PREDICTION OF ACADEMIC SUCCESS OF BUSINESS ADMINISTRATION MAJORS AT SAM HOUSTON STATE COLLEGE FROM THE AMERICAN COLLEGE TEST STANDARD COMPOSITE SCORES

by

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A THESIS

Approved:

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PREDICTION OF ACADEMIC SUCCESS OF BUSINESS ADMINISTRATION MAJORS AT SAM HOUSTON STATE COLLEGE FROM THE AMERICAN COLLEGE TEST STANDARD COMPOSITE SCORES

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ABSTRACT

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Purpose

It was the purpose of this study to determine the relationship of the ACT composite score of the American College Testing Program Examination (ACT) to academic success in terms of the accumulative grade-point averages for majors in the School of Business at Sam Houston State College, Huntsville, Texas. As grades are considered to be the essential criterion of success in college, it is the accuracy of the prediction of this type of success with which this study was concerned. The second purpose was to develop prediction equations for estimating grade-point averages, based on ACT composite scores, for individuals seeking admission to this curriculum in the future.

Methods

This study was begun by reviewing related research to analyze the statistical techniques that have been found to be effective by other researchers in predicting academic success. Background information was obtained from the periodical literature found in the Estill Library at Sam

Houston State College, Huntsville, Texas, and in the M. D. Anderson Memorial Library at the University of Houston, Houston, Texas.

The investigation was limited to a homogeneous group of 283 students who were enrolled as majors in Business Administration in the fall semester of 1964. These students were differentiated by class and sex. The data for the statistical research were obtained from the records of the Dean of Admission and Registrar of Sam Houston State College.

The input data were processed by programmed formulas on the IBM 1620 Computer. Accuracy was assured by checking the computations with a second set of formulas and by manual calculations on a small subgroup. The output data were compiled into tables, evaluated, and interpreted.

Findings

Based on the analysis of the data in this study, the statistical findings support the following conclusions:

1. A normal distribution of ACT composite scores and the grade-point averages of the sample can be assumed in every instance.

2. The correlations between the ACT composite scores and the grade-point averages fit satisfactorily into the historical perspective.

3. The correlation for senior females is exceedingly uncertain and practically worthless because of the small number of cases involved.

4. All other correlations are statistically reliable due to their significance at the .01 level.

5. The reliability of the correlations is further established by the probable limits being well placed in positions significantly different from zero or negative correlations.

6. There is a significant sex difference--that is, in general women are more predictable than men. However, the ACT scores of the females do not seem to be so much significantly greater to account for the difference in academic achievement. Therefore, it might be speculated that the usual aspect of sex difference may be due to other reasons.

7. Generally, the ACT composite score of 12 does not predict grade-point averages indicative of the academic success necessary for graduation.

8. The ACT composite scores provide efficient predictability of successful college achievement within a range of possibilities. It is believed that the identification and proper use of such data, as one of the factors contributing to the student's probable success in college, would result in more effective selection of students for

admission, with special reference to recommending the pursual or non-pursual of business as a course of study.

Approved:

Supervising Professor

ACKNOWLEDGMENTS

Dr. Rita Huff has been the person most closely associated with this study. For her participation in the early planning of the work as well as for her diligence in critical reading of the various drafts of the manuscript, my greatest appreciation is expressed.

In the initial stage of this study, Dr. Jean D. Neal, Dr. Suler E. Ryan, and Dr. Elliott T. Bowers expressed their gracious interest. To Dr. Ryan and Dr. Neal I am particularly grateful for certain ideas regarding the selection of formulas and presentation of data.

The task of obtaining the statistical results was lightened considerably by the willing and capable assistance of my son and his wife, Lyle, Jr., and Brenda Dickey. For their data processing work in the computer laboratory, I shall ever be indebted.

Finally, a word of thanks is given to my family for their patience while this thesis was being written.

Mary Rikard Dickey

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CHAPTER I

INTRODUCTION

Especially since the later 1930's, admission officers and counseling personnel of most colleges and universities have been confronted with the problem of selecting the students who would most benefit from attendance at their particular institutions. Though some of these colleges have maintained an open-door policy, the majority of them admitted those applicants whose academic qualifications indicated that they would be able to obtain passing grades.

However, beginning with the years following World War II, there has been a decided change in the American educational scene. This change was first observed in the explosion of student population which sky-rocketed college enrollments, thus increasing the competition for admission. For college admission officers the selection of students has become more difficult than ever before, because the growth in numbers has, in turn, increased the number of qualified applicants. Thus, colleges are faced with the responsibility of selecting those students who will be more successful academically than those who are not accepted.

With these developments has come an ever-increasing interest in and concern with the prediction of academic success. Kahn and Singer stated:

> Even the most cursory scanning of pedagogical and psychological literature reveals a steadily growing awareness on the part of the various interested professions that an unwarranted number of young men and women enter college without the necessary capacities and qualities--whatever their nature may be--to complete academic work or to benefit from the time, effort, and money spent in such an undertaking. Since the later thirties, and especially in the postwar years, educators have become increasingly concerned with the problems of selection of students and prediction of success in academic endeavors. A goodly number of reports have been published discussing these problems and proposing selective and predictive devices for adequate screening and prediction of success.[1]

With these thoughts in mind, the writer set about to analyze the statistical techniques that have been found to be effective by other researchers in predicting academic success and to use the appropriate ones in conducting a predictive study. It is believed that the results of this research will provide information which will be effective for admission and counseling purposes.

I. THE PROBLEM

Statement of the Problem

The present study was undertaken, first, in order to determine the relationship of the composite score of the American College Testing Program Examination (ACT) to academic success in terms of accumulative grade-point averages

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[1]Harris Kahn and Erwin Singer, "An Investigation of Some of the Factors Related to Success or Failure of School of Commerce Students," The Journal of Educational Psychology, Vol. 40, 1949, p. 107.

for students in the School of Business at Sam Houston State College, Huntsville, Texas. The second concern was the development of prediction equations for estimating grade-point averages, based on ACT composite scores, for individuals seeking admission to this curriculum in the future.

Limitation of the Study

Many non-intellectual factors may have possible significance in the prediction of success in college. These, however, cannot be considered here, as they are not related to the present study. Basically, grades are considered to be the essential criterion of success in college. Though the reliability of this criterion has often been questioned, it is the accuracy of the prediction of this type of success with which this study was concerned.

