruction used in the Fitness Training Unit appear to have been benefical. The rates are displayed in Table 2.

Table 2

Fitness Training Unit (FTU) Test, Phase II Data
Discharge Rates in Normal, Control and FTU Groups
For Males and Females During Basic Training

Gender	Discharge Rates		
	Normal	Control	FTU[a]
Males[b]	4.0	16.0	4.0
Females[c]	3.2	17.1	6.2

[a]Regular Army only.

[b]Includes Regular Army, Army National Guard, and U.S. Army Reserve. N = 1,625.

[c]Includes Regular Army, Army National Guard, and U.S. Army Reserve. N = 919.

Source.. Test Report, Fitness Training Unit Test: Program of Instruction and Entry and Exit Level Separation, Soldier Physical Fitness School, Fort Benjamin Harrison, Indiana, February, 1986.

CHAPTER III

METHODOLOGY

This analysis investigated the ability of a set of measures to correlate with and to predict separation from the Army for Regular Army recruits during their first 180 days of continuous active duty service. The significance of the different types of measures in terms of proportion of variance was also examined. Significance of the measures was determined by discriminant analysis and multiple regression analysis using the Statistical Program for Social Sciences (SPSS-X).

The measures were selected from the physical and motivational data collected by the Soldier Physical Fitness School, Fort Benjamin Harrison, Indiana, in their 1985 Fitness Training Unit Test Study. Additional demographic data obtained from military records were added.

Due to active duty training contract limitations for U.S. Army Reserve and Army National Guard, the analyses in this investigation were restricted to the Regular Army recruits. Two separate criterion variables were used; they were separation from the Army for any reason and separation for non-medical reasons. In the second situation, medical discharges were eliminated from the sample.

Basic Model

A hierarchial regression model was used in this investigation. This model consists of a series of multiple regression analyses, each with one more variable (or set of variables) than the previous; the variables (or sets of variables) are added in a specified order. Cohen and Cohen (1975) in their discussion of multiple regression state, "A major advantage of the hierarchial analyses in multiple regression correlation is that once the order of the independent variables has been specified, a unique partitioning of the total variance accounted for by the k independent variables may be made. Indeed, this is the only basis on which variance partitioning can proceed with correlated independent variables" (p. 78).

Since the variables in this study were correlated, as determined by examination of pilot study data, the hierarchial model was selected for this investigation. In view of the similarities of the measures, the model was applied to sets of variables rather than the individual variables. When the proportion of variance attributable to a set of variables was significant, the individual variables in the set were further examined in terms of zero-order correlation and the stability of the regression coefficient.

This model was applied eight times. Data pertaining to males and females were analyzed separately since different physical measures were utilized for these groups; and both groups were analyzed with the two criterion measures. The model was initially applied to two-thirds of the data and validated in the remaining portion. After the cross-validation, the model was used with the data of the entire sample.

Order of Sets in the Hierarchial Discrimination Analysis.

In this model, the increment in the variance attributable to any variable or set of variables may change depending on its location in the hierarchy. The motivational/psychological variables as measured by their appropriate scale were added last for the following reasons: (a) as race and demographic variables are causally prior variables, these sets were added first; (b) as the physical measures exhibited a relationship with attrition in a prior analysis by the Soldier Physical Fitness School at the end of basic training, this set was added before the motivational/psychological variables; and (c) as the motivational/psychological variables represent measures not normally obtained from the recruits, these variables would need to exhibit significance after the other measures in order to justify the extra costs required to collect such data.

The order of sets in the heirarchy was as follows:

1. Set A: Race
2. Set B: Educational Level, Age, AFQT
3. Set C: Physical Measure
4. Set D: Motivational/Psychological Subtests

Cross Validation

The statistical procedure in multiple regression analysis or dichotomous discriminant analysis is designed to provide the highest possible correlation between the independent variables and the criterion variable. In this procedure, the measures and the resulting zero-order correlations with the dependent variables are assumed to be error free. The zero-order correlations between the criterion variable and

a particular independent measure may, however, vary from sample to sample. Although a decrease in the correlation is expected in an independent sample, there should still be a significant relationship. If not, ..e validity of the measures is suspect; the multiple correlation may be totally due to chance variations.

Cross-validation requires two samples. A regression equation is obtained from the first sample (screening sample). Predicted scores for the second sample (calibration sample) are then obtained by using this equation with the independent measures of this second sample. A Pearson correlation between the predicted scores and the actual scores in the calibration sample is then calculated. This correlation is analagous to a multiple correlation between the equation obtained in the screening sample and the measures in the calibaration sample (Kerlinger & Pedhazur, 1973).

In this analysis, one-third of the sample was withheld as the calibration sample for cross-validation purposes. As the original sample had been ordered by social security number and then indexed, the calibration sample was composed of every third record. Pearson r values for each calibration sample were computed as described above. When the r was statistically significant, the screening sample and calibration sample were combined.

Variables

Two criterion (dependent) variables were used in the multiple analysis regression and discriminant analysis. First, separation for any reason was the criterion measure. In the second analyses, the criterion measure was restricted to non-medical separations. In both

situations, the time period was the first 180 days of continuous active duty for Regular Army recruits. Individuals who were separated were coded 0 and those retained in the Army were coded 1.

Independent Variables

The following independent variables, suggested by prior studies in military settings, were used in this investigation.

Achievement Orientation. A quantitative variable representing a score from zero to twenty on an achievement scale further described in the Instrumentation section. A low score represents a lack of desire to achieve.

AFQT. A quantitative variable representing AFQT scores as quantitative percentiles.

Age. A quantitative variable representing age in discrete years at time of entry into the Army.

Education. A quantitative variable representing level of education. Education level was coded as 3 for those with a college or associate degree; as 2 for those with a high school diploma or a high school diploma and some college; and as 1 for those without a high school diploma or having a General Education Certificate.

Locus of Control. A quantitative variable representing a score from zero to twenty-nine on the Rotter I-E Locus of Control scale. A low score represents an external orientation.

Conformity. A quantitative variable representing a score from zero to twenty on a conformity scale further described in the Instrumentation section. A low score represents a higher degree of non-conformity.

Physical Measure for Men. A quantitative variable representing the number of pushups completed. The scoring methods and the procedure followed are provided in the Instrumentation section.

Physical Measure for Women. A quantitative variable representing the interaction of the number of pushups and flex-arm hang time. The measures, scoring methods, and procedures followed are described in the Instrumentation section. In prior analysis of the data, the Soldier Physical Fitness School found that pushups were a significant predictor of att[illegible]ion only for women who also achieved low (less than 20 seconds) flex-arm hang time. In order to capture this interaction, one was added to the pushup score (eliminating zero scores) and this modified number was multiplied by the hang-time.

