A multivariate analysis of certain personality and sociological characteristics related to the prediction of academic achievement in a Liberal Arts College for men

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A MULTIVARIATE ANALYSIS OF CERTAIN PERSONALITY AND
SOCIOLOGICAL CHARACTERISTICS RELATED TO THE
PREDICTION OF ACADEMIC ACHIEVEMENT IN
A LIBERAL ARTS COLLEGE FOR MEN

A DISSERTATION
SUBMITTED TO THE FACULTY OF ATLANTA UNIVERSITY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

BY
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CHAPTER I

INTRODUCTION

Rationale.--Man is forever predicting the likely outcome of his efforts. Mouly feels that at both the personal and professional level man's behavior implies some degree of expectancy. In educational and psychological journals for the last two decades, the prediction of academic success has been given a great deal of attention. Prior to World War II, predicting academic success in college was not a pressing problem because enrollment was low, most students were from the upper socio-economic level and there were no major demands placed on admission officers for sophisticated screening. However, after World War II an influx of students from all social strata sought admission to college. With the great growth in population of the nation, college enrollment steadily increased until it became necessary to become more selective in admitting students, since the expansion in college facilities had not increased with the demand for college admission. Trying to find the most effective way of screening all applicants and selecting those individuals, regardless of social class, who would probably be able to profit


most from college experience rapidly expanded into a perplexing problem. Consequently, many investigators in the field of education and psychology have been trying to ascertain the best way of predicting student performance.

In an attempt to develop more effective means of dealing with the problem of prediction, Stein undertook a review of the literature published during the 1950s. In the course of his review, he found that several different approaches were characteristic of studies purporting to predict college success. They were: the pilot experience, the social and demographic approach, the psychological approach, and the transactional approach.¹

In the approach that Stein called the pilot experience, the investigator selects an experience in the life history of the student that is most similar to college experience. Thus, for example, on the basis of a student's achievement in high school, a prediction of his success in college is made. A review of much of the past literature reveals clear evidence that achievement in high school is the best single predictor of college success.² The pilot experience approach, therefore, has yielded predictors of college success that are very reliable.

The social and demographic approach investigates the relationship between academic success and the social milieu in which the individual


has been reared. Some of the variables investigated in this approach include age, sex, birth order, religious and ethnic affiliation, parents' educational and professional status, and rural and urban residence.

The third approach, the psychological, concentrates upon investigating the characteristics of the individual's personality that are assumed either to hinder or facilitate his progress in college. Investigators use a variety of procedures to gather data on students' characteristics—paper and pencil tests, projective tests, questionnaires, and experimental situations.

The fourth approach to the problem of prediction enumerated by Stein is the transactional.\(^1\) The assumption basic to this approach is that success in college, like all behavior, is a function of the transaction between the individual and his environment. Within this approach, several methods are employed for making predictions. The major method involves the selection of a standard of performance. Additionally, the investigator seeks to determine those psychological characteristics that an individual needs to possess if he is to achieve this standard of performance. On the basis of his theoretical knowledge of personality or his knowledge of the situation the investigator hypothesizes a "model" of the successful student. He then studies the student to determine whether he possesses characteristics congruent with the model. Success represents congruence with the model.

In most current theories of behavior the idea is expressed that behavior is a function of personality and situational characteristics.

\(^1\)Stein, op. cit., p. 50.
The present investigator was able to find very little research that has considered both aspects of this proposition. A review of the literature concerned with the psychological approach revealed that the psychologists have looked for the effects of personality factors on academic achievement but overlooked the variation in the social environment.

The literature concerned with the social and demographic approach illustrates that sociologists have generally investigated only the characteristics of the social environment and have either eliminated or played down individual personalities. In their "pure" forms both the psychological and sociological approaches attempted to examine the main effects of each type of variable on academic performance. Neither approach has been strikingly successful. Lavin in commenting on these approaches indicated that their failure does not mean that the variables studied are not useful, but rather that the strategy of research is at fault.

One major assumption of this investigator is that neither psychological nor sociological factors alone is capable of substantially enhancing our understanding of academic achievement. If any major breakthrough is likely to come, it is the investigator's belief that it will be through the study of interaction among a number of personality and sociological variables.

This investigator embraces the transactional approach. This study differs from the usual transactional methods by investigating not only personality characteristics in a particular environment but also aptitude,

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study habits, reading skills and sociological variables, to determine which variables are significantly related to the prediction of academic achievement. The usual hypothetical "model" will, in this study, take the form of a null hypothesis.

Personality factors were included as major variables in this investigation because it is the investigator's assumption that personality is a product of social learning acquired primarily from experiences with other human beings. Personality is assumed to be rather consistent while at the same time it is a changing consistency, and it continues to change with experience from birth to death. It is never completely determined at some point in childhood so as to be unalterable thereafter. The scores from the Edwards Personal Preference Schedule were used to provide a measure of 15 personality variables, and the score from the Brown-Holtzman Survey of Study Habits and Attitudes were used as a measure of study habits and attitudes.

Sociological background determinants were investigated as major variables because of the inseparable connection between the individual and society. The relationship between certain socio-economic variables and academic performance has already been demonstrated or established. In the present study, family income, occupational status, parental education, size of family, and other background information were investigated. A questionnaire prepared by the investigator was used to provide information on sociological background data.

Aptitude and reading test scores were included in this study as major variables. It is the investigator's assumption that intelligence level is determined by the interaction of hereditary and environmental factors. Many intervening factors affect test scores, but the position is taken that success in school requires, in part, certain cognitive skills. It is assumed that these skills are measured to a significant degree by intelligence, aptitude, and reading tests. Test scores obtained on the School and College Ability Test were used as a measure of intelligence and aptitude, and scores from the Iowa Silent Reading Test were used as the measure of reading skill.

The criterion for academic performance was college grade-point averages. Stein's definition of a standard of performance is accepted by this investigator. Stein refers to a standard of performance as that level of quality of achievement that an individual is said to have attained by significant others.\(^1\) Therefore, grades assigned by teachers are standards of performance.

Academic performance, as indexed by the grade-point average, is subject to variation that falls into two categories.\(^2\) First, some types of majors in college may be more difficult than others. In order to control this source of variation, the determinants of performance were divided by curricular groupings.

The second source of variation is that teachers use different criteria for assigning grades. This subjective factor in teachers' grading practices is difficult to define and measure reliably. However, this

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\(^1\) Stein, op. cit., p. 50.

\(^2\) Lavin, op. cit., p. 19.
subjective factor, Lavin believes, should not be avoided by the substitution of other criteria of performance. To do this, he feels, would not enhance our understanding of the determinants of grades.¹ In this study, a student's grades should be viewed as a function of the interaction between student and teacher. In addition to the numerical value of grade point average for statistical purposes, we have an added variable in that grades may be viewed as an index of the social relationship between student and teacher.

The technical terms used in this study are statistical in nature and are defined as follows: **Beta Weight** refers to the multiplier of one of the independent variables in a multiple regression equation . . . that will yield the highest multiple correlation of the predictors with such a criterion as college marks.² **Criterion Variable** refers to the variable which is predicted in a regression equation. **F-Test** is used to test the significance of the ratio of two variances. **Multiple Correlation** \((r)\) refers to the correlation between a variable and two or more variables taken together. It is the highest possible correlation between the criterion and two or more independent variables.³ **Multiple Regression Equation** refers to an equation for computing for each individual a score on a criterion variable (the predicted score) from his score on each of several other variables. It is based on the correlation of each of the variables with the criterion and on their intercorre-

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¹Lavin, op. cit., p. 21.


³Ibid., p. 125.
lations.\textsuperscript{1} \textbf{Zero Order Correlation} is defined as the correlation between two variables in their original form.\textsuperscript{2}

\textbf{Evolution of the problem.}—Every September more than a million students enter America’s colleges as freshmen. Although each institution uses a particular set of criteria for selection, the attrition rate among most college students is approximately fifty per cent.\textsuperscript{3}

Many colleges select students by using high school grade point averages, which is the most effective predictor variable. When college achievement has been predicted from high school achievement, the correlation coefficients have averaged consistently around .55. This procedure in prediction has been referred to as the pilot experience approach. The variability in grading standards used in different high schools, however, is a factor that has limited predictive value of such grades. Another shortcoming is that grades, considered by themselves, provide little understanding psychologically of what is required to achieve either in high school or in college.

The "lag phenomenon" is another problem of the pilot experience approach. This approach can become effective only after students from specific high schools have been accepted at specific colleges over a period of time, and cannot be used with new high schools for which no information is available. It does not allow for change in the individual, nor does it take into account the problem of the "late bloomers", chance

\begin{footnotesize}
\begin{enumerate}
    \item Ibid., p. 126.
    \item Ibid., p. 450.
    \item Boyce, \textit{op. cit.}, p. 295; Marsh, \textit{op. cit.}, p. 481.
\end{enumerate}
\end{footnotesize}
factors, maturational processes, and the changes that may occur in the
individual as a result of exposure to new stimuli and new experience.¹

Usually some measures of scholastic aptitude and objective mea-
ures of achievement in high school are included in the set of criteria
for selection in most colleges. Tests of academic aptitude show that
such tests correlate about .50 with grades in college. Stern, Stein,
and Bloom have expressed the opinion that prediction of academic ap-
titude alone has been developed about as far as it can be. These authors
have indicated that they believe personality factors must be examined
in order to make progress in work on such prediction.²

One major shortcoming of the aptitude test is that a particular
test may be valid and reliable for predicting academic achievement for
college students in general, but it may fail miserably in predicting
the performance of students in any given institution. In order to be
useful, it is necessary for each institution to prepare expectancy tables
and select the best predictors of success based on the test performance
of its own students.

The social and demographic approach asks whether ecological char-
acteristics or characteristics of the social setting have any general
effect on academic performance irrespective of the personality of the
individual. In general, these studies tend to show that personality
characteristics pertinent to achievement are not simply randomly dis-
tributed in the population, but rather, they tend to be associated

¹Stein, op. cit., p. 2.

²G. G. Stern, M. I. Stein and B. S. Bloom, Methods in Personality
Assessment (Glencoe: The Free Press, 1956), passim.
systematically with position in the social structure. As currently used, this approach is rather limited in predicting college success because the dynamic interaction between personality factors and the social setting was not included.

Previous studies have generally found that using personality factors as predictors has not significantly aided in discovering the under-achievers. In most cases the relationship between personality characteristics and academic performance is quite weak and the findings are often inconsistent. Essentially, the literature presents a somewhat disappointing picture. Almost all of the studies using personality factors as predictors conceived of the individual as if he were operating in a social vacuum.

The writer's interest in this problem is an outgrowth of the failure of previous investigators to include sociological and personality variables as predictors of academic success. It is the investigator's contention that personality and sociological characteristics are useful in predicting academic success in college when these characteristics are used as significant variables. A review of the literature revealed that no previous investigator had combined measures of aptitude, reading and study habits along with personality and sociological variables.

It was important to try to determine whether college success can be predicted more successfully by an investigation of 48 variables, including measures of aptitude, reading, study habits, personality factors and sociological characteristics.

Statement of the problem.—In the past, some investigators have
attempted to predict college success by using the result of aptitude and achievement tests, while excluding sociological and personality influences. Other investigators have attempted to predict college success by analyzing personality characteristics and ignoring aptitude and sociological variables. Neither approach has been strikingly successful in predicting academic performance. The problem in this research was to select from a battery of 48 predictor variables those variables which yielded the optimum estimate of college grade point average at a Southern liberal arts college for men. The forty-eight predictor variables included measures of scholastic aptitude, reading ability, study habits, personality and sociological characteristics. A battery of the most efficient predictors was selected in the order of their importance.

The following variables were examined for their possible significance in predicting grade point averages:

**VARIABLES**

**Grade Point Average (Criterion Variable)**

**Predictor Variables**

1. Scat - Verbal
2. Scat - Quantitative
3. Scat - Total
4. Iowa Reading Score
5. Study Habit Survey
6. Edwards 1 - Achievement
7. " 2 - Deference
8. " 3 - Order
9. " 4 - Exhibition
10. " 5 - Autonomy
11. " 6 - Affiliation
12. " 7 - Intraception
13. " 8 - Succorance
14. " 9 - Dominance
15. " 10 - Abasement
The purpose of this study was threefold: first, to test the null hypothesis by postulating that all of the 48 predictor variables have a correlation coefficient of zero with grade point average. The second purpose was to establish a hierarchy of these variables in terms of their contributions to the prediction of academic success, while the third purpose was to abstract a personality profile of the academic achiever based on the significant predictors.
CHAPTER II

SURVEY OF RELATED LITERATURE

The related literature concerned with the prediction of academic achievement has reached voluminous proportions over the last twenty years. An examination of this literature indicated that these studies were characterized by much diversity. Studies differed from each other in criteria, methodology, and characteristics of students studied. Consequently, the present review will organize the related literature around five different methods of predicting academic achievements: High school grade point average, Intellectual factors, Personality factors, Sociological determinants and Predictors based on multivariate analyses.