Predictor and Criterion Used

As indicated, the composite score on the American College Testing Program Examination (ACT) was the predictor tested. The ACT is a test intended specifically as a predictor of academic performance. Standard scores ranging from 1 (low) to 36 (high) are reported in four areas: English usage, mathematics usage, social studies reading, and natural sciences reading. In addition to the scores on the individual tests, an average of the four scores, known as the composite score, is also reported.

The accumulative over-all grade-point average was the criterion of academic performance. Expressed on a 4.0 scale where A = 4, B = 3, C = 2, D = 1, and F = 0, the grade-point average was computed by dividing the total number of grade points earned by the total number of semester hours attempted.

Value of the Study

The selection of students likely to achieve success in college, and more particularly in a specific curriculum, is a problem of concern to students, faculty, and college administrators. While there are a number of factors responsible for lack of success in college, the first and foremost of these is academic failure. In attempting to avoid failure experiences, it is necessary to identify certain measures that might be sufficiently related to academic performance to be used for predictive purposes.

Since the establishment of the American College Testing Program in 1959, very little data are to be found in professional journals concerning the correlation of the ACT with scholastic achievement in college beyond the freshman year to determine its predictive validity. Because the ACT is used as a criterion for admission by Sam Houston State College, as well as hundreds of other colleges and universities, it is necessary that its predictive ability be validated by statistical research.

As it seems desirable for each college to establish its own predictive statistics, this study was made in an effort to contribute to the understanding of the meaning of the ACT composite scores as applied to students in the School of Business at Sam Houston State College. It is believed that the identification and use of such data would result in more effective selection of students for admission purposes. Also, the estimation of probable achievement would be valuable information upon which counselors may have some basis for assisting the student in understanding of himself, of his present environment, and of the opportunities that are open to him, with special reference to recommending the pursual or non-pursual of business as a course of study.

II. PROCEDURES OF THE INVESTIGATION

Sources of Data

Information for a background study of related research was found in educational and psychological literature obtained from the Estill Library at Sam Houston State College, Huntsville, Texas, and from the M. D. Anderson Memorial Library at the University of Houston, Houston, Texas.

The data used for this study were obtained from the records of the Dean of Admissions and Registrar of Sam

Houston State College. A roster of students enrolled as majors in the School of Business in the fall semester of 1964 served as the basic list from which the sample was chosen. The permanent records of the students were carefully examined to select a homogeneous group. These records also supplied the ACT composite scores and the academic achievements of the students.

Selection of the Sample

This investigation was limited to those students who were enrolled in the School of Business at Sam Houston State College in the fall semester of 1964, provided they (1) were classified as sophomores, juniors, or seniors; (2) had taken the American College Test; (3) had earned no more than twelve semester hours at another institution; (4) carried a full load of at least twelve semester hours, the only exception being those graduating seniors who lacked less than twelve semester hours to graduate; and (5) completed the semester. These requirements were used in order to assure homogeneity in the sample group.

A roster of 283 students was included in this study, or 49 percent of the 576 students on the list of majors in the Undergraduate School of Business for the three classes designated. (See Appendix A.) Students within each class were further differentiated by sex, the total sample including 215 males and 68 females.

Statistical Terms and Formulas

Only beginning or elementary statistical terms were used in this study. Should the layman not understand the terminology, the glossary or index of any text in fundamental statistics will provide sufficient information for basic understanding.

Formulas for the processing of statistical data were selected on the basis of their adaptability for use by machine computation from ungrouped original scores. For easy understanding of the formulas, the symbols are explained:

n = number of sample or subgroup

X = predictor variable (ACT composite score)

Y = criterion variable (grade-point average)

Y' = estimated grade-point average

Σ = "the sum of"

$\sqrt{}$ = "the square root of"

For machine computation the principal work involved finding five sums: X, Y, X^2, Y^2, and XY. These sums were substituted into the following formulas:

1. Means

$$\bar{X} = \frac{\Sigma X}{n} \qquad \bar{Y} = \frac{\Sigma Y}{n}$$

2. Standard Deviations

$$s_x = \sqrt{\frac{\Sigma X^2}{n} - \bar{X}^2} \qquad s_y = \sqrt{\frac{\Sigma Y^2}{n} - \bar{Y}^2}$$

3. Standard Error of the Mean

$$s_{\bar{y}} = \frac{s_y}{\sqrt{n-1}}$$

4. Correlation

$$r = \frac{n\Sigma XY - \Sigma X \Sigma Y}{\sqrt{[n\Sigma X^2 - (\Sigma X)^2][n\Sigma Y^2 - (\Sigma Y)^2]}} = \frac{[A]}{\sqrt{[B][C]}}$$

5. Standard Error of the Correlation

$$s_r \doteq \frac{1-r^2}{\sqrt{n-1}}$$

6. Regression Coefficient for Y on X

$$b_y = \frac{A}{B}$$

7. Regression Equation for Estimating

Grade-Point Averages

$$Y' = b_y (X - \bar{X}) + \bar{Y}$$

8. Standard Error of Estimate

$$S_y = s_y\sqrt{1-r^2}$$

Processing of Data

Using the formulas previously chosen and programmed, the data were processed by the IBM 1620 Computer. Calculations were carried to eight significant places; however, statistical findings are reported to three decimal places. Accuracy was assured by checking the computations with a second set of formulas and by manual calculations on a small subgroup.

Input Data. For each student a card was key-punched with the following information: identification number, classification, sex, ACT composite score, and the accumulative grade-point average. Rosters were compiled for each classification and for the total group, each differentiated by sex. These were used for compiling frequency tables.

Output Data. The output data for each subgroup included the mean and standard deviation on the above input predictor and criterion data, the standard error of the mean of the criterion, correlation of the predictor to the criterion, and the standard error of the correlation. Regression equations and the standard error of estimate were used to predict estimated grade-point averages of each subgroup within a range of possibilities. (See Appendix B.)

All output data were compiled into tables. In the process of evaluating and interpreting the statistical findings, it was necessary to change the organization of the thesis and to make revisions as suggested by the supervising committee.

III. ORGANIZATION OF THE THESIS

The thesis is organized into a background study of related research, statistical findings and their interpretation, and a summary with conclusions and recommendations.