Race. A dichotomous variable representing race. Whites were coded 1, and Blacks and other minorities were coded 0.

Stress. A quantitative variable representing a score from zero to twenty on a stress scale further described in the Instrumentation section. A low score represents susceptibility to stress.

Statistical Design and Test

The hierarchial analysis model is essentially a series of direct multiple regression analyses, each with one more set of independent variables than its predecessor, in a specified order. The proportion of the variance attributed to the first set, A, is the coefficient of determination when Y is regressed on set A; i.e., $R^2_{Y.A}$. The proportion of the variance attributable to the second set, B, is the increment in the coefficient of determination after set B is added to the analysis. If $R^2_{Y.AB}$ represents this coefficent, then the

difference represents the proportion of variance attributable to set B. (The difference is represented by $\underline{R}^2_{Y.AB} - \underline{R}^2_{Y.A}$.) The procedure is continued for each set of variables with set A representing all previous sets of variables and set B being the set under consideration. (When all variables are included, this model is equivalent to a simultaneous model.)

In this investigation, the null hypothesis was that there is no (significant) increase in Y variance accounted for when set B is added to set A. That is, $\underline{R}^2_{Y.AB} - \underline{R}^2_{Y.A} = I_B = 0$.

The statistical test was the $\underline{F}$ ratio of the normalized mean square for the unique B variance to the normalized mean square for the error at this point. The .05 level of significance was used.

If a set was significant in terms of the statistical test, examinations of the component variables in the set were completed. Both the zero-order correlations $\underline{r}$ of the individual variables and the stability of the coefficients of the variables were examined.

Significance of the Coefficients

In a multiple regression analysis, the equation form obtained is $Y = b_1x_1 + b_2x_2 + \ldots + b_kx_k + a$. Y is the predicted value for the measured independent variables $X_1, X_2, \ldots, X_k$. The coefficients $b_1, b_2, \ldots, b_k$ are developed statistically; they represent optimal linear estimates of the dependent variable (Y) when used with the specified independent variables. (When the b coefficients are standardized, they are known as beta coefficients.)

Coefficients with large standard errors are unreliable and may differ from sample to sample. The error in the coefficient depends

both on the variation in the variable and its correlation with other variables in the equation.

Beta coefficients were tested for significance by the t distribution. The null hypothesis was that for a particular beta coefficient, the population value was zero.

Data

The sources of data analyzed in this study were as follows:

1. The phase I and phase II data collected in the Fitness Training Unit Study were obtained. (This study is further described in chapter II.)
2. The TRADOC Enlisted Master File, a subset of the Enlisted Master File maintained by the Army Military Personnel Center, was used to obtain measures of race, education, and AFQT scores.
3. The Army-wide Location Resolution System maintained at the U.S. Army Records and Evaluation Center provided a current address or a termination of service designator for the subjects.
4. The Enlisted Separation Master File, also maintained at the U.S. Army Records and Evaluation Center, was examined to determine the reason for each termination of service.

Selection of Subjects

The Soldier Physical Fitness School, with the assistance of the Directorate of Soldier Advocacy, completed the physical measures and also administered the written motivational assessment to 1,828 males and 988 females processing through the Fort Dix Reception Station during April 12 to May 23, 1985. Included in this group were Regular Army, Army National Guard, and U.S. Army Reserve recruits. As active

Army training commitments for the Army National Guard and the U.S. Army Reserve do not require 180 days of continous service, this investigation was restricted to Regular Army recruits. (The Regular Army group contained 1,290 male and 709 female recruits.)

For this analysis, various subjects were eliminated due to missing data elements, participation in a Fitness Training Unit, separation after 180 days of service, or separation for reasons other than Entry Level Separation or EPTS medical separations. This information is itemized below:

1. Fifty-nine male and 66 females records were eliminated as they were not located in the Enlisted Master File. Therefore, demographic information was not available. (This was most likely due to incorrect social security numbers in sample data.)

2. Six male and 17 female records were eliminated due to missing psychological data elements. (One male in this group had been separated from the Army.)

3. In the research design for the Fitness Training Unit Study, selected individuals were placed in a Fitness Training Unit. As these individuals received longer training with a different program of instruction, their experience was not comparable to the rest of the sample. After the match of social security number with the Enlisted Master File, an additional 70 males and 66 females in the Special Fitness Unit were eliminated from this analysis.

4. Since the purpose of this analysis was attrition during the first 180 days of service for Regular Army recruits, six males who were separated from the Army after 180 days of service were eliminated.

5. Also deleted were four males and eight females separated by more stringent discharge procedures for reasons considered unrelated to the measures in this analysis. Two males were separated for failure to pass flight school medical; two males were separated with severence pay for disabilities implying service-related injuries; and the eight females requested separation due to pregancy or sole parent status.

This resulted in a final sample of 1,110 males and 552 females.

Data Collection Procedures

The physical and motivation measures were obtained from all soldiers processing at the Fort Dix Reception Station during April 12 to May 23, 1985. In order to insure uniformity in the collection procedures, representatives from the Soldier Physical Fitness School assessed the physical measures; and the motivational questionnaire was administrated by personnel from the Directorate of Soldier Advocacy. Additionally, individuals scoring high on the written questionnaire were interviewed to ensure the questions had been understood.

Instrumentation

This study included both physical and psychological measures.

Physical Measures

The physical measures utilized were defined as follows:

Pushups. The number of correct pushups accomplished in a 2-minute time limit as defined in Army Field Manual 21-20. If a soldier fails to perform the first few pushups correctly, the errors were explained, and the individual was sent to the end of the line to be retested. After the first ten pushups, no restarts were allowed; the test continued and correct pushups were counted.

Flex-Arm Hang Time. Starting with the chin above the bar and both palms in the same direction, the flex-arm hang score was the actual time in seconds the soldier is able to keep the arms flexed. Once the arms become straight, the time was recorded.

Psychological Measures

The scales for stress, achievement and conformity were constructed by a Army Clinical Psychologist after a review of available scales. This review indicated there were no appropriate scales, in totality, for the problems and the military population. (Scales reviewed were the Minnesota Multiphasic Inventory (MMPI), Comery Subscales of MMPI, Harris Lingoes subscales of MMPI, Wiggins Content Scales of MMPI, Jackson Personality Research Form, and the California Psychological Inventory.)

The primary emphasis of the constructed scales was that of face validity. Although measures of internal consistency were not calculated, a measure of the reliability for the scales can be inferred from their reliability over time. Correlations between pre- and post-scores from phase I data (from the Soldier Physical Fitness School), although separated by 8 weeks and the intervening experience of basic training, ranged from .65 to .70 for both the males and females.

The three constructed scales and the locus of control measure utilized are further described as follows:

Achievement Scale. Twenty true/false items which reported self-interpreted measures of past performance. Sample true/false questions were: "I generally try my hardest at whatever I do," and "Most people who know me would say I lack ambition."