High School Scholarship As Predictors

Cline (1941) analyzed admissions data on freshmen at Wayne University. The material examined included high school grade point average and a number of other ecological and demographic characteristics. The purpose of the analysis was to predict or find factors which correlated with academic success during the first year of college. Cline found that the best criterion for prediction of success was grade point average in academic subjects during the four years of high school.\(^1\)

In a review of more than two hundred prediction studies, Travers (1949) concluded that average high school grades surpass either subject matter tests or psychological tests as predictors of college grades.¹

Even when two groups of students did not differ on scores obtained on a standard aptitude test, Swansen (1957) found that high school students in the upper two-fifths of their graduating class received significantly higher grades at the end of the first semester of college than students who graduated in the lower three-fifths of their high school class.² High school grades not only predict the grades reliably during the first year of college, but Fishman (1957) has shown that they rank among the best predictors of future college success.³

Over a five-year period at the University of Southern California, Michael and Jones (1963) found that high school grades were consistently more predictive of college freshmen grades than either the part or total scores of the SAT.⁴


Altman, in a study of the effect of the rank in graduating class and size of the high school on academic achievement, found that: (1) rank in the upper ten per cent of the high school graduating class is a better predictor of achievement than rank in the remaining percentiles; and (2) there is no significant difference in achievement between graduates from various size of high schools. This study was a replication of previous studies by Garrett, Pierson, Dwyer, Thornburg, and Goldthorpe, and supports their conclusions.

Nichols (1966) using Merit Finalists as subjects reported that the best predictor of college grades was rank in high school class. Watley (1964) found that high school rank was of little value as a

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6 J. Harold Goldthorpe, "The Relative Rank in High School and in the First Two Years of the University," School and Society, XXX (1929), 138-134.

predictor of scholastic achievement for business students.¹

The variability in standards of grading used in different high
schools is one of the factors that have limited the predictive value of
grades. Bloom and Peters (1961) dealt with this problem and obtained
some interesting results. To adjust for the differences in standards
between high schools, they used an internal method and an aptitude
method. Correlations as high as +.85 were obtained between high school
grades and college grades. The average correlation obtained was approxi-
mately +.78.² Bloom (1964) went on to state that when these correla-
tions are corrected for the unreliability of grades, the theoretical
correlation is +.92.³ Needless to say, correlations of this magnitude
are extremely rare in educational research.

With the exception of the study by Watley ⁴ in which he found that
high school rank was of little value in predicting business school suc-
cess, the literature, of which only a representative sample is reported
here, supports the conclusion reached in several recent reviews⁵ that
high school performance is the best single predictor of success in col-
lege. The correlations between high school averages and college grades

¹D. J. Watley, "The Effectiveness of Intellectual and Non-Intel-


⁴Watley, op. cit., p. 407.

⁵Levin, op. cit., p. 52; Boyce, op. cit., p. 295; Marsh, op. cit., p. 481.
average only around .50. It is probable that the variation between different high schools in grading standards partially accounts for this low correlation. When Bloom and Peters\(^1\) used an index which adjusted for differences in high school standards, they reported an average correlation of .78 between high school and college grades.

It would appear that past academic performance predicts well future academic success. Inasmuch, however, as there is between 25 and 50 per cent of the variance in these predictions unaccounted for by high school performance, it may be necessary to examine additional factors to strengthen the prediction of college success.

**Intellectual Factors as Predictors**

There is considerable variation in the studies that employed intellectual measures to predict academic performance. Before examining some of the literature on the relationship between intellectual ability and academic performance, it should be made clear that intellectual factors in this context refer to ability that is measured usually by aptitude and intelligence tests.

The classical work that employed the Stanford-Binet\(^2\) and provided the greatest impetus and stimulation in the study of predicting scholastic achievement among students of high ability is the Stanford Study by Terman and his associates begun in 1921 designed to answer the questions: What are the mental, physical, and personality traits of intellectually

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\(^1\) Bloom and Peters, *op. cit.*

superior children and what sort of adult the typical gifted child becomes.

The subjects chosen for this study were selected by intelligence tests from a total school population of a million school children in California. This group represented the highest one per cent of the child population as measured by the tests used. Follow-up studies were conducted in 1927, 1939, 1951 and by mail follow-up at other dates.

When the college records of 570 men of this group of gifted students were investigated, Terman and Oden found that 489 had been graduated from college and 81 dropped out of college after two years. Of the graduating group, 22 per cent made grades of "C" or less as compared to 54 per cent for the non-graduates.

In seeking explanation for underachievement among the college students, Terman and Oden found that the causes were so numerous that no two subjects presented exactly the same picture.

"Most important were habits of idleness, unwillingness to do routine assignments, excessive amount of work for self-support, or deliberate choice to give preference to social and extra-curricular activities."

The reason given most commonly by students to explain their poor college achievement was the fact that in high school they made high marks without effort and that in college they underestimated the amount of study necessary to do passing work. Another explanation offered was their feelings of social inferiority because they were younger than their classmates;

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2 Ibid., p. 155.
3 Ibid., p. 157.
therefore, at college they attempted to compensate by pursuing popular activities or by affecting an anti-intellectual attitude. A few felt that the lack of stimulation in the lower school and the lack of guidance were responsible for their scholastic failures. Other factors mentioned were personality maladjustment, lack of motivation and ambition, and overwork for self-support.¹

In summarizing the results of their study Terman and Oden made the following observations:

... we have seen that intellect and achievement are far from perfectly correlated. Why this is so, what circumstances affect the fruition of human talent, are questions of such transcendent importance that they should be investigated by every method that promises the slightest reduction of our present ignorance. So little do we know about our available supply of potential genius, the environmental factors that favor or hinder its expression, the emotional compulsions that give it dynamic qualities, or the personality distortions that make it dangerous.²

On the question of prediction based on this study, Terman stated:

The follow-up of these gifted subjects has proved beyond question that tests of general intelligence, given as early as six, eight, or ten years, tell a great deal about the ability to achieve either presently or 30 years hence. Such tests do not, however, enable us to predict what direction the achievement will take, and least of all they tell us what personality factors or what accident of fortune will affect the fruition of exceptional ability.³

Garrett (1949) reviewed studies of factors related to scholastic success at the college level. Intelligence, he reported, was the factor most frequently used. The criterion reported for all studies was some

¹Ibid.
²Ibid., p. 532.
form of grade point average. A summary of the results of relevant studies is presented in Table 1.

**TABLE 1**

**A SUMMARY OF THE FINDINGS OF PREDICTION STUDIES**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Rank</th>
<th>Median Correlation</th>
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<tbody>
<tr>
<td>High School Scholarship</td>
<td>1</td>
<td>.56</td>
</tr>
<tr>
<td>Achievement and College Entrance Tests</td>
<td>2</td>
<td>.49</td>
</tr>
<tr>
<td>All Measures of Intelligence</td>
<td>3</td>
<td>.47</td>
</tr>
</tbody>
</table>

In this table, the rank refers to groups of measures of intelligence but in each case the criterion was grade point average. Intelligence, as indicated by correlations reported in the table, is valuable in the prediction of achievement as measured by grade-point average, although not as good a predictor as past academic performance.

Cronbach (1949) reports that the college level ability tests correlates about .50 to .55 with grade point averages. More recent research also indicates that the average correlations are about .50, with a range from .30 to .70.

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Klug and Bierley (1959) found that the School and College Ability Test (SCAT) was about as good as high school average in predicting first semester college grades.\(^1\)

Getzels and Jackson (1961) investigated the relationship between creativity and intelligence. When students high in creativity but not correspondingly high in intelligence were compared with students high in intelligence but not correspondingly high in creativity, it was found that there was no difference between the groups in academic achievement.\(^2\)

In general the research shows that the best predictors are obtained when a battery of tests are used to predict the overall grade point average. Cronbach reported that multiple correlations of such batteries with college grade point average run at about .60 to .70.\(^3\)

This conclusion is in line with recent research findings in which the average correlation is about .65.\(^4\)

From these studies in which correlations between intellectual factors and grades were made it was found that measures of ability on

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\(^3\) Cronbach, *op. cit.*, p. 267.

the average accounted for 35 to 45 per cent of the variation in academic performance. It is evident, then, that a combination of intellectual factors plus previous academic performance strengthens prediction of success in college but does not, even in combination, predict with certainty a student's future success.

**Personality Factors as Predictors**

It has been assumed that some of the predictive ability of the other approaches might be enhanced if studies of the personality characteristics of high and low achievers were undertaken.

Holland, in a study concerned with the validity of the California Psychological Inventory and the Scholastic Aptitude Test, used a sample of high ability male and female college freshmen. For males it was found that the best predictors included the mathematics score from the aptitude test and high scores on socialization, social presence, and

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femininity scales.¹ For female, the best battery included verbal aptitude and scores on social presence, responsibility, achievement via conformity and femininity.

Holland, also studied a group of Merit scholarship finalists, and investigated the validity of non-intellectual factors as predictors of academic achievement. In this study, he used the Cattell 16 personality factor questionnaire (16PF), the National Student Survey, the Vocational Preference Inventory, the Scholastic Aptitude Test (SAT), and high school rank.² In terms of non-intellectual factors, the male college achiever is dependable, serious, persistent, responsible, submissive, quiet, feminine, naive, self-sufficient, and self-controlled. The female college achiever has also done well in high school, and has a high scholastic aptitude, is persistent, responsible, submissive, and conservative. He concludes that none of the measures of non-intellectual factors is accurate enough to be used universally as predictors mainly because cross validation at several colleges illustrated a varying amount of individual personality factors in achievement. He states quite bluntly that an uncritical use of high school and college grades as predictors is to be cautioned against in light of our growing knowledge of creativity and non-intellectual super-ego factors. In general, super-ego strength, persistence, and deferred gratification are non-intellectual variables useful in predicting academic achievers.


A popular test for studying student's adjustment is the Minnesota Multiphasic Personality Inventory (MMPI). Owens and Johnson, using the MMPI, a Scale of Barley and McNamara, and a personal check list developed by the authors, succeeded in isolating thirty-eight items where differences between underachievers and normal achievers occurred. On the whole, underachievers were characterized by good adjustment in all areas except family relationships and neurotic-psychotic tendencies. The authors concluded that the underachievers are too socially oriented to spend the necessary time in solitary study and that the neurotic-psychotic tendencies were probably a result of poor achievement rather than a causative factor.

A parallel study conducted by Barley concluded that overachievers are characterized by social introversion, lack of confidence, good family adjustment, and emotional instability.

In the attempt to find non-intellectual correlates of academic success many variables have been investigated. One of the most promis-

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ing has been study habits. The Brown-Holtzman Survey of Study Habits and Attitudes is recognized as being one of the best of the empirical instruments designed to measure study habits.

The majority of the studies have shown a positive correlation with college performance. One such study that did not show such a correlation includes an investigation by Lum (1960) of overachievers, underachievers, and normal achievers.

Lum, in a comparison of three groups of 20 female students equated for ability by the American Council on Education Psychological Examination Test, but with different grade-point averages, hypothesized that students who underachieve differ significantly from those who overachieve in their motive for studying and attitudes toward various aspects of the academic situation. Using the Survey of Study Habits and Attitudes and sentence stems, Lum found that the three groups were indistinguishable in terms of study habits, but were differentiated when the instruments were oriented to academic drive or motivation. The underachiever is


\[2\] Mable K. M. Lum, "A Comparison of Under and Overachieving Female College Students," Journal of Educational Psychology, LI (1960), 109-114.
easily discouraged, inclined to procrastination, is subject to distracting influences (mostly social), doubts the value of college, is critical of education, and requires that a particular course be liked before she will exert herself in accordance with her ability. The overachiever, on the other hand, is self-confident, tolerant of pressures, and has stronger motivation.

Duff and Siegel attempted to determine the relationship between certain biographical data and academic overachievement or underachievement.

The Biographical Inventory for Students was used as a measure of obtaining personal history. The results of the study indicate a negative relationship between effective utilization of academic ability and degree of participation in physical, social, and heterosexual activities. Participation appears to cause diversion of time, and may be symptomatic of low academic drive.

Lunneborg's\(^2\) and Freeberg's\(^3\) data support the notion that biographic information can effectively contribute to the prediction of academic performance.

Middleton and Guthrie in a study of "Personality Syndromes and Academic Adjustment Achievement," conducted with 14 low and 14 high achievers differentiated by 2.5 grade point averages on the four-point

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scale, found that aptitude tests and high score performance together are the best predictors of adjustment. Both groups were given a 300-item personality questionnaire extracted from Murray's system. Five needs seemed to identify the high achievers: (1) power and approval; (2) surface expression of resentment and independence; (3) strong dependence; (4) social prestige and influence; and (5) hostile aggressive denial of tender socialized feelings or in general, drive for power, resentment, dependence, and social acceptance are the factors allied with need for adjustment. In this study four factors tend to identify the low achievers: (1) pre-occupation with pleasures; (2) insistently extroverted in their relationship with peers; (3) intent on disavowing social shortcomings; (4) avoidance of blame and threat to self-esteem. In general, power and acceptance pleasure seeking, extroversion, and denial of normal shortcomings are the factors allied with low achievement.