Review of Related Research

The results of the background study of related research studies found in educational and psychological literature are presented from several contexts: (1) Variation in Research; (2) Interpretation of A Coefficient of Correlation; (3) Summary Reviews of Related Research; (4) Scholastic Aptitude Tests As Predictor Variables in Recent Research; and (5) A Review of Eleven Recent Research Studies.

Preliminary Statistical Findings

An analysis of preliminary statistics is made by examination of frequency distributions. The means as a measure of central tendency and the standard deviations as a measure of variability are summarized for the ACT composite scores and for the grade-point averages.

Correlations

Correlations between ACT composite scores and grade-point averages are summarized and interpreted in terms of the strength of relationship, findings in prior research, reliability, and probable limits.

Predictions from Correlations

Estimated grade-point averages are predicted from correlations by means of regression equations and the standard error of estimate.

Summary, Conclusions, and Recommendations

Each area that has been discussed is summarized. Conclusions are reached, and recommendations for further research are made.

CHAPTER II

REVIEW OF RELATED RESEARCH

The interest in prediction of college grades from the student's educational background is reflected in the voluminous and almost innumerable research studies found in educational and psychological literature. Because of the complexity and extensiveness of the literature, the reader may become somewhat overwhelmed by the findings and thus not benefit from the conclusions and suggestions for further research resulting from an evaluation of them. Therefore, in an effort to present this review of related research with some degree of organization, the present chapter examines the studies from several contexts: (1) Variation in Research, (2) Interpretation of A Coefficient of Correlation, (3) Summary Reviews of Related Research, (4) Scholastic Aptitude Tests As Predictor Variables in Recent Research, (5) Review of Eleven Recent Research Studies, and (6) Summary.

I. VARIATION IN RESEARCH

There is considerable variation in the reported correlations for studies that use ability measures to predict academic performance. In order to interpret findings on a comparable basis, it is necessary to understand the reasons for these apparent discrepancies or variations.

Types of Ability Measures

Part of the variation in correlations is probably due to the use of different types of ability measures. Some studies use one of the standard intelligence tests, and others use tests intended specifically as predictors of school performance.

Types of Studies

Some variation may be due to the type of study. There are four general types of studies. One is the type of study in which a single index of ability is used to predict a single overall index of academic performance. A second type uses a single measure of ability to predict grades in specific courses or course areas. Still other studies report multiple correlations in which a battery of predictors is used to predict a single measure of performance. Other findings are from studies in which the method is to use several dimensions or measures of ability for the prediction of grades in specific courses or course areas. In other words, the predictor and/or the criterion may be either single or multidimensional.[1]

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[1]David E. Lavin, The Prediction of Academic Performance (New York: Russell Sage Foundation, 1965), p. 49.

Such variation presents analogous difficulties. For instance, in any distribution of grade-point averages, some have been obtained by students majoring in mathematics, others by students concentrating in social studies, still others majoring in business administration, etc. This brings up the question as to whether it is meaningful to compare averages of students across the various majors. Lavin expressed his opinion:

> It would be more appropriate to study the determinants of performance within curricular groups. Failure to do this is one reason for our inability to predict performance with any great degree of precision. In fact, considering the effects of all the factors that determine grades and yet are not controlled, one wonders how it is possible to predict them with even the fair degree of success already attained.[2]

Static Versus Longitudinal Studies

A third reason for differences in correlations may be the point of time involved in the prediction. Most of the reported studies predict academic performance at only one point of time--that is, they are static. On the other hand, as the result of the lack of sufficient longitudinal studies, little is known regarding the constancy of performance and the degree to which it is predicted over a period of time.

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[2] *Ibid.*, p. 20.

Usually the data are used in an attempt to evaluate the effectiveness of the predictive devices by comparing them with scholastic achievements of the students in question at the end of the first semester of the freshman year or at the end of the freshman year. Kahn and Singer stated, however, that

> . . . it seems rather obvious that for a goodly number of students freshman grades are not valid indices of future performance. Virtually any educator or educational psychologist is aware that a number of unpredictable circumstances may lead to quite marked changes in a student's grades from one year to another, and that when a student is making the difficult transition from high school to college work, his freshman grades are often no dependable predictor of future achievement.[3]

Longitudinal studies deal with performance at several points in time. In referring to these studies, Lavin stated:

> . . . such research can shed light on the degree of variability of academic performance through time. For example, longitudinal research can assess the consistency of academic performance from the freshman through senior years of college . . . and can find variables that may be useful predictors at one time or educational level but do not predict at a later time or different educational level. . . . College admissions officers and guidance personnel are certainly interested in predicting more than a student's grades during the freshman year. It would be valuable to be able to predict the level of performance throughout the college career because a student's performance may fluctuate widely in quality. If this type of performance were predictable, and if it were possible to

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[3]Harris Kahn and Erwin Singer, "An Investigation of Some of the Factors Related to Success or Failure of School of Commerce Students," The Journal of Educational Psychology, Vol. 40, 1949, pp. 107-108.

> know whether or not future performance was likely to improve, educational administrators would be in a position to make sounder decisions. More longitudinal research may provide some answers for these problems.[4]

Sex Composition of Study Samples

Another reason for discrepancies in results is the differing sex composition of study samples. In some studies correlations are computed for both sexes combined; in others the sample consists entirely of males or females. Where correlations are computed separately a sex difference is suggested. Several reports in the educational and psychological literature have pointed out that the college grades of women seem to be more predictable than those of men. For instance, in Abelson's study he noted that "the observed standard error of prediction is smaller for girls than those for boys. On this basis alone, one could claim a significant sex difference in predictability."[5] He also found that when the aptitude test score is used as a single predictor the differences in predictability favor the girls in every college except one. Lavin's studies also indicated that

> . . . the absolute level of performance tends to be higher for females. This means that when males and females are not separated in analysis, the magnitude

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[4]Lavin, *op. cit.*, p. 45.

[5]Robert P. Abelson, "Sex Differences in Predictability of College Grades," *Educational and Psychological Measurement*, Vol. 12, October, 1952, p. 640.

> of correlations between ability and school performance will not accurately reflect the true level for the sexes separately. . . . The variables that predict performance for males may be different from the variables that are predictive for females, and even if the same variables are involved for both sexes, the direction of the relationships might differ. If the sexes are not separated, these possibilities are obscured. Moreover, the failure to control for sex differences contributes to our present ignorance concerning the sources of these differences in academic performance. For these reasons, it is important to perform separate analysis for each sex.[6]

A summary review of predictive research, authored by Harris,[7] also indicated studies in which prediction was found to be better for women students than for men, as well as for homogeneous groups in general.