Conformity Scale. Twenty true/false items which reported an individuals inclination to accept prevailing standards or customs in regard to authority, family and peers. The self-reported items included questions on familial discord, authority problems, and anti-social behavior. Sample true/false questions were: "I ran away from home at least once," and "Policemen tend to abuse their power."

Locus of Control Scale. Twenty-nine forced choice questions measuring one's belief as to the "cause" of events; i.e., external forces or one's own doing. A sample question was the following: "(1) Many of the unhappy things in people's lives are partly due to bad luck. (2) People's misfortunes result from the mistakes they make."

Stress Scale. Twenty true/false items constructed to measure anxiety, usually considered conducive to stress, on a fairly regular day-to-day level. The items included evaluation of self-confidence and symptoms of depression such as guilt, worry, sadness, inability to concentrate, and sleep disturbances. Sample true/false items were: "I have enough self-confidence," and "I feel blue or sad a lot."

Methodological Assumptions

Relative to methodology, the following assumptions were made:

1. The process of interviewing individuals with high scores on the written questionnaires did not influence the individual's final outcome of separation vs retention in the Army.
2. The reading level of the individuals with lower AFQT scores was sufficient to comprehend the questions on the various scales.
3. Responses to the questionnaire represented "real" responses rather than constructed or socially acceptable answers.

Limitations of the Study

To the extent that the conceptual assumptions enumerated in Chapter I and the methodological assumptions in this Chapter were not met, limitations in the investigation were present. Additional limitations are noted as follows:

1. No consideration of the possible differences in organizational structure encountered by the individuals in the sample was included in the investigation; i.e., basic training company, advanced individual training company, and the type/location of the soldier's first assignment.

2. Some of the data collected for the analyses were also used to select individuals for a special Fitness Training Unit. These individuals received an additional three weeks of training; they were eliminated from the study since their experience was not comparable to that of the other recruits. This elimination may have decreased the variance of the measures by decreasing the number of separations.

3. Entry Level Separations require the approval of the training commander, or his representative, at the installation. During FY85, the Commanding General of the Training and Doctrine Command (TRADOC) provided guidance emphasizing the need to decrease this type of separation. There was no control over the possibility that this emphasis, with the corresponding decrease in this type of separation, influenced the variance of the measures.

CHAPTER IV

STATISTICAL RESULTS

Hierarchial multiple regression equations were developed for the sample data. The increments gained in the multiple regression correlation, R^2, as additional sets were added, were tested for significance. (As discussed in Chapter III, this increment represents the proportion of variance attributable to the added set.)

Screening Sample Regressions

The screening sample was composed of two-thirds of the entire sample. "All separations" and "non-medical separations" were used as dependent criterion measures.

Criterion Measure: All Separations

Multiple regression coefficients of .2550 for males and .2511 for females were obtained. These correlations were significant at the .01 level for males and the .05 level for females.

For both the male and female sample, the set of psychological variables were significant at the .01 level. In the male screening sample, pushups were also significant at the .01 level; and the combined variables of educational level, age, and AFQT scores were significant at the .05 level. No other variable sets were significant for women. The regression results are exhibited in Tables 3 and 4.

Table 3

Male Screening Sample, n = 740
Results of Hierarchial Multiple Regression/Correlation Analysis
Criterion Measure: All Separations

Set	Variables Added (k)	Cum R	Cum R^2	Increment(I)	F Value for I	df k,n-k-1
A	Race	.0714	.0051	.0051	3.783	1,738
B	Ed, Age, AFQT	.1168	.0157	.0086	2.136*	3,735
C	Pushups	.1508	.0227	.0090	6.759**	1,734
D	Stress, Conf Ach, LC	.2550	.0650	.0423	8.256**	4,730
A-D	All Variables	.2550	.0650	-	5.639**	9,730

Note. Number of separations = 66.

*$p < .05$
**$p < .01$

Table 4

Female Screening Sample, n = 368
Results of Hierarchial Multiple Regression/Correlation Analysis
Criterion Measure: All Separations

Set	Variables Added (k)	Cum R	Cum R^2	Increment(I)	F Value for I	df k,n-k-1
A	Race	.0965	.0093	.0093	3.436	1,366
B	Ed, Age, AFQT	.1078	.0116	.0023	.282	3,363
C	Physical Meas	.1137	.0129	.0013	.477	1,362
D	Stress, Conf Ach, LC	.2511	.0631	.0502	4.795**	4,358
A-D	All Variables	.2511	.0631	-	2.679*	9,358

Note. Number of separations = 54.

*$p < .05$
**$p < .01$

Criterion Measure: Non-Medical Separations

When medical discharges were deleted resulting in a criterion measure of non-medical separations, the overall regression equation for males was significant at the .05 level. None of the individual sets of variables were significant, however. The significance may be due to one of the demographic variables and/or one of the psychological variables in the respective sets. Table 5 suggests this possibility. The distribution is quite skewed with 29 separations in a sample of 703.

In the female screening sample, the overall regression equation increased in significance to the .01 level when only non-medical separations were considered. Race also became significant for females at the .01 level. The set of psychological variables remained at the .01 level of significance. The results are provided in Table 6.

Table 5

Male Screening Sample, $n = 703$
Results of Hierarchial Multiple Regression/Correlation Analysis
Criterion Measure: Non-Medical Separations

Set	Variables Added (k)	Cum R	Cum R^2	Increment(I)	F Value for I	df k,n-k-1
A	Race	.0247	.0006	.0006	.421	1,701
B	Ed, Age, AFQT	.1036	.0107	.0101	2.375	3,698
C	Pushups	.1116	.0125	.0018	1.271	1,697
D	Stress, Conf Ach, LC	.1550	.0240	.0115	2.041	4,693
A-D	All Variables	.1550	.0240	-	1.893*	9,693

Note. Number of separations = 29.

*$p < .05$

Table 6

Female Screening Sample, n = 344
Results of Hierarchial Multiple Regression/Correlation Analysis
Criterion Measure: Non-Medical Separations

Set	Variables Added (k)	Cum R	Cum R^2	Increment(I)	F Value for I	df k,n-k-1
A	Race	.1608	.0259	.0259	9.093**	1,324
B	Ed, Age, AFQT	.1654	.0274	.0015	.174	3,339
C	Physical Meas	.1719	.0295	.0020	.731	1,338
D	Stress, Conf Ach, LC	.2658	.0707	.0412	3.702**	4,334
A-D	All Variables	.2658	.0707	-	2.823**	9,334

Note. Number of separations = 30.

**$p < .01$

Calibration Sample Correlations

In order to determine if the results obtained in the screening samples, although significant, were chance characteristics of the data or results common to other samples, the measures from the calibration samples were directly substituted into the respective screening sample regression equations. For both male and female calibration sample data, with and without the inclusion of medical separations, the correlations between the predicted measures and the actual measures were significant. This is illustrated in Table 7.