McClelland, working from the assumption that motivation could be measured from analysis of fantasy, used parts of the TAT to obtain examples of students' fantasy, and devised a method for the measurement of motivation or need for achievement. The concept of achievement motivation refers to the need of an individual to perform at a high level of excellence. It has been measured by projective techniques and by paper-

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and-pencil questionnaires. Lavin, in his review of nine relevant studies on the college level using projective techniques, indicates that four investigators found positive relations between achievement motivation and academic performance. Five of these studies showed projective measures of achievement motivation to be unrelated to performance. Lavin found that studies using questionnaire resources of achievement motivation present a clearer overall picture than do the projective measures. Six college level investigations found positive relations between achievement motivation and academic performance. Three of these studies used the Need Achievement Scale from the Edwards Personal Preference Schedule. In his evaluation of these measures, Lavin stated that questionnaire measures of Achievement Motivation provide consistent and positive relations with academic performance. On the basis of their greater consistency, he stated that these questionnaire measures seem at present to be more useful than the projective measures.¹

Harlow compared the McClelland version of the (TAT) and the Edwards Personal Preference Schedule (EPPS) as measures of Achievement Motivation by comparing them to a sociometric measure of behavior in a present-life situation rather than in an experimental setting. Statistical comparison between TAT and EPPS on 44 male Sophomores showed that they are not measuring the same thing. A further comparison showed in analysis of fantasy the TAT to be significantly correlated with overt behavior whereas the EPPS was not. It was concluded that since the McClelland version of the TAT was correlated with overt achievement behavior, it is more suitable

¹Lavin, op. cit., pp. 74-77.
than the EPPS for the prediction of such behavior.¹

**Sociological Determinants as Predictors**

The observations expressed by Walter Dearborn may be said to reflect a sociological orientation. In 1949, Dearborn indicated that a survey of the literature led to a general conclusion that school success is significantly and positively correlated with socio-economic status, cultural factors, and occupational level of parents.²

The findings from the relationship between socio-economic status and academic performance are ambiguous. Lavin in his review of the research on this issue found 13 studies that reported a positive relationship between socio-economic status (SES) and academic performance.³ However, there were six studies that found SES to be related inversely to academic performance.

Kenneth Clark in a follow-up study among highly selected Negro students found that those in this underprivileged population most likely to succeed in college were those with low socio-economic family background and high scholastic aptitude.⁴

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In the case of the Negro see also: James S. Coleman, et al., Equality of Educational Opportunity, (Washington, D. C.: U. S. Government
In summary, the research shows that in the general student population academic performance is usually positively related to socio-economic status; but at the upper socio-economic levels and, in contrast, in the Negro student population studied at the low socio-economic levels, this relationship appears to be inverse.

It has been found that the occupational level of the father is positively correlated with academically successful students. However, the family income does not seem to be the only factor affecting the length of time a student will stay in school. In one study on drop-outs, it was reported that about one-sixth (16.5 per cent) of the first registration period drop-outs come from the $10,000 and higher income group. Effert found that academic difficulties were the cause for most drop-outs during the first year, but for those who drop out after the first year it was mostly a financial problem.

Hood found the father's educational level to be inversely related to attrition among the male students but not among the female students.

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he sampled. Carter and McGinnis found that the level of the mother's education was more significant in predicting college success than the level of the father's education.  

Studies on the effect of age on academic performance reached conclusions that are contradictory. Hood found that the younger the student the more likely he is to be successful in college. In contrast, Bledsoe found older students are more likely to be more successful than younger students. Owens and Owens in their investigation of some factors in the "Academic Superiority of Veteran Students" concluded that age (maturity) was nearly as good a predictor of achievement as college aptitude tests.

Weitz and Wilkinson offered some understanding of how sex difference may contribute to the prediction problem. They found that male students achieved a higher grade point average when they had expressed

1Hood, op. cit., p. 2919.


3Hood, op. cit., p. 2919.

4J. C. Bledsoe, "Success of Non-High School Graduate GED Students in Three Southern Colleges," College and University, XXVIII (1953), 381-383.


a preference for a major field than those who did not. The content of
the education seems to have little bearing on the performance of female
students. Weitz and Colver, in a later study, found that girls perform
equally well in college whether or not they had a clearly defined educa-
tional goal.¹ The standard deviation was found to be smaller for girls
than it was for male students. Because of this greater homogeneity,
it was found that college grades for females were more predictable when
these predictors were based on high school grades used in combination
with aptitude test scores.² The evidence, based on studies that assess
the relationship between sex and academic performance, indicates that
females have higher academic performance than males.³
Alone with characteristics of social class, age, and sex, students
can be categorized ecologically as deriving from rural or urban residen-
tial background.

Studies of rural-urban background have found students from urban
areas to be superior in academic performance than students from rural
areas.⁴ Because of the greater heterogeneity of students from large
metropolitan areas of 500,000 or more, Washburn found that this relation

¹H. Weitz and R. H. Colver, "The Relationship Between the Educa-
tional Goals and the Academic Performance of Women, A Confirmation,"
²Stein, op. cit., p. 8.
³Lavin, op. cit., p. 129.
⁴Herville C. Shaw and Donald J. Brown, "Scholastic Underachieve-
ment of Bright College Students," Personnel and Guidance Journal, XXXVI
(1957), 195-199.
of urbanism to academic performance is not reliable. Sanders noted that students from urban areas were superior on aptitude tests to rural students but found that there were no significant differences in college grades obtained.

Lavin has criticized such studies because the grades are not comparable since rural students tended to enroll in schools of agriculture while urban students enrolled in colleges of business or arts and sciences.

Predictions Based on Multivariate Analysis

Most of the studies reviewed to this point examined the relationship between a single variable and academic achievement. A new trend has emerged in which a broad multivariate approach is suggested by some investigators. Clifford (1959) suggests at least five variables that must be taken into consideration in any attempt to identify potentially creative individuals in chemistry or mathematics. The variables include the intellectual functioning of the individual, his psychodynamics, the interaction between the individual and his peers, his culture, and the specific problem on which he is working.

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3Lavin, op. cit., p. 132.

A number of writers have directed their attention to additional variables, a tendency which is illustrative of this multivariate trend.\(^1\)

Richards, Holland and Lutz (1966) indicated results from a multivariate study that both academic and non-academic accomplishment can be reliably predicted. The results strongly suggest that non-academic accomplishment is largely independent of academic potential and achievement.\(^2\)

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A number of multivariate studies have examined the relationship between the Edwards Personal Preference Schedule (EPPS) needs and grades.

Weiss, Wertheimer and Grosbeck,\(^1\) found that there was a correlation of .42, significant at the .01 level, between need achievement (NACH) on the Edwards (EPPS) and the cumulative grade point average.

In contrast, Uhlinger and Stephens\(^2\) found no relationship between need achievement (NACH) measured by the Edwards (EPPS) and freshman grade point average.

Diener\(^3\) examined the differences between the means of the Edwards (EPPS) needs of over and underachievers. He found differences between group means for need deference (nde), need order (nord), and need endurance (nend) significant at the .05 level.

Merrill and Murphy\(^4\) used high school grades as part of the predictor of college grades. The investigators selected a group of students who were predicted to fail and were passing and a group of students who were predicted to fail and were failing. These two groups were compared as to their means on each of the fifteen needs of the Edwards (EPPS). The low ability students whose school performance was adequate were higher on needs for deference, endurance, and dominance but lower on


\(^{2}\) Carolyn Uhlinger and M. W. Stephens, "Relation of Achievement Motivation to Academic Achievement in Students of Superior Ability," Journal of Educational Psychology, LI (1960), 259-266.

\(^{3}\) C. L. Diener, op. cit., pp. 396-400.

autonomy, exhibition, and affiliation.

The research evidence suggests that the Edwards Personal Preference Schedule appears to hold promise as a tool to investigate the relationship between personality and grades in college.

Stern, Stein and Bloom\(^1\) undertook an ambitious study in which multivariate analysis was used. From a number of measures of cognitive, motivational and behavioral dimensions they found that academic performance was highly correlated with a spatial relation test, relevant thinking in the classroom, and the instructors' rating of class participation.

In one phase of the study, they found that high achievers were more restrained in social and heterosexual activities and were more interested in theoretical and abstract cognitive matters.

Another aspect of this study involved the formulation of concepts defining two contrasting types of personalities: Stereopathic and non-stereopathic. As predicted, when matched on ability the stereopath had more difficulty in the social sciences and humanities than the non-stereopath.

It would appear, from the wide variety of personality and sociological variables tested and measuring instruments employed, that non-intellective factors are considered important adjuncts in the prediction of college success. Such variables, particularly study habits and achievement motivation, appear to have a positive and consistent correlation with academic performance. The addition of personality and socio-

\(^1\)Stern, Stein, Bloom, op. cit.
logical predictors seems likely to enhance prediction of college success when combined with past performance and intellectual ability.

The studies discussed above certainly do not provide any definitive statements about the effects on academic performance of the interactions between personality and socio-environmental factors. It has become increasingly evident that any scientific consideration of individual behavior must take into account the interactional dynamics of an organic-social-psychological whole. This growing appreciation for the role of social relationships and cultural controls in the structure of human personality and behavioral patterns, has influenced an accompanying shift in emphasis in the social sciences.

Writing about one such group of social scientists, Kimball Young states:

"The social interactional theory of personality has a long history, but the most important names associated with its formulation are J. Mark Baldwin, Charles H. Cooley, John Dewey, William I. Thomas, and George M. Mead. Although we cannot consider them and their present-day followers as forming a 'school of thought', they all have certain related views. While the personality rests upon certain constitutional bases, they consider it to be fundamentally a social-cultural product, but one which is always in a dynamic or moving state of equilibrium or disequilibrium with reference to the particular group and its culture at a given time and place."

The common element in these pioneer social scientists' points of view is awareness of the significance of social-cultural factors for an understanding and explanation of human behavior.

Especially significant as a consequence of this rapprochement

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In the social sciences has been the development of fruitful and challenging interdisciplinary areas of endeavor. This closer alliance of the disciplines means that increasingly several disciplinary points of view are being brought to bear upon the same data. The consequence has often been the emergence of more meaningful results than could have been obtained independently. Not often enough, however, has this been true of the attention given by social scientists to the area of academic prediction, as a review of reported research reveals.
CHAPTER III

METHODS OF PROCEDURE

The purpose of this chapter is to describe the procedures followed in the conduct of the study, including: (1) the selection and characteristics of the sample, (2) the instruments used and the coded variable number for the computer, (3) the collection of data and the statistical procedures.

I. The Selection and Characteristics of the Sample

The sample consisted of 200 students attending an all-male predominantly Negro liberal arts college with an enrollment of 962 students located in a large Southern city. The average chronological age of the sample was 19 years, ranging from 18 to 23.

The sample was selected randomly from the roster of upperclass students. The sample included 95 sophomores, 46 juniors, and 59 seniors. Seven students were married. Almost half of the sample completed high school in towns below 50,000 population (47.5 per cent) but only 14.5 per cent) attended high school in cities of 500,000 or more.

The majority of subjects came from intact families. Seventy-one per cent reported that their parents are presently married. A majority of their mothers (70.5 per cent) are currently employed and almost half of them (49.5 per cent) had attended or graduated from college. Somewhat fewer of the fathers had attended or graduated from college (44.5 per cent). The occupations of the fathers were heterogeneous, ranging from
33 per cent professional men to 24 per cent in unskilled occupations. The median income for the entire household was $6,000.00.

Forty-six per cent of the students were receiving financial aid of some kind. The majority of the sample was either first or second born (73 per cent) in the family, and the average number of siblings was 2.5.

The sample was divided heterogeneously in the expected areas of interest: 56.5 per cent expected to major in social sciences, the division of humanities and education. Forty-three per cent expected to major in the division of the natural sciences. The majority was participating in one or more extra-curricular activities, (70.5 per cent). A high percentage expected to work toward a doctorate degree or professional degree; only 6.5 per cent expressed intention to terminate with the B. A. degree. The average expected earning at the age of 35 was $12,500.00.

II. Instruments Used

The measurements used in this study were obtained from five instruments, and college grade-point averages taken from transcripts.

The instruments selected for collecting the data and the variable numbers for the computer are the following:

1. The Grade-Point Average was used as the measure of academic performance. The grade-point average for the academic year 1965-1966 was computed for each student included in the sample. The grades which are expressed normally (A, B, C, D, and F) were converted to the numerical value as follows: A=4; B=3; C=2; D=1 and F=0. These values were multiplied by the number of credit hours carried. For the IBM computer, grade-point averages were used as the criterion of academic performance and were coded as variable 0.

2. The entrance scores obtained on the School and College
Abilities Test (SCAT advanced level one) were used to evaluate aptitude. This test was used because it has been administered to all freshmen and is oriented specifically toward the prediction of academic achievement. The test yields a verbal, quantitative and a total score. Reliability coefficients for verbal, quantitative and total scores were computed by Kuder-Richardson technique, and the reported reliabilities vary between .88 and .94. For the IBM computer, these scores were coded as variables 1, 2, and 3.

3. The entrance scores from the Iowa Silent Reading Test (advanced form) were used as the measure of silent reading. The scores from this test were used because the Iowa is considered as one of the best diagnostic reading tests. At this particular institution, the Iowa has routinely been administered to all freshmen for more than 15 years. The test contains items measuring vocabulary, sentence comprehension, paragraph comprehension and the use of an index. The reliabilities were computed by the Kuder-Richardson formula and the tables showed a range from .682 to .949. For the IBM computer, this score was coded as variable 4.

4. The scores from the Brown-Holtzman Survey of Study Habits were used to determine study habits and attitudes. The purpose of the Survey of Study Habit scale is to identify students who earn high grades. The test-retest reliability coefficients with a two-week interval were .95 for men and .93 for women. The corresponding coefficients for the eleven-week interval were .88 and .84, respectively. The validity coefficients for men vary from .27 to .66 with an average of .42. This survey was administered to each student in the sample. For the IBM computer, this score was coded as variable 5.