II. INTERPRETATION OF A COEFFICIENT OF CORRELATION

The coefficient of correlation, an index number which expresses the degree of relationship between two or even more variables, may take any value from 0.00 to $\pm$ 1.00, which is indicative of the range from no relationship to a perfect positive or a perfect negative relationship. Interpretation of the size of the correlation depends upon the area of investigation and the purpose for which it was computed. Guilford explains that the relationship can be

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[6]Lavin, _op_. _cit_., p. 44.

[7]Daniel Harris, "Factors Affecting College Grades: A Review of the Literature, 1930-1937," _Psychological Bulletin_, Vol. 37, March, 1940, p. 149.

described generally as follows:

Less than .20	Slight; almost negligible relationship
.20 - .40	Low correlation; definite but small relationship
.40 - .70	Moderate correlation; substantial relationship
.70 - .90	High correlation; marked relationship
.90 -1.00	Very high correlation; very dependable relationship[8]

In discussing the degree of relationship of correlation, Hillway stated: "A positive correlation of .30 or higher ordinarily may be considered sufficient evidence of a positive degree of relationship."[9] Garrett advised that

> . . . the size of a coefficient of correlation can scarcely be considered apart from the purpose for which it is computed. For example, a coefficient of correlation of .40 between scholastic aptitude test scores and course marks by no stretch of the imagination can be construed as high for the purpose of predicting the academic achievement of an individual. On the other hand, if the purpose were to predict the academic achievement of a group, a coefficient of correlation of .40 would be extremely high.[10]

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[8]J. P. Guilford, Fundamental Statistics in Psychology and Education (New York: McGraw-Hill Book Company, 1950), p. 165.

[9]Tyrus Hillway, Introduction to Research (Boston: Houghton Mifflin Company, 1964), p. 225.

[10]Henry E. Garrett, Elementary Statistics (New York: Longmans, Green and Company, 1956), p. 116.

It would appear, from the many research articles, that correlations of test results with academic success cluster around the average of + .50. This is well substantiated by Lavin's findings which indicated that the average correlation is about .50.[11]

Using these factors alone oversimplifies the evaluation of the worth of a correlation. Therefore, an obtained correlation should be evaluated by other factors, especially in terms of its reliability and the standard error of the correlation.

III. SUMMARY REVIEWS OF RELATED RESEARCH

A brief review of correlations reported in early studies can best be accomplished by reference to several general summaries which have been made of the many studies prior to the 1960's concerned with the relation of various factors to college success.

Summary Review by Harris (1940)

Harris[12] recorded a comprehensive review of 328 studies for the period 1930-1937. Researchers reported correlations with grades ranging from .33 to .64, and many of

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[11]Lavin, *op. cit.*, p. 56.

[12]Harris, *op. cit.*, pp. 125-166.

these found intelligence test scores to be the best single predictor for grades. In fact, it was Harris' personal opinion after making these summaries that ability (or intelligence, or scholastic aptitude, etc.) ranks first in the essential factors in student achievement. He also pointed out that academic failures are easier to predict than successes because a lack of ability is difficult or impossible to remedy, while an ability can be easily neglected.

Summary by Emme (1942)

Seven criteria for the prediction of college success were discussed by Emme[13] in his summary made in 1942. Data revealed that there is much evidence that high school performance or rank is the best single criterion for prediction, with intelligence ranked second. Other criteria included college marks, tests of all kinds, and such non-intellectual factors as interest and enjoyment, and personal traits and characteristics. One investigator found correlations between intelligence and college marks to be as low as .35. Others reported correlations of .46, .47, .52, and even as high as .70.[14]

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[13] Earle E. Emme, "Predicting College Success," *Journal of Higher Education*, Vol. 13, 1942, pp. 263-267.

[14] *Ibid*., p. 264.

Emme included other studies which reported correlations between pairs of semesters in college to range from .516 to .749, with the fourth semester showing closest average agreement with all others. Another said, "Scholastic performance during the first three years is the best single means so far tested for selecting students for admission to the senior year."[15] Another researcher found the correlation of .47 between achievement scores and four years' scholarship.[16]

Summary by Garrett (1949)

According to Garrett,[17] in his survey of more than 300 research investigations which were directed toward the purpose of predicting academic success as measured by grades, five factors had the greatest predictive value. He ranked their average coefficient of correlation with average college grades as follows:

(1) High school scholarship	.56
(2) General achievement test scores	.49
(3) Intelligence test scores	.47
(4) General college aptitude test scores	.43
(5) Special aptitude test scores	.41

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[15] Ibid.

[16] Ibid.

[17] Harley F. Garrett, "A Review and Interpretation of Investigations of Factors Related to Scholastic Success in Colleges of Arts and Science and Teachers Colleges," Journal of Experimental Education, Vol. 28, December, 1949, pp. 91-138.

Pursuing further his summary on 94 studies using general intelligence tests or psychological examinations, Garrett reported correlations ranging from .17 to .67, with a median of .47. He stated that these findings were in keeping with other summaries showing correlations ranging from .31 to .60 and from .13 to .71. He also reported the summary averages of other studies as being about .45.[18]

Other Summaries

Several other researchers have made similar reviews. Cronbach[19] in a review in 1949 reported that scores on the college level ability tests correlate about .50 to .55 with grade-point averages. A review by Henry[20] in 1950 arrived at a similar conclusion. Cosand[21] in 1953 ranked predictors by their median correlation with college grade-point averages as follows:

(1) High school percentile rank	.58
(2) Average high school grade	.54
(3) General achievement tests	.54
(4) Mental ability tests	.45

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[18] _Ibid._, p. 106.

[19] Lee J. Cronbach, _Essentials of Psychological Testing_ (New York: Harper and Brothers, 1949).

[20] Erwin R. Henry, "Predicting Success in College and University" in Douglas H. Fryer and Erwin R. Henry, editors, _Handbook of Applied Psychology_ (New York: Rinehart and Co., 1950), pp. 449-453.

[21] Joseph Cosand, "Admissions Criteria," _College and University_, Vol. 28, Spring, 1953, pp. 338-364.