Due to concern with the correlation shrinkage in the female calibration sample, the composition of the both samples was further examined. A difference in the number of separations was found. The screening sample compared to the calibration sample had approximately three times the number of total separations (54 vs. 19) and three times

the number of medical discharges (24 vs. 8). The expected ratio would be two. Proportions of the variances are presented in Table 8.

Table 7

Male and Female Samples
Correlations in Screening Sample and Calibration Sample
With and Without Medical Separations

Group	Correlations and Number			
	Screening Sample		Calibration Sample	
	R	n	r	n
Male				
With	.255**	740	.200**	370
Without	.155*	703	.139*	350
Female				
With	.251**	368	.154*	184
Without	.266**	344	.172*	176

*$p < .05$
**$p < .01$

Table 8

Male and Female Samples
Screening Sample With and Without Medical Separations
Proportion of Sample Variance R^2

Group	Proportion of Variance	
	Screening Sample	Calibration Sample
Male		
With	.065	.040
Without	.024	.019
Female		
With	.063	.024
Without	.071	.030

Total Sample Regressions

With a total sample composed of the combination of the screening sample and the calibration sample, regression analyses for the male and female groups were developed. The series of regression equations were again developed twice for the two criterion measures; all separations and non-medical separations. Results for the total samples were similar to the results obtained in the screening samples.

In the total samples, the set of psychological variables was significant at the .01 level with either criterion measure.

Race, pushups, and the set of demographic variables were significant for males only when all separations were considered. Compared to the screening sample, the only change was the significance of race.

Race and the [illegible]up measure were not significant for males when the criterion measure was limited to non-medical separations. This lack of significance was also exhibited in the screening sample.

For the female sample, race was also significant with either criterion measure. In the screening sample, race was significant only when the criterion measure was non-medical separations.

The primary differences were found in the male sample when the criterion measure was non-medical separations. The regression with all the sets of variables was again significant; but, with a larger sample, the set of demographic variables and the set of psychological variables were also significant.

Results for the total samples, both male and female, with the respective criterion measure are provided in Tables 9, 10, 11, and 12.

Table 9

Male Total Sample, N = 1,110
Results of Hierarchial Multiple Regression/Correlation Analysis
Criterion Measure: All Separations

Set	Variables Added (k)	Cum R	Cum R^2	Increment(I)	F Value for I	df k,n-k-1
A	Race	.0766	.0059	.0059	6.537*	1,1108
B	Ed, Age, AFQT	.1141	.0130	.0071	2.650*	3,1105
C	Pushups	.1541	.0237	.0107	12.100**	1,1104
D	Stress, Conf Ach, LC	.2399	.0576	.0339	9.892**	4,1100
A-D	All Variables	.2399	.0576	-	7.470**	9,1100

Note. Number of separations = 104.

*p < .05
**p < .01

Table 10

Female Total Sample, N = 552
Results of Hierarchial Multiple Regression/Correlation Analysis
Criterion Measure: All Separations

Set	Variables Added (k)	Cum R	Cum R^2	Increment(I)	F Value for I	df k,n-k-1
A	Race	.0939	.0088	.0088	4.883*	1,550
B	Ed, Age, AFQT	.1140	.0130	.0042	.769	3,547
C	Physical Meas	.1191	.0142	.0012	.656	1,546
D	Stress, Conf Ach, LC	.2272	.0516	.0374	5.265**	4,542
A-D	All Variables	.2272	.0516	-	3.277**	9,542

Note. Number of separations = 73.

*p < .05
**p < .01

Table 11

Male Total Sample, N = 1,053
Result of Hierarchial Multiple Regression/Correlation Analysis
Criterion Measure: Non-medical Separations

Set	Variables Added (k)	Cum R	Cum R^2	Increment(I)	F Value for I	df k,n-k-1
A	Race	.0315	.0010	.0010	1.052	1,1050
B	Ed, Age, AFQT	.0954	.0091	.0081	2.856*	3,1048
C	Pushups	.1058	.0112	.0021	2.224	1,1047
D	Stress, Conf Ach, LC	.1662	.0276	.0164	4.398**	4,1043
A-D	All Variables	.1662	.0276	-	3.292*	9,1043

Note. Number of separations = 47.

*p < .05
**p < .01

Table 12

Female Total Sample, N = 520
Results of Hierarchial Multiple Regression/Correlation Analysis
Criterion Measure: Non-medical Separations

Set	Variables Added (k)	Cum R	Cum R^2	Increment(I)	F Value for I	df k,n-k-1
A	Race	.1519	.0231	.0231	12.248**	1,518
B	Ed, Age, AFQT	.1688	.0285	.0054	.932	3,515
C	Physical Meas	.1719	.0295	.0010	.515	1,514
D	Stress, Conf Ach, LC	.2487	.0619	.0324	4.269**	4,510
A-D	All Variables	.2487	.0619	-	3.739**	9,510

Note. Number of separations = 41.

*p < .05
**p < .01

Significance of Individual Variables

In order to determine the importance of individual variables, the zero-order correlations with the criterion measures were examined. The independence of the measures was also examined.

Zero-Order Correlations

Correlation matrices are presented in Tables 13 and 14; the lower diagonal represents the correlation of the variable when the criterion variable is separation for any reason and the upper diagonal represents the correlation when the criterion variable is non-medical separations.

Zero-order correlations between attrition and the four psychological variables were significant in almost all situations. In the female sample with the criteria measure of all separations, however, only stress and conformity had significant correlations with attrition.

It can be observed from the correlation matrices that the four measures are highly correlated among themselves. In both samples, using either criterion measure, the correlation between the stress measure and the achievement measure was approximately .6; between the achievement measure and the conformity measure was approximately .5; and between the stress measure and the conformity measure was approximately .4. The locus of control measure also had a correlation of .3 to .4 with the other psychological variables.

For the female sample with either criterion measure and the male sample with all separations as the criterion measure, race exhibited a significant correlation with attrition. This was an expected result since minorities have lower attrition rates.

Pushups were significant for the male sample only when the criterion measure was all separations. Since pushups were not significant when medical discharges are eliminated, there may be an association between poor physical conditioning and medical separations.

Examination of the intercorrelations between the individual variables indicates significant correlations between age and education level and AFQT scores. This would be expected as older recruits often have more education and thus score higher on standardized tests.

For the male sample with either criterion measure, the correlation between educational level and attrition was significant at the .05 level. The correlation between race and AFQT is also expected as Blacks have had lower AFQT scores historically.