5. The scores from the Edwards Personal Preference Schedule were used to provide measures of 15 personality variables. Needs which college students and adults seek to satisfy in the daily conduct of their lives are the basis of the

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variables whose relative strength is measured by the Edwards Personal Preference Schedule. The 15 EPPS variables are:

1 - Achievement  
2 - Deference  
3 - Order  
4 - Exhibition  
5 - Autonomy  
6 - Affiliation  
7 - Intracception  
8 - Succorance  
9 - Dominance  
10 - Abasement  
11 - Nurturance  
12 - Chance  
13 - Endurance  
14 - Heterosexuality  
15 - Aggression

Edwards' definitions of these variables are found in Appendix C.

The schedule consists of 225 forced-choice items and was constructed with particular attention to overcoming the natural tendency to choose face-saving, socially desirable responses.

Split-half reliability coefficients corrected by the Spearman-Brown formula ranged from .60 to .84. The test-retest reliability coefficients ranged from .74 to .87.¹ This Preference Schedule was administered to each student in the investigation. The IBM computer scores were coded as variables 6 through 20.

6. A Questionnaire prepared by the investigator was used to provide information on sociological data. The essential information that was obtained from the questionnaire consisted of the socio-economic background of the students—such as family income and education and occupation of parents, plus the personal characteristics of the students themselves, their own estimate of their academic ability, drive to achieve, future earning expectancy, and highest degree expected.

This questionnaire was validated by checking a sample of the student responses against the available background information on file in the Student Personnel Office. The reliability of the questionnaire was determined by the test-retest method on a sample of the students and was found to be .93.

This questionnaire was administered to each student in the sample by the investigator. The responses on this questionnaire for the computer were coded as variables 21 through 48.

III. The Collection of Data and the Analysis of Statistical Procedures

The data for this study were obtained from the Office of the Registrar, the Reading Center and the instrument administered to the students in the sample. The statistical procedure was multivariate correlational analysis as described and illustrated by Draper and Smith,¹ and Ralston and Wilf.²

The 200 subjects participating in this study were requested to fill out The Edwards Personal Preference Schedule, The Brown-Holtzman Survey of Study Habits and Attitudes, and a Questionnaire prepared by the investigator. The college grade-point averages for these subjects for the academic year 1965-1966 were acquired from transcripts. The entrance scores obtained on the School and College Abilities Test (SCAT) and the Iowa Silent Reading Test were acquired. The scores from these instruments and the coded questionnaire were converted to a final deck of 80-space IBM cards. A stepwise multiple regression analysis was performed on an IBM 1410 computing system located at the Emory University Biomedical Data Processing and Analysis Center. All 48 predictors were regressed on grade-point average.

The statistical method was multiple correlational analysis by the IBM stepwise multiple regression equation. Multiple regression was used in this data analysis to obtain the best fit of the set of observations.

of independent and dependent variables by an equation of the form

$$Y=b_0+b_1x_1+b_2x_2+b_3x_3 \ldots \ldots b_{48}x_{48}$$

where $Y$ (grade point average) was the dependent variable; $x_1, x_2, x_3, \ldots, x_{48}$ were the independent variables and $b_0, b_1, b_2, \ldots, b_{48}$ were the coefficients to be determined. (The 48 variables are described earlier in this study.)

In the stepwise procedure, the beta weight for each variable was tested against zero by the $F$ test of variance at the .05 level. The beta multiples of the independent variables were computed to maximize the prediction of the dependent variable.

The stepwise regression procedure involves every stage of the regression the reexamination of the variable previously incorporated in the model. For example, a variable which may have been the best single predictor variable to enter at an early step may, at a later step, be insignificant because of the relationship between it and other variables now in the regression. To check on this, the partial $F$ criterion for each variable in the regression at any stage of calculation was evaluated and compared with a pre-selected percentage point of the appropriate $F$ distribution. This provided a judgment on the contribution made by each variable, as though it had been the most recent variable entered, irrespective of its actual point of entry into the model. Any variable which provided a non-significant contribution could have been removed from the model. ² In this study, the process was continued, allowing all of the

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¹ Draper and Smith, op. cit.; Ralston and Wilf, op. cit., p. 195.
variables to be admitted to the equation, and instead of rejecting the non-significant variable, the solution was to select the variable in the order of its importance to predict Grade Point Average.

Step 1. The stepwise procedure started with the simple correlation matrix and entered into regression the $X$ variable most highly correlated with the criterion response.

Step 2. Using the partial correlation coefficients as before, the computer then selected, as the next variable to enter regression, that $X$ variable whose partial correlation with the criterion was next highest.

Step 3. The stepwise method then examined the contribution of the second variable selected, as if the second variable selected had entered first and the first selected entered second.

Step 4. The stepwise method then selected the next variable to enter, the one most highly correlated with the criterion variable. This procedure was repeated for all 46 variables.

Step 5. The program was terminated by calculating the predicted values of the dependent variables and the deviation between actual and predicted values.

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**Stepwise Solution to Data Print Out**

**In Put**

1. **Original Data**

   The original data were the scores on each measure and the coded information from the questionnaire.

2. **Means of Original Variables**

   The means of the original variables were computed by the $X_1X \overline{X}$ matrix

3. **Standard Deviations of Variables**

   The standard deviations were determined by the square root of the diagonal element of the $S$ matrix.

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Footnote:

1 Ralston and Wilf, *op. cit.*., pp. 195-203.
4. Correlation Matrix

The correlation was determined by the computer's R matrix.

Output

The stepwise multiple regression procedure supplied the solution for each of the 48 variables; the following coefficients were used to test the hypotheses:

1. Variable entering -- In sequential order the variables' solution that is most highly correlated with GPA was shown.

2. Multiple F-test -- The F ratio was computed to show the significance of reduction of residual variance.

3. Multiple Correlations -- The coefficient $R^2$ shows the percentage of the variance in Y that was associated with Variance in X.

4. Determinant Value (Delta) -- Delta, the determinant of the correlation Matrix, indicates the proportion of the variance in Y not determined by variance in X. If the determinant has a value of zero, it means that all of the variables have a linear relationship to each other.

From the 48 sets of raw scores, 48 zero-order correlations coefficients were computed. These correlations supplied information about the relationship between academic achievement and the 48 predictor variables found in Appendix C. These correlations also supplied the additional feed-in information for the multivariate correlational analysis.
CHAPTER IV

RESULTS AND DISCUSSION

From the 48 predictor variables regressed on grade-point averages, 19 were found to be significant at the .05 level of confidence. The 19 most efficient predictor variables along with their zero-order correlations, multiple correlations and multiple F's are shown in descending order of significance in Table 2.

At step one The Brown-Holtzman Survey of Study Habits had the largest beta weight, and, consequently, was the first predictor to enter the regression equation.

The Survey of Study Habits and Attitudes (SSHA) is a measure of study methods, motivation for studying, and certain important attitudes toward scholastic activities. One of the major purposes of SSHA is to identify students whose study habits are different from those of students who earn high grades.¹

The next largest beta weight, at step two, and the second best predictor variable, was the quantitative score on the School and College Ability Test.

The better student may be characterized as an individual who is proficient in mathematics. The School and College Ability Test is used

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¹Brown-Holtzman, op. cit., p. 3.
primarily for predicting academic success. A verbal score measures vocabulary and reading comprehension; a quantitative score measures arithmetic reasoning and understanding of arithmetic operations. The quantitative score on the SCAT was not only the second best predictor but also had the second highest coefficient of correlation with grade point average, \( r = .23 \).

### TABLE 2

<table>
<thead>
<tr>
<th>Predictor Variables</th>
<th>Zero-Order Correlations ( r )</th>
<th>Cumulative Multiple Correlations ( r^2 )</th>
<th>Multiple F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Habits</td>
<td>.30</td>
<td>.09</td>
<td>20.25</td>
</tr>
<tr>
<td>SCAT-Quantitative</td>
<td>.23</td>
<td>.15</td>
<td>16.93</td>
</tr>
<tr>
<td>Father's Occupation</td>
<td>-.11</td>
<td>.19</td>
<td>11.61</td>
</tr>
<tr>
<td>Estimated Writing Ability</td>
<td>.20</td>
<td>.21</td>
<td>10.76</td>
</tr>
<tr>
<td>Number of Extra-Curricular Activities</td>
<td>.05</td>
<td>.23</td>
<td>9.67</td>
</tr>
<tr>
<td>Edwards-Change</td>
<td>-.20</td>
<td>.24</td>
<td>8.90</td>
</tr>
<tr>
<td>Estimated Academic Ability</td>
<td>.22</td>
<td>.25</td>
<td>8.28</td>
</tr>
<tr>
<td>Edwards-Autonomy</td>
<td>-.11</td>
<td>.27</td>
<td>7.90</td>
</tr>
<tr>
<td>Estimated Drive to Achieve</td>
<td>.23</td>
<td>.28</td>
<td>7.56</td>
</tr>
<tr>
<td>Edwards-Nurturance</td>
<td>-.04</td>
<td>.29</td>
<td>7.22</td>
</tr>
</tbody>
</table>
TABLE 2—Continued

<table>
<thead>
<tr>
<th>Predictor Variables</th>
<th>Zero-Order Correlations r</th>
<th>Cumulative Multiple Correlations a</th>
<th>Multiple F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated-Heterosexual Popularity</td>
<td>-.09</td>
<td>.31</td>
<td>6.97</td>
</tr>
<tr>
<td>Foreign Birth</td>
<td>.15</td>
<td>.32</td>
<td>6.65</td>
</tr>
<tr>
<td>Father's Education</td>
<td>-.10</td>
<td>.32</td>
<td>6.34</td>
</tr>
<tr>
<td>Financial Aid and Loan</td>
<td>.11</td>
<td>.33</td>
<td>6.07</td>
</tr>
<tr>
<td>Home Town Population</td>
<td>-.06</td>
<td>.34</td>
<td>5.81</td>
</tr>
<tr>
<td>Edwards-Success</td>
<td>.02</td>
<td>.34</td>
<td>5.55</td>
</tr>
<tr>
<td>Estimated Mathematical Ability</td>
<td>.15</td>
<td>.35</td>
<td>5.33</td>
</tr>
<tr>
<td>SCAT-Verbal</td>
<td>.18</td>
<td>.35</td>
<td>5.16</td>
</tr>
</tbody>
</table>

aThe multiple correlation beside each variable is that obtained for that variable in combination with all the variables listed above it.

The third best predictor to emerge was a personality variable—the need for deference—which was measured by the Edwards Personal Preference Schedule (EPPS). According to Edwards, deference refers to the tendency of an individual to seek suggestions from others, to be interested in finding out what others think, to follow instructions, and to do what is expected. Such an individual is willing to praise and accept the leadership of others. He conforms to customs and avoids the unconventional. \( r = .14 \).  

\[^{1}\] Edwards, op. cit., p. 10.
A sociological variable, the occupation of the father, was found to be the fourth best predictor of grade-point average. The occupations were coded for the computer in descending order based on the classification used by the Census Bureau, i.e., professional persons, proprietor-managers, clerks, and kindred workers, skilled workers, semi-skilled workers and unskilled workers. The correlation between grade-point average and the father's occupation was found to have a negative value \( r = .11 \). The negative value of this variable indicated that the lower the level of occupation of the father the higher or better is the predictive value of this variable; i.e., for example, in this sample a boy whose father is a semi-skilled worker would be expected to perform better in college than the son of a professional man.

The better student is one who feels that he has better-than-average writing ability. The fifth best predictor variable was measured by the self-scored rating scale (writing ability, in item ten of the questionnaire) in which each subject rated himself above average, below average, or average in writing ability. This measure depends on the student's perception of his writing ability and does not measure writing ability \textit{per se} \( r = .20 \).

The better the student the more extra-curricular activities he participates in. The sixth best predictor variable relative to student participation was measured by item number 18 of the questionnaire found in Appendix A \( r = .05 \).

The next best predictor was a personality variable from Edwards scale-need for change, however, this variable had a negative Beta value
which indicated that the better student; i.e., the one having a higher grade-point average, is one who does not like change. According to Edwards' definition, he is more comfortable with daily routines and is reluctant to experiment and try new things. \( r = -0.20 \).

The eighth best predictor was based on the findings of the self-scored rating scale (academic ability, in item ten of the questionnaire). The better student perceives himself as being above average in academic ability. Apparently most of those who rated themselves above average were successful academically \( r = 0.22 \).

Edwards' need for Autonomy was the ninth best predictor. Table 2 shows that this variable also has a negative correlation with grade point average \( r = -0.11 \). This correlation suggests that the better student is a highly socialized individual who is willing to conform, who is guided by what others may think, and who is reluctant to criticize those in authority. He has a tendency to accept responsibility and to fulfill his obligations.\(^2\)

The more successful student tends to feel that he has a greater-than-average drive to achieve. This self-perception, the tenth best predictor, was also measured by item number ten of the questionnaire, a self-scored rating item that requested the student to estimate his drive to achieve as above average, below average, or average \( r = 0.23 \).

The next best predictor was Nurturance, a personality variable suggested by Edwards. However, the correlation was negative, indicat- 

\(^1\)Ibid. 
\(^2\)Ibid.
ing that the better student is not too concerned about others in a sympathetic manner. According to Edwards’ definition, he is not willing to have others confide in him about their personal problems\(^1\) \((r = -0.04)\).

The twelfth best predictor was based on self-rating of popularity with the opposite sex. The negative correlation found here suggested that the better student feels that he is not popular with the members of the opposite sex. This variable emerges as a good predictor despite the fact that only six per cent of the subjects rated themselves below average in heterosexual popularity \((r = -0.09)\).