IV. SCHOLASTIC APTITUDE TESTS AS PREDICTOR VARIABLES IN RECENT RESEARCH

Although more attention has been paid in recent years to non-intellectual factors affecting scholastic success in college, the most popular factor studied in its relation to college success has been intelligence.

Intelligence tests, as well as their many pseudonyms, may be thought of as tests of general aptitude or scholastic aptitude. They have the same purpose: to estimate the capacity of the student for school learning. For all practical purposes, they are the same kind of tests, although there is a difference in content. Intelligence tests generally are composed of verbal and numerical tasks, and nonacademic skills having to do with space perception. On the other hand, the scholastic aptitude tests include verbal and numerical content but omit such nonacademic tasks. They are most typically used in predicting achievement or a future level of performance academically.[22]

In an effort to review those findings and conclusions which are especially pertinent to the subject of this study, it was thought desirable to consider only those recent

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[22]Henry Chauncey and John E. Dobbin, Testing: Its Place in Education Today (New York: Harper & Row, 1963), p. 31.

prediction studies which used tests intended specifically as predictors of school performance. Reference is made especially to three tests used by hundreds of colleges and universities--the Scholastic Aptitude Test of the College Entrance Examination Board (SAT), the School and College Ability Test (SCAT), and the American College Testing Program Examination (ACT). Descriptions of these three tests will serve to familiarize the reader with the content of each before undertaking a review of the recent research using them as predictor variables.

The Scholastic Aptitude Test

The oldest and best known test is the Scholastic Aptitude Test, operated by the College Entrance Examination Board, an organization which had its beginning around the turn of the century. It is a selection test administered for college admission purposes. It consists of two parts, verbal and mathematical, with scores reported in the two areas. The scores are not reported together to make a total score, but are usually considered separately in predicting how well a student is likely to perform at a particular college.[23]

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[23] Donald E. Super, "The Scholastic Aptitude Tests of the College Entrance Examination Board," Personnel and Guidance Journal, Vol. 42, December, 1963, p. 406.

The School and College Ability Test

Inaugurated in 1955, the School and College Ability Test is a measure of academic ability, as its name implies. Various forms are used in school, beginning with the fourth grade, through college. It contains four subtests, two verbal and two numerical. The two verbal subtests together yield a verbal score, the two arithmetic subtests together yield a quantitative score, and all four yield a total score.[24]

The American College Testing Program Examination

The American College Testing Program was begun in 1959. The ACT battery consists of tests in four areas: English usage, mathematics usage, social studies reading, and natural sciences reading. The individual tests sample the ability to understand and to use, or to evaluate, certain principles, techniques, or problems, in the areas designated. In addition to the four scores on the individual tests, the composite score is also reported. It is an average of the four scores. In this sense, it becomes an overall estimate of skills and abilities necessary to perform the intellectual tasks students are required to

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[24] Chauncey and Dobbin, *op. cit.*, p. 32.

perform in their college studies.[25] As the ACT is primarily intended for decision with regard to admission to college, Tiedeman expressed his opinion that "the composite score . . . provides a good indication of scholastic aptitude for college work as claimed."[26]

With the ACT battery the student supplies his most recent high school grades in the four areas and completes a Student Profile questionnaire, thus complementing the test scores and high school grades with information for a broader basis for decisions.

The ACT Program also has a Research and Development Division which focuses its goals toward developing new techniques and services to higher education and to improving ACT assessment devices.[27]

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[25] Paul L. Trump, "The American College Testing Program," Journal of National Association of Women Deans and Co[illegible] October, 1963, p. 40.

[26] David V. Tiedeman, "The American College Testing Program Examination," Personnel and Guidance Journal, Vol. 41, May, 1963, p. 816.

[27] John L. Holland, "The Research and Development Division in the American College Testing Program," Journal of Counseling Psychology, Vol. 13, Spring, 1966, p. 117.

V. REVIEW OF ELEVEN RECENT RESEARCH STUDIES

From the recent research studies scrutinized, eleven studies were selected as being representative of those using as predictor variables the Scholastic Aptitude Test, the School and College Ability Test, and the American College Test. Even though other variables may have been included, the summary review of each of these research studies reports only those findings concerned with the aptitude tests named as being significantly related to the subject of this thesis.

In some of these studies only one of the tests was included as a predictor variable; in other studies two of them, or all of them, were used. The summary reviews are grouped according to the tests used as predictor variables and further identified by the college or university at which the study was conducted.

Two Research Studies With SAT As A Predictor Variable

The Scholastic Aptitude Test was used as a predictor variable in two studies. One was conducted for colleges in the University System of Georgia and the other for the University of Denver.

University System of Georgia. Using the scores on the verbal and mathematical sections of the Scholastic

Aptitude Test, an entrance requirement for all colleges in the University System of Georgia, Franz, Davis, and Garcia[28] compiled statistical data on sixteen state colleges, eight of which were senior colleges. First-term freshmen students of the 1957 class were included in the research. Each college was treated separately with two basic groups, according to sex.

Statistics revealed that the correlations between the Verbal score and GPA ranged from .35 to .53 for males. The comparable range for women was from .39 to .63. Using the Mathematical score, correlations ranged from .44 to .58 for males and .41 to .56 for females. When the two scores were added together, correlations ranged from .47 to .63, and from .46 to .67 for males and females, respectively. The highest correlations reported for females were greater than for males in every instance except one, the Mathematical score. This followed the usual sex pattern that the performance of females is usually more predictable than is the performance of male students.

It was noted also that the Total score (Verbal and Mathematical scores added together) was superior to either

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[28]Gretchen Franz, _et al_., "Prediction of Grades From Pre-Admission Indices in Georgia Tax-Supported Colleges," _Educational and Psychological Measurement_, Vol. 18, Winter, 1958, pp. 841-844.

of the scores considered alone in predicting the grade-point averages of males and females.

The researchers concluded that the correlations were substantial in most instances and that the SAT would seem to be a promising instrument for use with the kinds of populations upon which these Georgia colleges draw.

University of Denver. Though Watley's study[29] focused attention on the effectiveness of both intellectual and non-intellectual factors in predicting grades for business administration students, consideration was given particularly to the predictor variable, SAT, because of its use in the selection of business students at the University of Denver. The subjects used were freshmen males who entered the College of Business Administration at that University during the fall quarters of 1958 and 1959 with majors in Accounting, Hotel and Restaurant Management, Marketing, or Management, with the latter two being combined for the study.