The positive significant correlation between the four psychological variables, where a low score is favorable, and AFQT scores, where a high score is favorable, is interesting. It may be that psychological "problems" are associated with higher AFQT scores; or, those with lower AFQT scores may have reading difficulties. (The score orientation is described in Chapter III.)

For the female sample, there is also a significant correlation between conformity and race. As minorities were coded zero and a low score on conformity indicated a higher degree of conformity, it may be that minority females exhibit a higher degree of conformity.

Since the square of a zero-order correlation represents the proportion of the variance which is described by the relationship, it can be determined by an examination of Tables 13 and 14 that the magnitude of the correlation, although significant, was small.

Table 14

Correlation Matrix of Female Sample
Upper Diagonal Represent Attrition as Non-medical Separations[a]
Lower Diagonal Represent Attrition as All Separations[b]

	Att	Race	Educ	Age	AFQT	Push	Stress	Conf	Ach	Locus
Att	-	-.152**	.061	-.012	-.020	.023	.160**	.120**	.098*	.087*
Race	-.094*	-	.027	.083	.345**	.078	-.058	.090*	-.052	.100*
Educ	.052	.032	-	.175	.212**	.039	-.033	.095*	.110*	.058
Age	-.013	.090*	.187**	-	.067	.005	.031	.114*	.020	.104*
AFQT	.009	.343**	.212**	.076	-	.048	.060	.130**	.078	.115*
Phy	.030	.076	.036	-.008	.052	-	-.072	.048	-.003	.047
Stress	.131**	-.061	-.033	.028	.065	-.063	-	.368**	.579**	.389**
Conf	.159**	.085*	.093*	.126**	.144**	.037	.351**	-	.487**	.338**
Ach	.066	-.057	.103*	.019	.094*	.003	.596**	.472**	-	.332**
Locus	.057	.100*	.056	.107	.110**	.050	.384**	.311**	.327**	-

[a]The sample size is 520. [b]The sample size is 552.

*$p \leq .05$
**$p \leq .01$

Table 13

Correlation Matrix of Male Sample
Upper Diagonal Represent Attrition as Non-medical Separations[a]
Lower Diagonal Represent Attrition as All Separations[b]

	Att	Race	Educ	Age	AFQT	Push	Stress	Conf	Ach	Locus
Att	-	-.032	.091*	.027	.009	.050	.087**	.099**	.122**	.100**
Race	-.077*	-	-.075*	-.032	.324**	-.073*	-.052	-.019	-.066*	.071*
Educ	.078**	-.079*	-	.340**	.080**	.026	.002	.218**	.107**	.038
Age	.045	-.038	.334**	-	.157**	.002	.066*	.167**	.097**	.147**
AFQT	.021	.319**	.071*	.141**	-	.027	.097**	.115**	.111**	.184**
Push	.113**	-.088**	.025	.001	.032	-	.044	.067*	.064*	.036
Stress	.149**	-.056	.005	.067*	.080**	.061*	-	.048**	.577**	.382**
Conf	.167**	-.031	.216**	.174**	.106**	.073*	.414	-	.488**	.331**
Ach	.179**	-.079**	.112**	.106**	.103**	.082**	.585**	.500**	-	.366**
Locus	.121**	.062*	.042	.139**	.178**	.040	.381**	.335**	.365*	-

[a]The sample size is 1,053. [b]The sample size is 1,110.

*$p < .05$
**$p < .01$

Stability and Independence of the Measures

The stability of the measures was assessed by testing the coefficients of the respective measures by a t ratio of the coefficient (in standard form) to the standard error of the coefficient. Since the error increases when the particular measure is highly correlated with the other variables, this procedure provided an indicator of both the independence and stability of the measure.

In the female sample, the significant variables of race and stress were the most stable and independent measures for both of the criterion measures. The results are exhibited in Table 15.

Table 15

Female Sample
Significance of the Standardized Beta Coefficients

	Criterion Measure					
	All Separations			Non-Medical Separations		
Variable	Beta	t	Sign	Beta	t	Sign
Race	-.112	-2.458	.014*	-.161	-3.456	.001*
Education	.058	1.317	.189	.069	1.518	.130
Age	-.037[a]	-.858	.391	-.028	-.636	.525
AFQT	.013	.293	.760	.000[b]	.036	.972
Physical	.038	.905	.366	.037	.864	.389
Stress	.134	2.454	.014*	.141	2.537	.012*
Conf	.168	3.423	.001**	.093	1.826	.068
Ach	-.105[a]	-1.866	.063	-.055	-.952	.341
Locus	.000[b]	-.088	.930	.031	.646	.519

[a]Negative value due to intercorrelations. [b]Rounded to three decimals.

*$p < .05$
**$p < .01$

The results in the male sample were not consistent when the criterion measure changed. Pushups were a stable and independent measure when all separations were considered whereas educational level exhibited these characteristics only when medical separations were eliminated. (As in the screening sample, however, the number of male non-medical separations was small; i.e., less than 5 percent of the total sample.) The achievement orientation had the most stable coefficient when regressions for both criterion measures were considered. This is portrayed in Table 16.

Table 16

Male Sample
Significance of the Standardized Beta Coefficients

Variable	Criterion Measure					
	All Separations			Non-Medical Separations		
	Beta	t	Sign	Beta	t	Sign
Race	-.059	-1.873	.061	-.017	- .504	.614
Education	.045	1.407	.159	.078	2.443	.015*
Age	-.001	- .128	.898	.018	.603	.546
AFQT	.001	.204	.838	-.014	- .418	.676
Pushups	.090	3.049	.002**	.038	1.229	.219
Stress	.043	1.148	.251	.012	.308	.758
Conf	.074	2.088	.037*	.022	.607	.544
Ach	-.082[a]	2.105	.036*	.071	1.772	.077
Locus	.047	1.427	.154	.063	1.826	.068

[a]Negative value due to intercorrelations.

*$p < .05$
**$p < .01$

Correlations in Subgroups

The increase in the proportion of variance attributable to the set of psychological variables constituted the largest proportion of variance in the investigation. Although added last in the hierarchial model, the psychological variables were significant in all cases; i.e., in both the male and female sample with the criterion measure of separation for any reason and also with the criterion measure of non-medical separations.

In order to examine the effects of the psychological variables in different categories, multiple regression correlations were obtained for various subgroups. The criterion variable in the regression was attrition for any reason and the independent variables were the four psychological variables. In almost all cases, the psychological variables exhibited significant correlation with the criterion variable.

In the male sample, the psychological variables exhibited a higher correlation for Whites who were either over 22 or did not have a high school diploma. Similar analyses were not completed for the minority subgroups due to relatively small number of separations.

The psychological variables were significant in all subgroups examined; i.e., Whites, Blacks and others; Whites with a high school diploma; Whites without a high school diploma; Whites between 18 and 22 years of age; Whites over 22 years of age; and all recruits with AFQT scores equal to or greater than 50. All correlations were at the .01 level of significance with the exception of the minority subgroup; that correlation, however, was significant at the .05 level.