In the investigation, foreign birth was a better predictor of high grade-point average in college than native birth. However, it should be noted that there were only four foreign subjects in the sample \((r = .15)\).

The father’s education was the next best predictor of college grade-point average. This variable had a negative \(r\) value, thus indicating that the lower the educational level of the father the better is the son’s academic performance. The inter-correlation between this variable and the father’s occupation is obviously high. Inter-correlations which significantly affect the interpretation of these data will be discussed later in this chapter \((r = -.10)\).

The better student is likely to have some financial aid, such as a scholarship or a loan. The fifteenth best predictor was based on an analysis of item 14 on the questionnaire, relating to the main source
of funds for meeting college expenses. The majority of the students
in the sample received aid from their parents as the main source of
financial support ($r = .11$).

The next predictor was based on item number six of the question-
naire, in which the subject indicated the name of the town in which he
finished high school. The data were analyzed by the population size of
the town as reported in the World Almanac.\(^1\) The data suggested that
the good student is more likely to have completed his education in a
small town rather than in a large metropolitan area ($r = -.06$).

According to the results on Edwards' measure of Succorance, the
seventeenth best predictor, the better student desires to have others
help him when he is in trouble. He seeks encouragement from others and
he desires them to be sympathetic and understanding about his personal
problems\(^2\) ($r = .02$).

The student's estimate of his mathematical ability on the self-
scored rating scale was the next significant predictor. This item
suggested that the better student perceives himself as more proficient
than average in mathematical ability ($r = .15$).

The last predictor of college grade-point average found to be
statistically significant was the verbal score of the SCAT. The verbal
scale of the SCAT measures vocabulary and reading comprehension ($r = .18$).

In summary, Table 2 shows the output of 19 variables in the order
of their efficiency as predictors of grade-point average. A combination

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\(^2\) Edwards, op. cit., p. 10.
of such variables as aptitude, study habits, reading ability, estimate of social and intellectual abilities, personality, and sociological characteristics in a stepwise multiple regression program revealed that several personality and sociological variables may be better predictors than the usual aptitude test scores alone. It should be noted that the total SCAT score, which is frequently the sole measure for admission to some colleges, was not found in this study to be significantly related to grade-point average.

In addition to establishing a hierarchy of those variables which would yield the optimum estimate of college grade-point average, another purpose of this investigation was to test the null hypothesis that all of the 48 predictor variables will have a correlation coefficient of zero with grade-point average. The correlations found in Appendix C lead to the rejection of the null hypothesis.

DISCUSSION

The findings of the present study can be divided into three main areas paralleling those reviewed in Chapter II (Intellectual, Personality, and Sociological). The discussion will include the 19 major variables found to be significant in the prediction of academic success in this study compared with the findings of those previously investigated. Intercorrelation data and a discussion of any of the other 48 predictor variables will also be included where relevant.

Intellectual Factors

In the present study, the total score on the Scholastic and College Aptitude Test (SCAT) did not emerge as a significant predictor
of college success. However, the quantitative scale emerged as the second most significant variable.

In regard to mathematical ability, the literature suggests that there is a large and significant sex difference. On the mathematical section of the Scholastic Ability Test used by the College Entrance Examination Board males scored significantly higher on this section while females scored significantly higher on the verbal section.\(^1\) Studies on Negro College students\(^2\) as well as on white, Chinese, Japanese and part-Hawaiian high school graduates showed similar results.\(^3\)

The verbal section of the SCAT was also significant among the predictor variables but was only the 19th best predictor. Perhaps because of an all-male sample, this highly verbal test was not as efficient in predicting grade-point average as the quantitative score.

This discrepancy between the verbal and quantitative scales does not clarify why the total SCAT score was not among the 19 significant predictors although it ranked 20th among the 48 measures. These data strongly suggest that intellectual factors, as measured by such standardized instruments as the SCAT, should be used with caution in making decisions about admission of students. For a sample with these particular characteristics, it would appear that more weight should be given


to the quantitative scores and that the tests should be used in combination with other criteria for a more efficient predictor.

The Iowa Silent Reading Test did not emerge as a significant predictor of grade-point average. It is possible that the low predictive value of this instrument could be accounted for by the fact that only entrance test scores were used in this study. For a number of years, it has been the policy of particular institutions to require students scoring below a certain point on the Iowa Reading Test to take a course in remedial reading. After a semester of the reading course, students usually show an increase in their scores when retested. The scores obtained on the retest were not included as a variable. It may be stated emphatically that the entrance test results were not found to be a significant predictor of academic success, but it is possible that the retest results may have some predictive value. Obviously, this matter deserves further study. However, if retest scores are revealed not to be significant predictors, an alternative reading test should be selected and evaluated for its predictive validity. If neither instrument is a valid predictor of college success, a measure of study habits should replace the reading test and a course designed to improve study habits should be offered.

Personality Factors

The findings in this area are divided into three subgroups: study habits, self-ratings, and Edwards' personality variables.

1. Study Habits--A major finding of this study is that the best predictor of college success is the score obtained on the Brown-Holtzman Survey of Study Habits and Attitudes (SSHA). Poor study habits have
been cited frequently in the literature as contributing to under-achievement and poor academic performance generally. Terman and Oden,\(^1\) for example, mention idleness and unwillingness to do routine assignments as part of the underachievement picture. Lum\(^2\) reports that study habits, in conjunction with academic drive or motivation, were important in college success. It is noteworthy in the present investigation to find study habits emerging in a position of top priority. Several explanations are likely. If the assumption is accepted that the SSHA actually reflects good and poor study habits, it would appear that a student who has developed the ability to work consistently, review periodically, find a quiet place to study, and not be easily distracted by the exigencies of dormitory life, has already surmounted many important obstacles to college success. It was noted earlier that the average number of siblings of these subjects is 2.5, which suggests a relatively small family and thus greater opportunity for solitude and quiet. The adjustment to dormitory living may seriously disrupt this pattern. At this particular school, dormitories are overcrowded, with three and four men in some rooms.

Another explanation for this finding may lie in the fact that the SSHA is a self-report measure and may reflect a student's estimate of his own ability to organize his work and overcome distractions as much as it does his actual ability to do so. The assumption here is that the test may, to some extent, be measuring academic self-confidence, and that this is also important in college success. (The self rating

\(^1\) Terman and Oden, \textit{op. cit.}, p. 157.

\(^2\) Lum, \textit{op. cit.}, p. 114.
will be discussed further later.)

One other possibility for the high relationship between study habits and grade-point average occurs when the SSHA items are examined. Many of the questions deal with the student's attitude toward authority and his expectations about himself as a student vis-a-vis his teachers.

Listed below are several examples of the items from the Brown-Holtzman SSHA:

Item 1. "I feel that teachers do not understand the student's problems."

Item 2. "My dislike for certain teachers causes me to neglect my school work."

Item 3. "I feel that teachers allow their personal like or dislike for a student to influence their grading unduly."

The cluster of personality variables discussed below suggests that the good student, in this population at least, is moderately submissive and somewhat dependent and conforming. These characteristics are very helpful to a student since he is more likely to do the assigned work, memorize the required facts, and thus receive a good grade. These personality characteristics are not meant to dismiss the importance of good study habits per se, but only to point out what many experts have already brought to light, that conformity may be an important psychological characteristic to possess if one wants to succeed in some colleges.\(^2\)

2. Self Ratings—Closely related to the theme of academic self-

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\(^2\) Morris I. Stein, op. cit., p. 43.
confidence is the finding that the good student is likely to rate him-
self higher in his writing ability, drive to achieve, mathematics, and
general academic ability (See Table 2). This observation strongly sug-
gests that the good student is not only realistic about his abilities
but is also confident that he has the ability to succeed. The percep-
tion of one's capabilities has been shown to influence his performance
as well as influencing the estimate his superiors have of him; i.e.,
the student who is confident will impress his teachers with his cap-
abilities and the teachers in turn will more likely be aware of his
potential.1

It is noteworthy in these self-ratings that the confidence of
the student was limited to academic matters and did not extend to social
situations. The estimate of popularity with the opposite sex was neg-
atively correlated with grade-point averages, the estimate of leader-
ship ability was significantly related, and the heterosexual scale of
the Edwards (EPPS) was not at all important in the prediction of col-
lege success.

These self-ratings suggest that the successful student is one
whose confidence in his abilities is realistic but largely limited to
the academic, rather than the social sphere. The possibility of cir-
cularity exists; i.e., academic confidence emerges when rewarded by
academic success, particularly when attempts at gratification in social
situations are not so successful.

1 J. N. Mitchell, "Goal-Setting Behavior as a Function of Self-
Acceptance, Over- and Underachievement and Related Personality Variables,"
Journal of Educational Psychology, (1959), 93-104; H. C. Shaw, K. Edson
and H. H. Bell, "The Self-Concept of Bright Underachieving High School
Students as Revealed by an Objective Check List," Personnel and Guidance
3. Edwards' Personality Factors--A general cluster of additional personality variables emerges from an examination of the 19 significant factors which appear to describe the good student. There was a significant positive relationship between academic success and the need or motives of Deference and Succorance as measured by the Edwards Personal Preference Schedule (EPPS) and a significant negative relationship between Edwards' need for Nurturance, Autonomy, and Change. A brief summary of what these scales are supposed to measure is found in the following definitions from the EPPS Manuals:

Deference: To let others make decisions, to conform to what is expected of one.

Succorance: To receive help or affection from others, to have others be sympathetic and understanding.

Nurturance: To help friends or others in trouble, to forgive others, to be generous with others.

Autonomy: To be independent of others in making decisions, to avoid responsibilities and obligations.

Change: To do new and different things, to meet new people, to travel, to take up new facts and fashions.

It would appear, then, that the successful student is somewhat dependent on others, expects to have decisions made for him, requires support from others, and generally does what is expected of him. He does not offer support to his friends, does not respond to new ideas or movements, and generally appears to be conservative and conforming.

It should be noted that the measures on the EPPS are not independent and that the intercorrelations between some of them are high enough to suggest that the characteristics being measured are really the two ends of one dimension. The correlation between Autonomy and Nurturance is -.36 on the original standardization group of 1500.
subjects. Deference and Autonomy are correlated -0.39 and Succorance and Autonomy are correlated -0.21. It should be mentioned in defense of the test, however, that although the correlations between Affiliation and Nurturance is +.46, only Nurturance was significantly related to grade-point average in the present study.

An additional finding relevant to this general personality picture is the high relationship between involvement in extracurricular activities and academic success. This observation enlarges the picture of the good student and suggests that, although he may not perceive himself as a leader or a lover, he is not an anti-social and exclusive type of person. He appears to be outgoing in a somewhat dependent way and may actually involve himself in extra-curricular activities as a way of achieving the social popularity and the nurturance (possibly from the opposite sex) which he perceives that he lacks. An alternative hypothesis is that a student with efficient study habits and superior ability has more time to pursue extracurricular activities than the disorganized, ill-equipped student.

This description is generally in accord with findings of previous investigators. There are, however, some discrepancies; e.g., Middleton and Guthrie reported their group of high achievers to have strong need for dependency, need for approval and social acceptance. Dienes found that high achievers had significantly higher scores on

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1Edwards, op. cit., p. 20.
2Middleton and Guthrie, op. cit., p. 69.
3Dienes, op. cit., p. 400.
under-achievers on Deference, Order, and Endurance. Merrill and Murphy\(^1\) found that students of low ability, whose work was better than expected, scored high on Deference, Endurance, and Dominance but lower on Autonomy, Exhibition, and Affiliation.

Holland,\(^2\) in regard to non-intellectual factors, found that the male college achiever is dependable, serious, persistent, responsible, submissive, quiet, feminine, naive, self-sufficient, and self-controlled.

The psychological profile which appears to emerge from this particular study is that of the good student who is well organized and has a good opinion of his ability to handle academic tasks, both in general and with reference to such factors as his study habits, his achievement drive, his writing, and mathematical ability. Despite his positive self-confidence in mastering academic matters, he has a low opinion of his popularity with girls. He is relatively dependent and conforms to authority. Although he requires support from others, he shuns interpersonal involvement when he is required to provide emotional support for others. This individual would probably not be the student who would be involved in causes and fads, although he would be a participant in extra-curricular activities just for the sake of furthering his social needs.

**Sociological Factors**

The major findings in this area point to an inverse relationship


between academic success and socio-economic status. Father's education, father's occupation, and the size of town in which student attended high school all proved to be negatively related to grade-point averages. The student with a high grade-point average tended to receive more financial aid than the one with a low grade-point average. This finding is probably a function of his low socio-economic background as well as his superior academic performance.

The good student comes from a small town and his father is likely to be an unskilled or semi-skilled worker who has not finished high school. The good student is receiving, and probably requires, financial aid to pursue his college program. The data suggest that he is more concerned with succeeding in his career preparation than the student from a more well-to-do family who does not feel the financial strain during his college stay.

Several previous studies have found that high socio-economic status is correlated with college success and that many students who come from poor families have insoluble financial problems requiring them to drop out of college. Recently, however, a few studies have reported findings similar to the present study; i.e., students from lower socio-economic status homes tend to do better in college than those from higher socio-economic status families. For sometime there has been in the literature the suggestion of the gentleman's "C"; i.e., that boys


from wealthy, upper-class homes are not expected nor encouraged to be competitive or to show more than a passing interest in attaining high and competitive grades.\(^1\) In addition, the necessity of academic success for the already well-to-do youth, in terms of economic necessity, social status, or professional employment, is not nearly as great as for the student who has worked his way up from an impoverished working-class home and has no family connections or money to fall back on if he does not succeed in school. Academic success is his only way up while the upper-class boy has only to maintain his position.