The mathematics part of the SAT correlated .52 with grades and the verbal part correlated .53, which indicated usefulness for predicting achievement for this group of Accounting students. For students with Marketing and

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[29]Donivan J. Watley, "The Effectiveness of Intellectual and Non-Intellectual Factors in Predicting Achievement for Business Students," The Journal of Educational Research, Vol. 57, April, 1964, pp. 402-408.

Management majors the SAT verbal yielded a correlation of .32, and the SAT Mathematics .47 with GPA. Different results were found for students majoring in Hotel and Restaurant Management. Practically no correlation was found to exist between either of the SAT variables and the GPA. The correlation coefficient between the mathematics part and grades was -.01, and -.07 between the verbal part and grades, both negative. Correlations for the combined groups of business students were .42 and .27 for the mathematics and verbal tests, respectively.

According to the conclusions reached, the mathematics and verbal parts of the SAT appeared to be useful variables for predictive purposes with business students.

Three Research Studies With SAT and SCAT As Predictor Variables

Predictor variables in three studies were the Scholastic Aptitude Test and the School and College Ability Test. These studies were made for Michigan State University, Seton Hill College, and a liberal arts, church-related college.

Michigan State University. The study by Juola[30] presented data on the predictive validity of five academic

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[30]A. E. Juola, "Predictive Validity of Five College-Level Academic Aptitude Tests at One Institution," Personnel and Guidance Journal, Vol. 38, April, 1960, pp. 637-641.

aptitude tests relative to the freshman grade-point average at Michigan State University. The SAT and SCAT were two of the tests used in the analyses. The SAT was administered to a group of 734 entering freshmen, 412 males and 322 females, in 1956; and the SCAT was administered to 910 freshmen in 1957, 476 males and 434 females. Though two scores are usually reported for the SAT, the Verbal and Mathematical scores were added together for the purpose of the study.

The investigator reported a correlation of .55, .53, and .63 between grades and SAT/V, SAT/M, and the two scores added together, respectively. Likewise, for females the correlations were .62, .61, and .68.

Statistics revealed a correlation of .49 between grades and SCAT/V for males, and a correlation of .59 for females. Correlations between grades and SCAT/Q were .45 for males and .57 for females. Using Total score, correlations were reported to be .56 for males and .68 for females.

Examination of the correlations revealed the usual sex pattern. The performance of females is usually more consistent with tested ability than is the performance of the male students. It was noted also that the Total score was superior to either of the individual scores in predicting the GPA of males and females.

Seton Hill College. At Seton Hill College, a liberal arts college for women, Mann[31] made a study on a random sample of 200 girls from classes of 1961 and 1962, using the SAT and the SCAT as two of three predictor variables and first-year averages as the criterion variable.

The investigator reported a correlation of .68 between GPA and SAT/V and a correlation of .63 between GPA and SAT/M. Correlations of .66 and .61 between GPA and SCAT/V and SCAT/Q, respectively, were also reported.

On the basis of these substantial relationships, it was concluded by the investigator that freshman-year success at the college named could be predicted efficiently.

A Small Liberal Arts, Church-Related College. Vick and Hornaday[32] reported the result of their study to determine the predictive ability of a battery of three college entrance tests against a criterion of freshman grade-point averages at a small liberal arts, church-related college. Subjects were 164 women entering college for the first time in the fall of 1960. One of the predictive variables used was SAT.

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[31] M. Jacinta Mann, "The Prediction of Achievement in A Liberal Arts College," Educational and Psychological Measurement, Vol. 21, Summer, 1961, pp. 481-483.

[32] Mary Catharine Vick and John A. Hornaday, "Predicting Grade Point Average at A Small Southern College," Educational and Psychological Measurement, Vol. 22, 1962, pp. 795-798.

The investigators reported a mean of 2.27 (using the four-point system) for the grade-point average with a standard deviation of .73, a correlation of .46 between GPA and SAT/V, and a correlation of .37 between GPA and SAT/M.

Another of the predictive variables was the SCAT. The investigators reported a correlation of .40, .43, and .47 between GPA and SCAT/V, SCAT/Q, and SCAT/T, respectively.

Also, for comparison purposes, eight other validity studies on SAT and SCAT were reported. The results on these studies were very similar to Vick and Hornaday's study. Generally, higher correlations were reported for women than for men and for private than for public colleges.

A Research Study With SAT, SCAT, and ACT As Predictor Variables

Only one research study used all three scholastic aptitude tests as predictor variables.

Troy State College. The purpose of the study by Boyce and Paxson[33] was to determine estimates of the local predictive validity of various standardized aptitude tests at Troy State College, Alabama. The predictor variables used were the Scholastic Aptitude Test, the School and

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[33]Richard W. Boyce and R. C. Paxson, "The Predictive Validity of Eleven Tests At One State College," Educational and Psychological Measurement, Vol. 25, Winter, 1965, pp. 1143-1147.

College Ability Test, and the American College Test. A random sample of 100 freshmen students in 1964 were used as subjects. The criterion used was the grade-point average at the end of the student's first quarter in college.

Correlations between predictor and criterion variable were reported to be .36, .38, and .46 for SAT/V, SAT/M, and SAT/T, respectively. Likewise, for SCAT/V, SCAT/Q, and SCAT/T the correlations were .49, .42, and .56. For the subtests of ACT the correlations were .64, .47, .50, and .46. For the composite score, the correlation was .57. The correlations for the Total scores on SAT and SCAT were higher than individual scores. With the exception of the score on the English subtest, the composite score on ACT had a higher correlation than the subtests.

A Research Study With SCAT and ACT As Predictor Variables

Only one research study used the combination of the School and College Ability Test and the American College Test as predictor variables.

Notre Dame College. It was the purpose of the study made by DeSena and Weber[34] to find the degree of correlation

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[34]Paul A. DeSena and Louise A. Weber, "The Predictive Validity of the School and College Ability Test (SCAT) and the American College Test (ACT) At A Liberal Arts College for Women," Educational and Psychological Measurement, Vol. 25, Winter, 1965, pp. 1149-1151.

between grade-point averages and the scores of the School and College Ability Test and the American College Test for students at Notre Dame College, a liberal arts college for women. Scores on the SCAT were obtained for 77 students of the 1958 class. ACT scores were used for 92 students of the 1960 class. Grade-point averages for two semesters of college work were calculated for both classes.