Similar correlations were obtained for the subgroups in the female sample. Since most females were high school graduates, female subgroups based on educational level were not considered. The multiple correlation between attrition/non-attrition status and the four psychological variables were significant at the .01 level with the exception of the subgroup of minority women. The number of separations in this subgroup, however, was small which decreased the possible variance. (Most of the separations were, in addition, for medical reasons.)

For the selected subgroups, the correlations between the psychological measures and the criterion measure of all separations are provided in Tables 17 and 18.

Table 17

Male Sample Subgroups
Results of Multiple Regression Correlation
and Variance for Psychological Variables
Criterion Measure: All Separations

Subgroup	Number in Subgroup	$\underline{R}$ Correlation	$\underline{R}^2$ Percent of Variance
Total Sample	1,110	.208**	.043
Black & Other	249	.226*	.051
White	861	.209**	.044
HS+	678	.181**	.033
Non-HS	183	.304**	.092
Age 18-22	655	.164**	.027
Age 23+	167	.303**	.092
AFQT > 50	748	.232**	.054

*$\underline{p} < .05$
**$\underline{p} < .01$

Table 18

Female Sample Subgroups
Results of Multiple Regression Correlation
and Variance for Psychological Variables
Criterion Measure: All Separations

Subgroup	Number in Subgroup	R Correlation	R^2 Percent of Variance
Total Sample	552	.189**	.036
Black & Other	208	.144	.021
White	344	.221**	.049
Age 18-22	209	.252**	.064
Age 23+	130	.272**	.074
AFQT > 50	402	.231**	.053

**$p < .01$

Sample Representation

In order to obtain a perspective on the sample representation, tree diagrams exhibiting the numbers of individuals and separations in each group and subgroup are provided in Tables 19 and 20.

Based on calculations with the data in these tables, the sample appears to be representative of the Army population expected from the review of the literature. For example, the male group had 22.4 percent minority representation, and the female group had 36.8 percent minority representation. For males, 81 percent of the group were high school graduates; female high school graduates were 97.1 percent.

Attrition rates were also representative in terms of rank order expected. Minorities had lower rates than Whites; male non-high graduates had higher rates as did those over 22 and under 17 years of age; females had higher rates than males.

TABLE 19

Subgroup Representation in Male Sample

Race	Education Level		Age		Separation[a]	Medical Separation
White: 861	HS & above: 678		17:	7	2	1
			18-22:	552	47	31
			23+:	149	15	9
	Non-HS & above: 183		17:	32	6	3
			18-22:	133	17	7
			23+:	18	4	1
Black & Other: 249[b]	HS & above: 221 (45)		17:	1 (1)	0	0
			18-22:	166 (30)	9 (1)	5
			23+:	54 (14)	2	0
	Non-HS & above: 28 (8)		17:	5 (2)	0	0
			18-22:	21 (4)	2	0
			23+:	2 (2)	0	0

[a]Includes medical separations. [b]Number of others in parentheses.

TABLE 20

Subgroup Representation in Female Sample

Race	Education Level		Age		Separation[a]	Medical Separation
White: 344	HS & above: 333		17:	4	1	0
			18-22:	205	34	9
			23+:	124	17	5
	Non-HS & above: 11		17:	1	1	0
			18-22:	4	0	0
			23+:	6	1	0
Black & Other: 203 [b]	HS & above: 203 (32)		17:	6 (2)	0	0
			18-22:	(20)	12 (2)	12 (2)
			23+:	(10)	7	2
	Non-HS & above: 5		17:	0	0	0
			18-22:	3	0	0
			23+:	2	0	0

[a]Includes medical separations. [b]Number of others in parentheses.

Predictive Ability of Variables

As part of the SPSS discriminate analysis software, the regression equations obtained were evaluated for each subject in the sample. On the basis of this discriminant score, subjects were predicted either to remain in the Army or to be separated. Predicted results were then compared to actual results in order to ascertain the predictive ability of the equation.

The predictive ability (using 50 percent probability for either situation) was approximately 70 percent. Although approximately 60 percent of the soldiers who were actually separated would have been, by these measures, predicted as "failures"; the measures also identified about 30 percent of the "successful" soldiers incorrectly. This is displayed in Tables 21 and 22.

Table 21

Male Sample
Criterion Measure: All Separations
Classification Results for the Variables

		Predicted Group Membership	
Actual Group	Number	Separation	Retention
Separation	104	66	38
Retention	1,006	311	695

Percent of cases classified correctly: 69%

Table 22

Female Sample
Criterion Measure: All Separations
Classification Results for the Variables

Actual Group	Number	Predicted Group Membership: Separation	Retention
Separation	73	43	30
Retention	479	154	325

Percent of cases classified correctly: 67%

Predictive Ability in Subgroups

The predictive ability of the psychological variables in the subgroups previously examined was similar to the predictive ability exhibited in the total sample. In general, the higher the correlation between the psychological variables and the criterion variable, the higher the predictive ability of the measures.

Fitness Training Unit. The original purpose of the measures collected by the Physical Fitness School, which were also used in this investigation, was to designate individuals for additional training in a Fitness Training Unit. During data collection, individuals were placed in the special unit when they exhibited "poor" performance on at least one physical measure and additionally obtained a second "poor" performance measure. The other measures for selection were percent body fat, self-rating of success possibility during basic training, total score on the psychological measures, or another physical measure.

(The individuals originally assigned to a Fitness Training Unit were eliminated from the present investigation.) Current policy is that individuals are placed in a Fitness Training Unit as follows: (a) males who perform less than ten pushups, and (b) females who cannot complete any pushups and also achieve flex-arm hang time measures of less than twenty seconds.

A multiple regression correlation and discriminant analysis was computed for the male subjects in the present sample who completed less than ten pushups. The correlation of the psychological measures with attrition/non-attrition status was .414; the predictive ability was 77 percent. There were 64 individuals in this group and 5 of these were minorities. Also, 12 of the 15 separations were for medical reasons. For this subgroup, stress and achievement were the significant variables. The results are displayed in Table 23.

Table 23

Male Subgroup
Pushups Less Than Ten
Criterion Measure: All Separations
Classification Results for the Psychological Variables

		Predicted Group Membership	
Actual Group	Number	Separation	Retention
Separation	15	9	6
Retention	49	9	40
Percent of cases classified correctly:		77%	

Although the results appear promising, the group size would restrict any generalization. Furthermore, it is not possible to determine whether any of the individuals in this sub-group were recycled; i.e., repeated basic training thus requiring 16 weeks of training.