The fact that good students are receiving financial assistance is not unexpected considering the apparent lack of financial resources their families have to offer plus their abilities and determination (as described above).

The rural-urban finding fits into the general picture. The fact that income is lower, the further one gets from large urban areas,\(^2\) suggests that the fathers of the high achievers in this study, with low education and occupational status, were predominantly small-town, unskilled laborers, rather than unskilled urban workers. It also suggests that students who come to this relatively small college in a large urban area, are more successful if they have come from a small town than if they have come from a city of this size or larger. A selective factor may be operative in that certain students from large cities who have exposure to larger colleges and universities, but who choose this particular college are either not able to gain admission to a larger college or are

\(^1\)Davis, op. cit., p. 73; McArthur, op. cit., p. 268.

\(^2\)Hood, op. cit.
over-confident about their abilities and hence do not work as hard as necessary for success. In addition, the higher socio-economic families are likely also to be urban.

The results of the present study indicated that measures of intellectual aptitude did not prove to be good predictors of grade-point averages themselves. Neither the total SCAT score nor the test of reading ability was related significantly to academic success. The quantitative score on the SCAT was the best single intellectual predictor. The verbal score also was significant but at a much lower magnitude.

Study habits proved to be the best single predictor, and self-ratings reflecting academic confidence showed that good students perceived themselves as above average in academic performance although not in social areas. The personality profile presented a picture of a somewhat dependent, conforming, conservative individual who participates in extra-curricular affairs and does not perceive himself as socially superior. An inverse coefficient of correlation between the father's occupation and education and size of city where the student went to high school suggests that the indigent student has a greater drive to succeed.
CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS FOR
EDUCATIONAL THEORY AND PRACTICE

A review of the literature related to the prediction of academic achievement indicated that, in the past, some investigators have attempted to predict college success by using the results of aptitude and achievement tests while excluding sociological and personality influences. Other investigators have attempted to predict college success by analyzing personality characteristics and ignoring aptitude and sociological variables. Neither approach has been strikingly successful.

The problem in this research was to select from a battery of 48 predictor variables those variables which would yield the optimum estimate of college grade-point average at a predominantly Negro Southern liberal arts college for men.

The forty-eight predictor variables included measures of aptitude, reading, study habits, personality, and sociological characteristics. The most efficient predictors of grade-point average were selected in the order of their importance.

The purpose of this study was threefold: First, to test the null hypothesis by postulating that all of the 48 predictor variables will have a correlation coefficient of zero with grade-point average; second, to establish a hierarchy of these variables in terms of their contribu-
tions to the prediction of academic success; and third, to abstract a personality profile of the academic achiever based on the significant predictors.

THE SAMPLE

The sample consisted of 200 students attending an all-male predominantly Negro liberal arts college with an enrollment of 962 students located in a large Southern city. The sample was randomly selected from the roster of upperclass students.

RESEARCH METHODOLOGY

The 200 subjects who participated in this study were requested to fill out the Edwards Personal Preference Schedule, The Brown-Holtzman Survey of Study Habits and Attitudes and a Self-Evaluation Questionnaire prepared by the investigator. The grade-point averages for these subjects for the academic year 1965-1966 were acquired from transcripts. The entrance scores obtained on the School and College Abilities Test (SCAT) and the Iowa Silent Reading Test were acquired from the Registrar and the Reading Center. The scores from these instruments and the coded questionnaire were converted to punch cards, and a step-wise multiple regression analysis was performed on an IBM Computing System. All 48 predictors were regressed on grade-point averages.

SUMMARY OF FINDINGS

The results obtained from the analysis of the data showed that 19 or the 48 variables were significant predictors of grade-point averages. The correlations found led to the rejection of the null hypothesis.

Measures of intellectual aptitude alone did not prove to be good
predictors of grade-point averages. Neither the total SCAT score nor the results of the Iowa Silent Reading Test were significantly related to academic success. The quantitative score of the SCAT was the best single intellectual predictor, the verbal score also being significant but at a much lower magnitude. Study habits proved to be the best single predictor. Self-ratings reflecting academic confidence showed that good students perceived themselves as above average in studies but low in social achievement and acceptance.

The general personality profile describes a somewhat dependent, conforming, conservative individual who participates in extra-curricular affairs and does not perceive himself as socially superior. In identifying the successful academic achievers this study indicates an inverse correlation between the father's occupation, education, and the size of the city where the student attended high school. This suggests that the student with a greater desire to succeed and a greater probability of academic success at this college comes from a low socio-economic background and from a small town.

CONCLUSIONS

The present study lends itself to the drawing of conclusions which can be subsumed under three major headings. These are:

(1) Conclusions which pertain to the refutation or confirmation of the null hypothesis for the forty-eight predictor variables, (2) Conclusions concerning a personality profile of the academic achiever based on the significant predictors, and (3) Conclusions concerning the methodological approach.
Conclusions pertaining to the refutation or confirmation of the null hypothesis for the forty-eight predictors.—Examination of the zero-order correlations and the output of the multiple regression program leads to the rejection of the null hypothesis. When correlations were maximized by the use of a step-wise multiple regression analysis, nineteen of these predictors were found to be significantly related to grade-point averages. The data support the conclusion that study habits, scholastic aptitude, self-concepts, personality and sociological characteristics are, in some aspects, related to the prediction of academic success in college.

Conclusions concerning a personality profile of the academic achiever based on the significant predictors.—Successful college achievement is seen as a kind of complex interaction between the multiplicity of stimuli which are impinging upon the individual and the psychodynamics of the individual at the moment. Although early childhood experience and other unknown factors most likely influence college performance, it is possible to describe some common characteristics of the high and low achievers emanating from the data collected in the present study.

The psychological profile, which appears to emerge from the data, is that of the good student who is well organized and has a good opinion of his ability to handle academic tasks, both in general and with reference to his study habits, his achievement drive, his writing, and mathematical ability. Despite his positive self-confidence in mastering academic matters, he has a low opinion of his popularity with girls. He is relatively dependent and conforms to authority. Although he requires
support from others he shuns interpersonal involvement when he is required to provide emotional support for others. This would probably not be the student who would be involved in causes and fads although he would be a participant in extra-curricular activities probably for the sake of furthering his social standing.

Academic success appears to serve as a lever for attaining social and financial status which may not be accessible through family background. The good student comes from a small town, and his father is likely to be an unskilled or semi-skilled worker who has not finished high school. The good student is receiving and probably requires financial aid to pursue his college program. He may be more concerned with succeeding in his career preparation than the student from a more well-to-do family who does not feel the financial pinch during college.

Conclusions concerning the methodological approach.—In Chapter I, the writer illustrated the relative sterility which characterized other approaches in predicting academic achievement. The writer embraces the transactional approach which assumes that success in college, like all behavior, is a function of the transaction between the individual and his environment.

The instruments used to measure aptitude, reading ability, study habits, self-concepts, personality, and sociological characteristics were selected on the basis of their validity, reliability, and availability. The data derived from paper-and-pencil tests of this type are, as yet, relatively imprecise. This is particularly true with variables in the area of personality. The instruments selected do, however, allow for the quantification of the psychological variables
and they appear to the writer to be as adequate as any of the other instruments presently on the market.

The most practical way of handling the large number of variables derived from these instruments was to use a multivariate procedure. The best known method and the one most appropriate for these data is multiple-regression analysis.

It was stated earlier that the multiple \( R \) represents the maximum correlation between a dependent variable and a weighted combination of independent variables. The multiple \( R \) is related to the intercorrelations of independent variables as well as to their correlations with the dependent variable. Because multiple regression results in a considerable increase in the accuracy of prediction, the forty-eight variables were regressed on grade-point averages.

It is the writer's conclusion that the multiple regression procedure of testing forty-eight null hypotheses concerning aptitude, reading, study habits, self-concepts, personality, and sociological characteristics illustrates the interaction of many variables. At our present level of knowledge, it appears that the approach employed was the most fruitful for the problem of predicting academic achievement.

**Implications for Educational Theory and Practice**

A review of the research literature indicated that many studies in the area of academic prediction are characterized by attempts to identify a relationship between a single variable and some criterion of college success. The writer accepts the position that behavior in college is a function of the transactional relationship between the student and his environment. Individuals do not behave in terms of the manifesta-
tion of single variables. Human beings are better described as possessing a constellation of interacting variables. While groups of students may share all of these variables, no single constellation or pattern can characterize all of them.

The present study supports the theoretical position that the prediction of college success is best accomplished by an analysis of the interaction of a number of variables. The implication is that a combination of several types of predictors is superior to a single category of predictors. Therefore, a model which combines these predictors will increase the accuracy of the prediction of academic success.

The most significant predictor was found to be a measure of study habits. An analysis of the Brown-Holtzman Survey of Study Habits Scale reveals that the actual mechanics of studying and the student's attitude toward studying are surveyed. These habits and attitudes are then compared with those of successful students. The implications are that poor habits and attitudes are probably the symptoms of poor achievement, and that these attitudes are most likely rooted in a personality factor associated with early childhood experience. Therefore, knowledge of parent-child relationships and early school experiences may provide many data which could be related to future college success. For practical application at the college level, a study habits scale should be included in the battery of freshmen orientation and placement tests. As a preventive technique, a course should be instituted to improve the study habits of those individuals found deficient in this area. Counselors should exert special efforts to help students maintain or improve their study habits.
Colleges may be described as social institutions set up by the society to achieve certain goals. Within certain limits roles are prescribed that members are expected to fulfill. To insure that the goals and roles are fulfilled, the college, like other social institutions, has a system of rewards and punishments that is utilized to reinforce behavior that is consistent with the roles and goals that the college was developed to achieve. Colleges vary in goals, roles, and reinforcing dimensions the same as individuals vary.

At this college the successful student was characterized as being dependent, submissive, resistant to change, unsympathetic, and socially unsuccessful. The implication is that the college in rewarding certain aspects of behavior has a stifling effect on the self-actualization propensities of students, requiring that they either manifest certain types of behavior or suffer the consequences of receiving low grades.

In addition to the above characteristics, the high academic achiever also was found to be well organized, motivated, respectful of authority, interested in learning, and able to withstand distractions. The implication here is that this college rewards those aspects of behavior which make it easier for the teachers to teach. The data further indicated that the successful student seeks the teachers' help when in trouble, is less hostile, and is less defensive about revealing personal inadequacy than the low achievers. Since grades in a small college of this size are usually more subjectively influenced than in a large university where teachers may be more impersonal and objective, the implication is that students possessing the characteristics enumerated above are likely to be graded more favorably.

The self-rating scale of the questionnaire revealed a number of
significant predictors. In general the findings from this scale indicated that high achievers are likely to have a positive self-image while the low achievers have more negative feelings about themselves. The implication is that the assessment of personality and self-concepts is a necessity for the improvement of the prediction of academic success. In educational practice, the implications suggest that the application blank for admission to this college should include a section designed to reveal certain self-perceptions of motivations and abilities.

In theory, education is one of the chief means of social and economic mobility. It appears that, within a given socio-economic stratum, the parental attitude toward education and upward mobility has a great influence on the achievement expectations of their children. It is believed that this basic motivational pattern for achievement is determined early in child-rearing practices.

The findings from this investigation indicated that the male students in this college who are most likely to be the high achievers are those with a low socio-economic family background, who come from small towns, but who have a high scholastic aptitude in quantitative ability. The implication is that students admitted to this particular college with these background characteristics and a desire to achieve upward mobility will try harder and perform better than students without these factors. All such students with talent and these characteristics should be stimulated and encouraged to "mount the educational ladder" for their own good and for that of the nation as a whole. The practical application of these findings indicates that more financial aid should be made available to indigent Negro male college students who are from small towns and who have high scholastic aptitude.
The prediction of college grades appears to be an increasingly dubious research enterprise. Some investigators have indicated that the student who either achieves high grades during the first year of college or who is admitted on the basis of high high school rank is the individual who is very socialized and is unlikely to express very much of his own individuality. This is probably the kind of student that educators and administrators may wish to accept and produce, but, if so, preferential admission of this kind of student is at variance with educational principles that purportedly emphasize the importance of autonomy, freeing the potentiality of the individual, and encouraging his creativity. Success in identifying and in both conserving and stimulating persons of promise from whatever level of society, is a basic necessity of a democracy. Meeting this need in an increasingly mechanized technological age and in a very large population is rapidly becoming acute.

Until we develop better methods for assessing motivation and potential creative ability, the writer would argue against the uncritical use of aptitude test scores and high school grades as predictors of college achievement. These criteria alone should not be used for selecting persons for admission, or scholarships, or jobs.

Institutions of higher education should constantly re-examine and revise their policies of admission. For individuals who score below average on an aptitude test, a remedial and/or tutorial program might be offered at the beginning of the school year on a non-credit basis, and the performance in such a program could determine final admission to the regular degree program.

Suggestions for further research.—It is the opinion of the
writer that the most fruitful kind of research concerned with the prediction of academic achievement must focus upon the individual as a dynamic system of forces in interaction with his world as he perceives it.

One direction such research might take is to attempt to do further research with the higher ranking significant predictors for the purpose of designing a multivariate battery to predict academic achievement.

Another fruitful study is for other colleges to replicate this present study to determine the most efficient predictors at their respective institutions by sex and ethnic groups.

A third suggestion for further research is the development of new types of tests that will give a greater concentration on motivational factors and methods to enable one to recognize potential creativity.