Statistics revealed the correlation between SCAT total and grade-point averages to be .67 and for ACT composite .52. Based on the evidence, it was found that the SCAT Total coefficient of correlation was not significantly different from the ACT composite correlation when two different samples of subjects were studied. It could be, however, that the observed difference suggested that SCAT Total may have had the higher degree of predictability of successful college achievement. This was the conclusion drawn by the investigators.

Four Research Studies With ACT As A Predictor Variable

The American College Test was used as a predictor variable in four research studies. These were conducted at Jackson State College in Mississippi, The Ohio State University, Kansas State University, and Iowa State University.

Jackson State College. An investigation by Funches[35] was made at Jackson State College, Mississippi, to determine the correlation between the American College Test composite standard score and the year-end grade-point average of 369 freshmen in the fall of 1962.

The mean ACT composite score was 9.4; the median was 9. The GPA mean was 1.17 on a three-point scale. The correlation of .59 between the composite score and the GPA was above what is generally accepted as sufficient evidence of a positive degree of relationship. It was concluded that the ACT composite score would be a reliable factor if used to predict first-year college success.

The Ohio State University. As The Ohio State University was interested in the possibility of finding a possible replacement for an academic aptitude test already in use, Peters and Plog[36] made a study to determine the effectiveness of the American College Test. The sample comprised 2,705 students who entered the University as freshmen in 1960.

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[35]Delars Funches, "A Correlation Between the ACT Scores and the Grade-Point Averages of Freshmen at Jackson State College," _College and University_, Vol. 40, Spring, 1965, pp. 324-326.

[36]Frank R. Peters and Eugenia L. Plog, "The Effectiveness of the ACT for Selection and Placement at The Ohio State University," _Educational Research Bulletin_, December, 1961, pp. 232-241, 252.

The reported data indicated a correlation of .56 between the ACT Total (the sum of four subtest scores in this instance) and the GPA. As correlations of other tests were reported to be .43, .53, and .54, the researchers concluded that the total score was the best predictor of GPA.

Kansas State University. At the Kansas State University, Foster and Danskin[37] used data on two separate freshmen classes, a total of 1,182 for 1960 and 1,661 for 1961, to evaluate the American College Test. Each class was divided by college and sex.

The correlations between ACT subtests and first-semester grades ranged from .607 to .709 for 1960 men and from .613 to .674 for 1961 men. The comparable ranges for women were from .681 to .690 and from .702 to .792.

With some variability between college-sex groups, the correlations between estimated and obtained first-semester grade-point averages ranged from .54 to .75.

The correlations between course grades and ACT subtests ranged from around .60 for six courses and between .42 and .58 for three. Of special interest was the correlation of .48 reported for men and women in Accounting.

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[37]James M. Foster and David G. Danskin, "The American College Test (ACT) Tested Three Ways," Personnel and Guidance Journal, Vol. 43, May, 1965, pp. 904-909.

It was concluded that the ACT is an effective estimator of academic performance at Kansas State University and that women are more predictable academically than men.

Iowa State University. Research with the American College Testing Program at Iowa State University was conducted by Brown and Wolins[38] over a three-year period, 1960-1962. The subjects included 1,404 from the freshman class of 1960, 1,647 for 1961, and 1,546 for 1962. Separate analyses were made for the various colleges and for men and women.

The correlations of ACT composite scores with the GPA within the various colleges ranged from .55 to .70 in 1960, from .48 to .67, and from .46 to .58 for the other two years, respectively. For male students in the College of Science and Humanities, correlations were reported to be .70, .52, and .58 for each of the years, respectively. Likewise, correlations were .63, .55, and .58 for females.

There was a tendency for the magnitude of the validity coefficients to decrease over the three years, but no reason for the decrease was apparent. The data also showed that the ACT composite scores provided a better predictor of GPA than did any subtests.

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[38]Frederick G. Brown and Leroy Wolins, "An Empirical Evaluation of the American College Testing Program," Personnel and Guidance Journal, Vol. 43, January, 1965, pp. 451-456.

Considering all findings of the three-year studies, it was concluded that at Iowa State University the ACT battery is as good a predictor of college success as other measures of scholastic aptitude. The magnitude of its correlations with GPA were similar to those found for other scholastic aptitude measures. Thus, the investigators concluded that ACT proved to be satisfactory as a measure of general scholastic aptitude.

VI. SUMMARY

Due to the complexity and extensiveness of the literature recording research studies predicting college grades from the students' scores on scholastic aptitude tests, the present chapter examined the studies from several contexts: (1) Variation in Research, (2) Interpretation of A Coefficient of Correlation, (3) Summary Reviews of Related Research, (4) Scholastic Aptitude Tests As Predictor Variables in Recent Research, and (5) Review of Eleven Recent Research Studies.

Variation in Research

Variation in the reported correlations for studies that used ability measures to predict academic performance may have been the result of the type of ability measure used. Some studies used one of the standard intelligence tests, and others used tests intended specifically as predictors of school performance.

Other variations may have been due to the type of study. There were four general types in which the predictor variable and/or the criterion variable may have been single or multidimensional.

A third reason for differences in correlations may have been the point of time involved in the prediction. Most of the studies were static--that is, they predicted academic performance at only one point of time. Some were longitudinal studies predicting performance at several points of time. More longitudinal research would be valuable in predicting the level of performance throughout the college career.

Another reason for variation in correlation results was the differing sex composition of study samples. Usually, prediction of the level of performance for females was higher than for males. For this reason, males and females should have been separated in analyses in order to reflect the true level for the sexes.

Interpretation of A Coefficient of Correlation

The coefficient of correlation expresses the degree of relationship between two or even more variables and may have any value from 0.0 to $\pm$ 1.00. Interpretation of the size of the correlation depends upon the area of interest and the purpose for which it was computed. It is generally agreed that if the purpose were to predict the academic achievement of a group, a coefficient of correlation of .40 would be extremely high. Other factors of reliability and probable limits of the correlation should be considered in the evaluation of its worth.