A multiple regression correlation and discriminant analysis was also completed for a subgroup of women with "poor" physical condition, defined as females who accomplished zero pushups and less than five seconds of flex-arm hang time. (For the interactive measure used in this investigation, this was a product score of less than five.) There were 62 women in this subgroup, 25 of these were minorities, and the attrition rate was 23 percent. Half of the separations were also for medical reasons. The correlation and predictive value were larger than that in the total sample; the correlation was .394 and predictive ability was 73 percent. The results are portrayed in Table 24.

Table 24

Female Subgroup
Zero Pushups and Less Than Five Seconds Hang Time
Criterion Measure: All Separations
Classification Results for the Psychological Variables

		Predicted Group Membership	
Actual Group	Number	Separation	Retention
Separation	14	11	3
Retention	48	14	34

Percent of cases classified correctly: 73%

Discussion and Summary of Results

Although the multiple regressions obtained in this analysis were significant, the magnitudes of the multiple correlation, R, obtained were small. This is partially due to a relatively small percentage of separations which created a skewed criterion measure. (Separations represented 9 percent in the total male sample and 13 percent in the female sample. When only non-medical separations were considered, the percents were further reduced to four and eight percent respectively.)

As previously mentioned, the maximum biserial correlation, which can be achieved from normally distributed, continuous, predictor variables correlated with a highly skewed, dictotomous criterion variable is restricted to .47 (Guilford, 1950).

It can be seen by an examination of Table 25, which provides details concerning prior predictive studies utilizing regression analysis, that a higher multiple correlation exists in studies for which the percentage of separations were higher; i.e., Seeley et al., 1978, and Hoberg et al., 1973. These results were obtained by combining a group of individuals who had been separated with a second group retained in the Army during the designated time. They were not a concurrent group.

The smallest correlations in the present investigation were in the samples with the lowest separation rates. They were: (a) the male samples with the criterion measure of non-medical separation, and (b) the female calibration sample with either criterion measure. In these cases, separation rates were between four and six percent.

TABLE 25

Prior Correlation Studies Summarized from Literature Review with Size of Sample and Correlation

Author/Group	Dependent Measure	Independent Variables	Sample Size	Percent Attrition in Sample	R
Lockman & Warner 1973 Navy Male Cohort	Discharged during first year	Education, Age AFQT, Race Number of Dependents	67,000	17.5	Not Given[a]
Hoiberg et al. 1973 Navy Male	Discharged during basic training	Recruit Temperament Scale[b] General Classification Test Mechanical Aptitude Number of Suspensions or Expulsions from high school	4,897	50.3[c]	.51[d] .45[e]
LaRocco et al. 1975 Navy Male	Discharged during basic training	Depression Anti-Social Behavior Social Participation	1,292	6.0	.24[d] .18[e]
Seeley et al. 1978 Army Male	Discharged during basic training	Education, Age Aptitude Test Record of Civilian Court Correction Early Experience Scale[b]	278	29.9[c]	.33

TABLE 25 (Continued)

Prior Correlation Studies Summarized from Literature Review with Size of Sample and Correlation

Author/Group	Dependent Measure	Independent Variables	Sample Size	Percent Attrition in Sample	R
Kowal et al. 1979 Army Males	Discharged during basic training	Health Opinion survey[b] Comparative Fitness Lean Body Mass Response to Life Problems Age	854	12	.20
Kowal et al. 1979 Army Females	Discharged during basic training	Self-Reported Fitness Health Opinion Survey Age Trunk and Leg Strength[b]	[illegible]	12	.50

[a]Not given: 78 percent classification.
[b]Identified as most significant variable in the study.
[c]Not a concourrent group.
[d]Correlation in sample.
[e]Correlation in cross-validation.

Demographic Variables

As mentioned in Chapter II, research prior to the All-Volunteer Forces concluded that the combination of age, education, and AFQT scores had a multiple correlation of $\underline{R}$ = .35 with attrition. These variables, therefore, accounted for approximately 12 percent ($\underline{R}^2$) of the variance in former studies. In this investigation, the same variables account for less than one percent of the variance.

Pushups, a significant variable for males when the criterion measure was separation for any reason, accounted for only one percent of attrition variance. This does not mean that the physical conditioning portrayed by the pushup measure is not important. Rather, it suggests the group is relatively homogenous and capable with respect to this measure. The decrease in signficance for this measure when medical separations were eliminated suggests a possible relationship between poor physical condition and medical separation.

The physical measurement scores for women were also somewhat homogeneous. In this case, however, the number of females who could not originally perform pushups but, through training, were able to be successful, required the pushup measure for females to be modified by flex-arm hang time in the original analysis by the Soldier Physical Fitness School. The product, pushups plus one times the hang time used in this analysis to capture that interaction, was not significant. The high correlations of the physical measures in the study completed by Kowal et al. (1979) suggests alternate physical measures for females might be more predictive. No cross validation on this prior study, however, was completed.

Education level was significant as a predictor for attrition in the male sample when the criterion measure was non-medical separation. As most medical separations occur during basic training, and non-high school diploma graduates may lack the discipline to achieve in the classroom situation of advanced individual training, this result is not surprising. Of more interest is the increase in correlation between attrition/separations and the psychological variables in the non-high school subgroup. (See Table 17.)

Psychological Variables

The set of four psychological variables were significant in all cases for the total sample under either criterion measure. Stress was the most significant and reliable measure for women and achievement orientation for men. The conformity measure for both males and females correlated significantly with the attrition/non-attrition under both criterion measures. In three of the four situations, the standard error of the coefficient was satisfactory. The lack of significance of the conformity coefficient in the male sample limited to non-medical separations, however, may be due to the measure's intercorrelation with the locus of control measure.

Predictive Ability

As exhibited in Tables 21 and 22, the variables in this study identified close to 70 percent of the sample correctly. Examining the data from a different viewpoint, approximately 35 percent of the recruits would have been identified by these measures, and of those identified approximately 20 percent of these were actually separated. It can be seen these measures identify too large a failure group. The

results might be improved by weighting the regression coefficients or changing the probability level in the discriminant analysis procedure.

The predictive ability of the psychological measures in various subgroups determined by blocking on demographic variables were similar or less than the predictive ability in the total samples.

In the subgroup defined by "poor" physical conditioning, the correlation of the psychological variables with attrition/non-attrition status increased; this was accompanied by a corresponding increase in predictive ability. This suggests that the combination of psychological orientation and "poor" physical conditioning may a factor in the attrition in this subgroup. The large percentage of medical separations in this subgroup also suggests that individuals who have "poor" physical conditioning are likely to obtain medical separations. For males, this subgroup represented 6 percent of the entire male sample; it contained 14 percent (15 out of 104) of all separations and 21 percent (12 out of 57) of all medical separations. For females, the subgroup represented 11 percent of the entire female sample. Also, it contained 19 percent (14 out of 73) of all separations and 22 percent (7 out of 32) of the medical separations.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The objective of this investigation was the analysis of physical and psychological data, originally collected by the Soldier Physical Fitness School in their 1985 Fitness Training Unit Study, in terms of predictive ability for separation over the longer period of 180 active duty days for Regular Army soldiers. Additional demographic information was added for this continuation study.