Another fruitful study might concern itself with further exploration of recently developed methods for identifying significant characteristics of the college environment. Information regarding these characteristics are critical for inferring the kinds of psycho-social characteristics the students need to possess if they are going to fulfill the demands of the college environment.

More intense effort needs to be devoted to refining personality tests, especially their reliability and validity. Research in this area should broaden its focus to determine the kinds of individuals who yield either reliable or unreliable results.
APPENDICES
APPENDIX A

STUDENT QUESTIONNAIRE

PLEASE ANSWER THE FOLLOWING QUESTIONS ON THE LINES PROVIDED, OR CHECK
THE APPROPRIATE BOXES.

The success of this study depends on your cooperation. Will you please
help?

Questions about You

1. YOUR NAME ___________________________ (Last) ____________ (First) ____________ (Middle) ____________

2. AGE:

   □ 18 years or less
   □ 19 years or "
   □ 20 years or "
   □ 21 years or "
   □ 22 years or "
   □ 23 years or over

3. IN WHAT STATE WERE YOU BORN?
   (Enter country, if foreign born)

4. YOUR MARITAL STATUS:
   Married _____ Single _____
   Divorced _____

5. WHERE DO YOU LIVE WHILE ATTENDING COLLEGE?

   □ In a college dormitory
   □ In an apartment, hotel, or rooming house
   □ At home with your family
   □ With other relatives or friends

6. WHAT IS THE NAME AND LOCATION OF THE HIGH SCHOOL FROM WHICH
   YOU GRADUATED?

   ____________________________ (Name) ____________________________ (City or Town) (State)

Questions about Your Family

7. WHO IS THE HEAD OF YOUR HOUSEHOLD? I am the head
   □ My father
   □ My mother
   □ Other relative
   □ Other non-relative
8. WHAT WAS YOUR FATHER'S AND YOUR MOTHER'S EDUCATION?

Father          Mother          Less than grammar school graduate
                  _______          Grammar school graduate
                  _______          Some high school
                  _______          High school graduate
                  _______          Post-high school technical or
                                  vocational training, but no college
                  _______          Some college
                  _______          College graduate
                  _______          Graduate or professional school

9. MARITAL STATUS OF PARENTS:  Married_______ Divorced_______
                              Separated_______ Other_________

                              Number of Brothers:  Older_______ Younger_______
                              Number of Sisters:  Older_______ Younger_______

10. RATE YOURSELF ON EACH OF THE FOLLOWING TRAITS AS YOU REALLY
     THINK YOU ARE WHEN COMPARED WITH THE AVERAGE STUDENT OF YOUR
     OWN AGE. WE WANT THE MOST ACCURATE ESTIMATE OF HOW YOU SEE
     YOURSELF. (MARK ONE FOR EACH ITEM.)

                                   Above Average Average Below Average

     Academic ability
     Drive to achieve
     Leadership ability
     Mathematical ability
     Popularity with the
     opposite sex
     Writing ability

11. THE FOLLOWING QUESTIONS ARE ABOUT THE OCCUPATIONS OF YOUR
     FATHER AND MOTHER. BY OCCUPATION WE MEAN THE SPECIFIC KIND
     OF WORK DONE. IF YOU DO NOT KNOW THE OCCUPATION, WRITE IN
     "DON'T KNOW".

     a. What is your father's occupation? If retired, enter his
        last occupation._______________________________________

     b. What is your mother's occupation?
        ____________________________________ Housewife only_______

12. PLEASE ESTIMATE THE APPROXIMATE TOTAL YEARLY INCOME OF ALL
     PERSONS IN YOUR IMMEDIATE HOUSEHOLD. WE MEAN THE PERSONS
     WITH WHOM YOU LIVE WHEN YOU ARE NOT AWAY AT COLLEGE OR
     TRAVELING, PLUS YOU YOURSELF.
Questions about Your College Career

13. WHO WAS THE PERSON WHO ENCOURAGED YOU THE MOST TO GO TO COLLEGE?

[ ] No one in particular
[ ] Minister or other church-related person
[ ] Nother
[ ] Other relative
[ ] High school teacher
[ ] Home community
[ ] High school Principal
[ ] Other person

14. WHAT ARE YOUR MAIN SOURCES OF FUNDS FOR MEETING COLLEGE EXPENSES? CHECK AS MANY ANSWERS AS APPLY.

[ ] My immediate family contributes money
[ ] I have a scholarship, or other financial aid from the college
[ ] I have a government loan
[ ] I receive aid from a group not connected with the college
[ ] I use my personal savings
[ ] I work during the school year
[ ] I work during the Summer vacation
[ ] Other sources of funds: (Identify)

15. IN WHAT YEAR OF COLLEGE ARE YOU ENROLLED THIS FALL?

[ ] Freshman
[ ] Sophomore
[ ] Junior
[ ] Senior

16. WHAT IS YOUR MAJOR IN COLLEGE? IF YOU DO NOT YET HAVE A MAJOR, WHAT DO YOU THINK IT WILL BE?

Major: Expected major:

17. WHILE ATTENDING COLLEGE, I AM A MEMBER OF:

[ ] Church Group
[ ] Social Fraternity
[ ] Athletic group
[ ] Music group
[ ] Dramatic group
[ ] Art group
[ ] Other (Please identify)
18. WHAT IS THE HIGHEST ACADEMIC DEGREE THAT YOU INTEND TO OBTAIN?

None
Bachelor's Degree
Master's Degree
Ph.D.
M.D.
Others (Indicate)

19. HOW MUCH DO YOU EXPECT TO EARN AT THE AGE OF 35?

$10,000 or less
$10,000 - $15,000
$15,000 - $20,000
$20,000 - $30,000
$30,000 or more
APPENDIX B

DEFINITIONS OF THE EDWARDS PERSONAL PREFERENCE SCHEDULE VARIABLES

The manifest needs associated with each of the 15 EPPS Variables¹ are:

1. *ach Achievement: To do one's best, to be successful, to accomplish tasks, requiring skill and effort, to be a recognized authority, to accomplish something of great significance, to do a difficult job well, to solve difficult problems and puzzles, to be able to do things better than others, to write a great novel or play.

2. *def Defenience: To get suggestions from others, to find out what others think, to follow instructions and do what is expected, to praise others, to tell others that they have done a good job, to accept the leadership of others, to read about great men, to conform to custom and avoid the unconventional, to let others make decisions.

3. *ord Order: To have written work neat and organized, to make plans before starting on a difficult task, to have things organized, to keep things neat and orderly, to make advance plans when taking a trip, to organize details of work, to keep letters and files according to some system, to have meals organized and a definite time for eating, to have things arranged so that they run smoothly without change.

4. *exh Exhibition: To say witty and clever things, to tell amusing jokes and stories, to talk about personal adventures and experiences, to have others notice and comment upon one's appearance, to say things just to see what effect it will have on others, to talk about personal achievements, to be the center of attention, to use words that others do not know the meaning of, to ask questions others cannot answer.

5. *aut Autonomy: To be able to come and go as desired, to say what one thinks about things, to be independent of others in making decisions, to feel free to do what one wants, to do things that are unconventional, to avoid situations where one is expected to conform, to do things without regard to what others may think, to criticize those in positions of authority, to avoid responsibilities and obligations.

6. Affiliation: To be loyal to friends, to participate in friendly groups, to do things for friends, to form new friendships, to make as many friends as possible, to share things with friends, to do things with friends rather than alone, to form strong attachments, to write letters to friends.

7. Int Intracceptions: To analyze one's motives and feelings, to observe others, to understand how others feel about problems, to put one's self in another's place, to judge people by why they do things rather than by what they do, to analyze the behavior of others, to analyze the motives of others, to predict how others will act.

8. succ Succorance: To have others provide help when in trouble, to seek encouragement from others, to have others be kindly, to have others be sympathetic and understanding about personal problems, to receive a great deal of affection from others, to have others do favors cheerfully, to be helped by others when depressed, to have others feel sorry when one is sick, to have a fuss made over one when hurt.

9. dom Dominance: To argue for one's point of view, to be a leader in groups to which one belongs, to be regarded by others as a leader, to be elected or appointed chairman of committees, to make group decisions, to settle arguments and disputes between others, to persuade and influence others to do what one wants, to supervise and direct the actions of others, to tell others how to do their jobs.

10. abs Abasement: To feel guilty when one does something wrong, to accept blame when things do not go right, to feel that personal pain and misery suffered does more good than harm, to feel the need for punishment for wrong doing, to feel better when giving in and avoiding a fight than when having one's own way, to feel the need for confession of errors, to feel depressed by inability to handle situations, to feel timid in the presence of superiors, to feel inferior to others in most respects.

11. nur Nurture: To help friends when they are in trouble, to assist others less fortunate, to treat others with kindness and sympathy, to forgive others, to do small favors for others, to be generous with others, to sympathize with others who are hurt or sick, to show a great deal of affection toward others, to have others confide in one about personal problems.
12. **chg Changes:** To do new and different things, to travel, to meet new people, to experience novelty and change in daily routine, to experiment and try new things, to eat in new and different places, to try new and different jobs, to move about the country and live in different places, to participate in new fads and fashions.

13. **Endurance:** To keep at a job until it is finished, to complete any job undertaken, to work hard at a task, to keep at a puzzle or problem until it is solved, to work at a single job before taking on others, to stay up late working in order to get a job done, to put in long hours of work without distraction, to stick at a problem even though it may seem as if no progress is being made, to avoid being interrupted while at work.

14. **Heterosexuality:** To go out with members of the opposite sex, to engage in social activities with the opposite sex, to be in love with someone of the opposite sex, to kiss those of the opposite sex, to be regarded as physically attractive by those of the opposite sex, to participate in discussions about sex, to read books and plays involving sex, to listen to or to tell jokes involving sex, to become sexually excited.

15. **Agg Aggression:** To attack contrary points of view, to tell others what one thinks about them, to criticize others publicly, to make fun of others, to tell others off when disagreeing with them, to get revenge for insults, to become angry, to blame others when things go wrong, to read newspaper accounts of violence.
APPENDIX C

The following is a listing of Predictors tabulated in the Table which follows immediately. They are identified with the numbers 1 - 48.

1. SCAT-Verbal
2. SCAT-Quant
3. SCAT-Total
4. Iowa Reading Score
5. Study Habits Survey
6. Edwards 1 - Achievement
7. Edwards 2 - Deference
8. Edwards 3 - Order
9. Edwards 4 - Exhibition
10. Edwards 5 - Autonomy
11. Edwards 6 - Affiliation
12. Edwards 7 - Intraception
13. Edwards 8 - Succorance
14. Edwards 9 - Dominance
15. Edwards 10 - Abasement
16. Edwards 11 - Nurturance
17. Edwards 12 - Chance
18. Edwards 13 - Endurance
19. Edwards 14 - Heterosexuality
20. Edwards 15 - Aggression
21. Questionnaire - Age
22. Native vs. Foreign Born
23. Single vs. Married
24. Live in Dormitory vs. Other
25. Population of Home Town
26. Head of House
27. Father's Education
28. Mother's Education
29. Parents' Marital Status
30. Number of Older Siblings
31. Number of Younger Siblings
32. Self Scored-Academic Ability
33. Self Scored-Drive to Achieve
34. Self Scored-Leadership Ability
35. Self Scored-Mathematical Ability
36. Self Scored-Popularity with Opposite Sex
37. Self-Scored-Writing Ability
38. Expect to Earn
39. Father's Occupation Level
40. Mother-Housewife vs. Work
41. Estimated Parental Income
42. Encouragement for College
43. Financial Aid-Family/Self
44. Financial Aid-Loan/Aid
45. Years in College
46. Social Science vs. Physical Science
47. Number of Extra-Curricular Activities
48. Highest Degree Expected

The asterisk (*) following certain correlations in the Table indicates:

*Those correlations which are significant at .05 level or beyond

\[ r_{05} = .11 \]
\[ r_{01} = .18 \]
### Appendix D

**Zero-Order Correlations, Multiple Correlations and Multiple F’s of the Remaining Predictors of College Grade-Point Averages**

(N=200 Males)