Summary

The basic model was hierarchial multiple regression and discriminate analysis. The data were analyzed with two criterion measures; all separations, and non-medical separations. (In the second analysis, medical separations were eliminated from the sample.)

Research Question

The major questions in this investigation were whether the contribution of the sets of measures to attrition/non-attrition status over the extended time period were statistically significant; whether the contributions were dependent upon the type of separation; and whether the combined sets of measures were capable of discriminating between attrition/non-attrition status. Individual measures in the sets were examined to determine which were significant and independent.

Methodology

The hierarchial regression model was selected for this investigation since preliminary study data indicated intercorrelations between the independent variables. Male and female data were also analyzed separately since different physical measures were used.

Subjects. The male sample contained 1,110 recruits and the female sample was composed of 552 recruits. All recruits were Regular Army accessions entering basic training at Fort Dix, New Jersey during April 12 to May 23, 1985.

Instruments. Four tests, constructed to measure stress, conformity, achievement inclinations, and locus of control orientation, represented the psychological variables. The physical variables were the number of pushups for males, and the number of pushups modified by flex-arm hang time for women. Demographic measures of race, education level, age, and AFQT scores were added from military records.

Statistical Design. Hierarchial multiple regression correlation procedures were used to analyze the significance of the different sets of variables. The correlation obtain in the multiple regression analyses and the increment due to each added set of variables were tested for statistical significance.

In order to eliminate the possibility of chance errors within a particular sample, the sample was divided into two parts. One-third of the sample was withheld for cross-validation purposes. (The portion withheld was referred to as the calibration sample; the remainder was referred to as the screening sample.)

The hierarchial procedure was first completed in the screening sample. The results were used to obtain a Pearson r correlation between the scores predicted by these regressions and the independent measures in the calibration sample. The Pearson r correlation were tested for significance. Then, with significant results in the calibration sample, hierarchial multiple regression correlation analysis of the entire sample was completed.

When a set of variables was significant, further analyses, in terms of zero-order correlation of the individual variable and the stability of the regression coefficent of the variable, were completed. The correlation of the psychological variables with attrition/non-attrition status was also examined for various subgroups.

The predictive ability of the combined sets of variables was assessed using discriminant analysis procedures.

Findings

Significant multiple regression correlations between the combined sets of variables and separation from the Army were found in all situations; i.e., the screening sample, the calibration sample, and the total sample for both males and females with either criterion measure. Although significant, several of the correlations were lower than the others. The lower correlations occurred for the male samples with the criterion measure of non-medical separations, and for the female calibration sample with both criterion measures. This appears to be a function of the low number of separations in these subsamples.

The following results were found in the investigation; they were based on the analyses of the total female and the total male sample.

Results are presented in terms of the criterion measure utilized, the independence and significance of the individual variables, the correlation obtained between the psychological variables and attrition/non-attrition status, and the predictive ability of the variables.

Results with Criterion Measure of All Separations.

1. Race was a significant variable for both the male and female sample. (This reflects the lower attrition rate for these subgroups.)
2. Education, AFQT, and age did not contribute significant variance in either the male or female sample.
3. Pushups were a significant variable for the male sample. The physical measures were not significant for the female sample.
4. The variance contributed by the psychological variables was significant for both the male and female sample.

Results with Criterion Measure of Non-medical Separations.

1. Race was a significant variable for the female sample. (The lack of significance for males reflects that most of the minority male separations were for medical reasons.)
2. Education was a significant variable for the male sample. (The lack of significance for females reflects their higher education level.) AFQT and age were not significant for males or females.
3. Physical measures were not significant for either the male or female sample.
4. The variance contributed by the psychological variables was significant for both the male and female sample.

Significance of the Individual Psychological Measures.

1. The most significant and independent measure associated with attrition/non-attrition status was the stress measure for the female sample and the achievement measure for the male sample.
2. The conformity measure was significant for both samples. (The lack of independence with non-medical separations was most likely due to its intercorrelations with the other variables.)

Effect of Psychological Variables in Subgroups.

1. The correlation between separation and the variables was larger in the subgroups known to exhibit higher attrition; i.e., White non-high school graduates and Whites over 22 years of age.
2. For the male minority subgroup, the variables correlated significantly with separation. The small number of separations did not permit satisfactory analysis for minority females.
3. For the subgroups with AFQT scores equal to or above 50, the four variables were significantly correlated with attrition/ non-attrition status.
4. The highest subgroup correlations were in the male and female subgroups identified by "poor" physical conditioning.

Predictive Ability of the Measures.

1. The predictive ability was limited. Approximately 60 percent of those who separated would have been predicted to separate; but, almost 30 percent of those successful were also predicted.
2. The predictive ability was improved when analysis was limited to subjects in "poor" physical condition. The size of these subgroups, however, were too small to allow generalization.

Conclusions

The following conclusions were derived from data analyses:

1. The proportion of variance which was attributable to the psychological variables, with both criterion measures regardless of gender, suggest that scores on the psychological measures are a factor in determining attrition/non-attrition status in the samples.

2. Since the amount of variance attributable to the psychological measures decreased in the male sample when medical separations were eliminated, it appears that psychological "state" contributes to medical separation for males. The literature suggests this correlation might be associated with the group of medical discharges separated for orthopedic reasons.

3. Assuming most medical discharges occur during the basic training period, the significance of education level in the male sample when medical discharges are eliminated suggests that individuals who are non-high school graduates have higher attrition risk during the advanced individual training.

4. The high correlation of the psychological measures with the criterion measure for subjects in "poor" physical condition suggests attrition may be a combination of physical and emotional state.

5. The lack of significance for the pushup measure in the male sample when the criterion measure was restricted to non-medical discharges suggests that a low level of physical conditioning contributes to medical separations.

6. The lack of significance for the physical measures in the female sample and the succes of isometric testing in predicting

attrition for women in the study by Kowal et al. (1978) suggests that alternative physical measures might be examined as predictive measures for women.

7. Although the low-order correlations restrict the use of the variables for prediction of separation, the higher correlations in sub-groups with established higher attrition rates, suggests the variables could be used to identify recruits for intervention programs.

Recommendations

In view of the finding and conclusion presented, the following recommendations are made:

1. The pscyhological constructs used in this investigation should be considered for inclusion in the new tests for the prediction of attrition presently being developed ("New Tests", 1986).

2. Further study for the verification of the correlation between the psychological measures and attrition/non-attrition status for individuals with a low level of physical conditioning should be encouraged.

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