<table>
<thead>
<tr>
<th>Predictor Variables</th>
<th>Zero-Order Correlations</th>
<th>Cumulative Multiple Correlations</th>
<th>Multiple F</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCAT - Total</td>
<td>.22</td>
<td>.37</td>
<td>5.20</td>
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<tr>
<td>Live Dormitory-Other</td>
<td>-.16</td>
<td>.37</td>
<td>5.05</td>
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<td>Head of House</td>
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<td>Edward’s-Aggression</td>
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<td>Edward’s-Order</td>
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<td>.40</td>
<td>4.85</td>
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<tr>
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<td>.12</td>
<td>.40</td>
<td>4.71</td>
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<td>Social vs. Physical Science</td>
<td>.02</td>
<td>.41</td>
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<td>Self-Scored-Leadership Ability</td>
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<td>.41</td>
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<td>Edward’s-Intracception</td>
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<td>Edward’s-Exhibition</td>
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<td>Number Older Siblings</td>
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<td>Years in College</td>
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<td>Estimated Parental Income</td>
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<td>Edward’s-Heterosexuality</td>
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<td>Edward’s-Achievement</td>
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<td>Edward’s-Abasement</td>
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<td>Age of the Subjects</td>
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<td>Mother’s Education</td>
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| Predictors | GPA | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
|------------|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1          |     | .18|    |    | .23| .56*|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 2          | .22 | .87*| .80*|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 3          | .10 | .14*|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 4          | .30 | .03 | .00 | .02 | .09 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 5          | .13 | .09 | .00 | .04 | .05 | .18*|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 6          | .14 | .07 | .06 | .09 | .07 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 7          | .14 | .05 | .03 | .06 | .02 | .19*| .05 | .35*|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 8          | .08 | .07 | .06 | .02 | .01 | .07 | .06 | .17*| .10 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 9          | .11 | .19*| .12*| .17*| .16*| .00 | .08 | .29*| .06 | .15*|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 10         | .03 | .07 | .01 | .03 | .00 | .00 | .22*| .10 | .23*| .11 | .33*|    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 11         | .01 | .04 | .04 | .07 | .05 | .11 | .18*| .03 | .02 | .28*| .06 | .05 |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 12         | .02 | .03 | .00 | .05 | .15 | .19*| .03 | .07 | .18*| .33*| .19 | .21*|    |    |    |    |    |    |    |    |    |    |    |    |
| 13         | .04 | .02 | .11*| .06 | .00 | .16*| .01 | .21*| .07 | .11*| .17*| .10 | .08 | .08 |    |    |    |    |    |    |    |    |    |    |
| 14         | .00 | .01 | .01 | .03 | .12*| .06 | .16*| .02 | .25 | .17 | .30*| .00 | .01 | .21*| .13*| .12*|    |    |    |    |    |    |    |    |
| 15         | .04 | .01 | .02 | .01 | .13*| .06 | .16*| .02 | .25 | .17 | .30*| .00 | .01 | .21*| .13*| .12*|    |    |    |    |    |    |    |    |
| 16         | .20 | .11*| .02 | .06 | .01 | .19*| .06 | .17*| .02 | .11*| .05 | .16*| .08 | .06 | .16*|    |    |    |    |    |    |    |    |    |    |
| 17         | .10 | .03 | .01 | .01 | .12*| .13*| .18*| .17*| .17*| .18*| .07 | .16*| .09 | .03 | .04 | .23*|    |    |    |    |    |    |    |    |
| 18         | .00 | .00 | .00 | .00 | .18*| .17*| .19*| .21*| .08 | .03 | .01 | .18*| .04 | .04 | .24*| .07 | .14*| .11*|    |    |    |    |    |    |
| 19         | .13 | .06 | .01 | .01 | .13*| .07 | .18*| .15*| .13*| .12*| .20*| .12*| .02 | .05 | .33*| .11*| .23*| .13*| .50 |    |    |    |    |    |
| 20         | .03 | .01 | .01 | .00 | .07 | .13*| .01 | .00 | .02 | .04 | .00 | .00 | .06 | .00 | .00 | .00 | .00 | .00 | .00 | .50*| .08 | .37*| .51*| .43*| .66*|
| 21         | .15 | .11*| .11*| .10*| .03 | .18*| .09 | .01 | .06 | .01 | .00 | .06 | .05 | .03 | .00 | .12*| .14*| .09 | .00 | .05 | .01 | .04 | .04 |    |    |
| 22         | .07 | .07 | .09 | .12 | .00 | .06 | .05 | .09 | .04 | .07 | .09 | .01 | .01 | .05 | .08 | .05 | .06 | .05 | .05 | .07 | .01 | .07 | .04 | .02 |    |    |
| 23         | .16 | .01 | .00 | .00 | .05 | .17*| .04 | .17*| .16*| .05 | .08 | .01 | .06 | .01 | .04 | .35*| .02 | .12*| .13*| .34*| .63*| .53*| .03 | .05 |    |    |
| 24         |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Predictors | GPA | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
|------------|-----|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|
| 25         | -.06| .12| .01| .06| .09| -.01| -.04| -.07| .05| .12| -.08| -.01| -.03| -.07| .06| -.20| .05| .13| -.09| -.03| -.14| -.15| .05| -.04| -.03 |
| 26         | .01 | -.04| -.02| -.04| -.04| -.05| -.09| -.04| -.09| -.11| -.05| -.02| .00| .01| .06| .02| .07| -.03| .03| .03| .32| .55| .65| .05| -.02| .00| .59|     |
| 27         | -.10| .06| .04| .04| .11| -.15| -.10| -.04| .06| .15| -.03| -.09| -.06| -.04| -.05| -.06| -.06| -.04| -.05| .07| -.01| -.00| -.06| -.03 |
| 28         | -.11| .00| -.02| -.02| .08| -.11| -.05| .06| .08| .08| -.06| -.07| -.04| -.04| -.06| -.02| -.08| -.06| -.07| -.13| -.07| -.23| -.11| -.06| -.17|     |
| 29         | .01  | .00| .04| .02| -.10| -.10| -.07| -.12| -.15| -.07| .03| -.05| -.02| -.01| .04| .10| -.06| .11| .01| .00| .05| -.05| -.09| .00| .13|     |
| 30         | .13  | .06| .07| -.09| -.01| .17| -.04| .11| -.00| -.02| -.06| .16| -.03| -.03| -.02| .03| .04| .03| -.10| -.08| -.05| -.06| -.05| .00| .01|     |
| 31         | -.03| -.04| -.11| -.08| -.02| .06| -.04| -.01| -.01| -.03| -.08| -.03| .13| -.03| -.08| -.09| -.05| .10| .07| -.02| -.04| -.04| -.06| -.03| .00|     |
| 32         | .22  | .38| -.26| .34| .20| .27| -.10| -.16| .02| -.05| .17| -.16| .01| .02| .17| -.09| -.11| -.05| .00| .03| -.09| .01| -.10| -.02| -.03 |
| 33         | .23  | .00| .06| .03| .10| .36| .11| .00| .16| -.03| .00| .09| .09| -.04| .03| -.21| -.00| -.04| -.09| -.15| -.10| -.03| .14| -.03| -.09 |
| 34         | -.02 | .01| -.02| -.01| -.01| -.09| -.09| -.14| -.03| -.07| -.05| -.09| -.04| -.01| -.35| -.16| -.04| .03| -.01| -.05| -.06| -.06| .08| -.02| -.06 |
| 35         | .16  | .10| .34| -.26| .18| .17| -.17| .19| -.00| .08| -.03| .12| -.09| .11| -.16| .07| -.05| -.07| -.02| -.10| -.06| -.04| .00| .03| .02| -.08 |
| 36         | -.09 | -.04| -.03| -.04| -.06| -.02| -.01| -.12| -.03| -.12| -.03| -.03| -.07| -.10| .13| -.16| -.06| -.06| -.14| -.08| -.01| -.05| -.02| -.03 |
| 37         | .20  | .17| .06| .13| -.08| .19| -.02| -.10| .19| -.04| .01| -.07| .16| -.06| .13| -.06| -.08| -.04| -.02| -.03| -.08| -.06| -.02| -.03| -.03 |
| 38         | -.02 | -.01| .04| .02| -.02| .04| .01| .02| -.04| -.13| -.18| -.09| -.03| -.05| -.05| -.14| -.04| -.03| -.02| -.10| -.05| -.00| -.06| -.07 |
| 39         | -.11 | -.12| -.07| -.10| -.04| -.14| -.04| -.08| -.20| .00| -.02| -.01| -.07| -.05| -.07| -.01| -.06| .00| .00| -.00| -.05| -.03| -.06| -.01| -.02 |
| 40         | .17  | -.05| -.01| -.03| -.04| -.12| -.00| -.07| -.03| -.12| -.10| .11| -.04| -.07| -.04| -.03| .06| -.00| -.04| -.07| -.19| -.12| -.00| -.01| -.04 |
| 41         | .04  | .06| .05| .06| -.02| -.17| -.03| -.08| -.02| -.04| -.06| -.02| -.10| -.05| .46| .03| .28| .28| .41| .55| .70| .10| -.01| .40|     |
| 42         | -.12 | -.08| -.02| -.01| .09| -.14| -.14| -.01| -.07| .15| -.01| -.12| -.12| -.00| .00| -.06| -.12| -.16| -.12| -.00| -.06| .21| -.10| -.00| -.09 |
| 43         | .12  | -.03| .00| .00| -.06| .11| .04| .06| -.02| -.10| .12| -.00| .08| -.05| -.08| -.15| -.00| .09| -.02| -.03| -.06| -.07| -.09| .00| -.01 |
| 44         | .02  | .07| -.09| .09| -.00| -.05| .03| -.01| -.09| .03| -.00| -.03| -.07| -.04| .01| .22| -.08| .08| .21| -.16| .32| .43| .27| .07| .27 |
| 45         | -.20 | -.02| -.06| -.04| -.13| -.16| -.06| -.04| -.02| .06| -.05| -.07| -.18| -.10| .01| .13| -.04| -.11| -.08| .00| -.09| -.03| .05| .00| .00 |
| 46         | .02  | -.06| .14| -.05| .00| .02| -.07| -.09| -.08| .00| .04| .03| -.06| -.05| .14| -.09| .02| -.05| -.09| -.13| -.02| -.01| .11| .16| -.01 |
| 47         | .05  | -.03| .22| -.13| -.20| -.01| .10| -.04| -.08| -.12| -.01| -.07| -.01| -.12| -.10| .12| -.02| -.02| -.07| -.01| -.02| -.01| -.00| .05 |
| 48         | .17  | -.02| .13| -.05| .05| .07| -.02| -.07| -.05| -.07| .02| -.09| -.03| -.03| .08| -.08| -.00| -.03| .06| -.00| .11| -.20| -.06| -.03| .06 |
| Predictors | GPA 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| 25        | - .06 |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 26        | + .02  | - |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 27        | +.10   | - | +19 | 00 | - |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 28        | - .11  | -10 | -19 | 00 | - |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 29        | +.02   | - | 15  | 19 | - | - |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 30        | +.13   | - | 13  | - | 39 | 00 | - |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 31        | - .03  | - | 06  | - | 26 | - | 25 | 00 | .01 | - |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 32        | +.26   | 09 | 05  | .01 | .05 | - | -2 | 04 | .01 | 7 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 33        | +.23   | 01 | 00  | - | -2 | 00 | 06 | .09 | - | .04 | - |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 34        | +.02   | + | 01  | .08 | .02 | - | -2 | 04 | - | .10 | - | .01 | .10 | .14 | - |   |   |   |   |   |   |   |   |   |   |   |
| 35        | +.16   | .03 | - | -5 | .05 | .04 | .11 | .04 | - | .01 | .36 | .06 | - | .11 | - |   |   |   |   |   |   |   |   |   |   |   |
| 36        | +.09   | .10 | .06 | .08 | .20 | - | 13 | - | .02 | - | .15 | .08 | .01 | .33 | .01 | - |   |   |   |   |   |   |   |   |   |   |
| 37        | +.20   | .10 | .04 | .03 | .02 | .12 | - | .02 | - | .07 | .17 | .15 | .13 | .00 | .14 | - |   |   |   |   |   |   |   |   |   |   |
| 38        | +.02   | - | -15 | .09 | .19 | .14 | .07 | .03 | .00 | .09 | .05 | .01 | .13 | .03 | .05 | - |   |   |   |   |   |   |   |   |   |   |
| 39        | - .11  | - | -7 | .04 | .00 | .01 | - | .12 | - | .03 | .08 | .07 | - | .12 | .09 | .12 | - | .08 | .69 | .06 | - |   |   |   |   |
| 40        | +.17   | - | 15 | - | .06 | - | .78 | + | 55 | .15 | .26 | .17 | .02 | .02 | - | .05 | - | .03 | .03 | .02 | - | .05 | - |   |   |
| 41        | +.04   | - | 15 | .69 | .16 | .09 | .05 | - | .25 | - | .12 | .12 | - | .14 | .02 | .05 | .01 | .11 | - | .14 | - | .22 | .17 | - |   |
| 42        | +.13   | - | .30 | - | .26 | + | .67 | + | .66 | - | 31 | - | 33 | - | 25 | .00 | .12 | .01 | - | .01 | .26 | + | .00 | .01 | .57 | .02 | .06 | - |
| 43        | +.12   | - | 10 | .01 | - | 51 | - | 52 | - | 23 | .26 | .17 | .01 | - | .04 | .05 | .04 | .07 | .02 | .01 | .46 | .16 | .44 | .11 | - |
| 44        | +.02   | - | .06 | .38 | - | .07 | - | .12 | .13 | .04 | .01 | .06 | .04 | .04 | .04 | .09 | .04 | .01 | .00 | .27 | .14 | .06 | .09 | - |
| 45        | - .21 | - | .03 | .01 | .28 | + | .26 | .05 | - | 29 | - | 12 | .12 | - | .01 | - | .02 | 05 | .09 | .01 | - | .25 | .16 | .31 | .28 | .13 | .08 | - |
| 46        | +.02   | - | .03 | .07 | .06 | .07 | - | .01 | .01 | .05 | .06 | .12 | .09 | .04 | .06 | .06 | .10 | .10 | .06 | .08 | .16 | .10 | .05 | .05 | - |
| 47        | +.05   | - | 15 | .03 | .07 | .05 | .13 | - | .01 | .02 | .27 | .01 | - | .10 | .48 | .02 | .03 | .03 | .01 | .08 | .00 | .01 | .01 | .02 | .03 | .30 | - |
| 48        | +.18   | .01 | .16 | .01 | .03 | .01 | - | .01 | .03 | .04 | .06 | .13 | - | .15 | .05 | .20 | - | .17 | .02 | .17 | .01 | .11 | .02 | .08 | .18 | .10 | .01 |