Summary Reviews of Related Research

Several general summaries have been made of the many studies concerned with the relation of various factors to academic success in college. Harris' summary reviewed 328 studies for the period 1930-1937. Researchers reported correlations with grades ranging from .33 to .64. Emme, in his summary published in 1942, reviewed research through 1941 and found correlations between intelligence and college marks to be as low as .35, and as high as .70.

According to Garrett's report on 94 studies using general intelligence tests or psychological examinations, correlations ranged from .17 to .67, with averages about .47. Other summaries indicated correlations clustering around .50.

Scholastic Aptitude Tests As Predictor Variables in Recent Research

In recent years the most popular predictor variables have been intelligence tests and scholastic aptitude tests.

They have the same purpose: to estimate the capacity of the student for school learning. For all practical purposes, they are the same kind of tests, although there is a difference in content. In addition to the usual verbal and numerical tasks, intelligence tests include nonacademic tasks, whereas the scholastic aptitude tests omit nonacademic tasks.

In an effort to consider only those recent predictive studies which used tests intended specifically as predictors of school performance, reference was made especially to three scholastic aptitude tests which are being used by hundreds of colleges and universities: the Scholastic Aptitude Test of the College Entrance Examination Board (SAT), the School and College Ability Test (SCAT), and the American College Testing Program Examination (ACT).

Review of Eleven Recent Research Studies

From the recent research studies scrutinized, eleven studies were chosen as being representative of the recent research using as predictor variables the Scholastic Aptitude Test, the School and College Ability Test, and the American College Test. Even though other variables may have been included, the summary review of each of these research studies reported only those findings concerned with the aptitude tests named as being significantly related to the subject of this thesis.

Statistics revealed that the correlations between the Verbal score of SAT and grade-point averages ranged from .27 to .55 for males. The comparable range for females was .39 to .68. Using the Mathematical score, correlations ranged from .42 to .58 for males, and from .41 to .61 for females. When the two scores were added together, correlations ranged from .47 to .63, and from .46 to .68 for males and females, respectively.

Investigators reported correlations of .49, .45, and .56 between grades and SCAT/V, SCAT/Q, and SCAT/T for males. Likewise, for females the correlations ranged from .40 to .66 on SCAT/V, .43 to .61 on SCAT/Q, and from .47 to .68 on SCAT/T.

An examination of the correlations between ACT subtests and grades indicated a range from .607 to .709 for males and a range from .681 to .792 for females. Using the ACT composite score, the correlations ranged from .52 to .70, and from .55 to .67, for males and females, respectively. Undifferentiated by sex, the correlations between ACT composite scores and grades ranged from .46 to .70.

Conclusions reached by the researchers may be summarized briefly:

(1) Examination of the correlations revealed the usual sex pattern. The performance of females is usually

more consistent with tested ability than is the performance of male students.

(2) The total score was superior to either of the individual scores in predicting the GPA of males and females.

(3) The scores of the Scholastic Aptitude Test, the School and College Ability Test, and the American College Test provided efficient predictability of successful college achievement.

CHAPTER III

PRELIMINARY STATISTICAL FINDINGS

I. PRESENTATION OF ORIGINAL DATA

Composition of the Sample

As stated in Chapter I of this thesis, 283 students, or 49 percent of the 576 students on the list of majors in the Undergraduate School of Business, were selected as a homogeneous group to be included in this study. The sample was divided by class and sex. A summary of the composition of these various subgroups is in Table I.

TABLE I

CLASSIFICATION AND SEX OF THE SAMPLE

Class	Males	Females	Total
Sophomore	80	37	117
Junior	80	22	102
Senior	55	9	64
Total	215	68	283

The sophomore majors consisted of 80 males and 37 females for a total of 117. Eighty males and 22 females comprised the juniors for a total of 102. The seniors consisted of 55 males and 9 females for a total of 64. In other words, 215 males and 68 females, or a total of 283, were included in this study.

Organization of the Data

A roster showing the original data is in Appendix A. These students were alphabetized and given identification numbers from 1 to 283 as indicated in the first column. The classification of each student is shown in the second column. The classification of sophomore is represented by 2, whereas 3 and 4 represent junior and senior classifications, respectively. The third column designates the sex, 1 representing male, 2 female. The ACT composite score is in the fourth column. The last three columns concern the academic record of the student: total semester hours attempted, total grade points earned, and accumulative grade-point average.

Using programmed formulas, the above input data were processed by the IBM 1620 computer. The preliminary statistical findings are presented and interpreted in this chapter through frequency distributions, statistics of the ACT composite scores, and statistics of the grade-point averages. Correlations and predictions of estimated grade-point averages are included in separate chapters.

II. ANALYSIS OF THE PRELIMINARY STATISTICAL FINDINGS

Frequency Distributions

Since all the data must be analyzed in some way to be of any use, scatter diagrams were compiled to portray graphically the distribution of ACT scores and grade-point averages for the three classes and for the total sample, each differentiated by sex. These frequency distributions are recorded in Tables II through XIII.

Distribution of ACT Composite Scores. For the males in the total sample, as shown in Table XI, the ACT composite scores range from 7, with two tallies, through 27, with only one tally. This comprises the range for the entire sample also, as indicated in Table XIII. The scores of the females in the total sample range from 9 to 24 as shown in Table XII. In ten of the twelve subgroups the scores cluster around 17 sufficiently to result in means ranging within 17.00 to 18.00. Generally, on both sides of the middle steps the frequencies drop off with fair symmetry toward the end steps, where the extreme scores are few in number. Since the tallies for the total sample fall within ± 3 sigmas, a normal distribution can be assumed in every instance for the ACT composite scores.

TABLE II

SCATTER DIAGRAM SHOWING THE RELATIONSHIP BETWEEN THE ACT COMPOSITE SCORES AND THE GRADE-POINT AVERAGES OF MALE SOPHOMORES MAJORING IN BUSINESS ADMINISTRATION

r = .288

Grade-Point Averages	ACT Composite Scores																					
	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	f
4.0																						0
3.5 - 3.9														1								1
3.0 - 3.4														1								1
2.5 - 2.9				1						1			1	1	2	3						9
2.0 - 2.4				2	1	1	1	3	1	2	3	2	1	3	3	1			1			25
1.5 - 1.9					2	2	2	1	4	7	3	3	4	4	3	2						37
1.0 - 1.4						1				2	1	1	1									6
Below 1.0										1												1
f	0	0	0	3	3	4	3	4	5	13	7	6	7	10	8	6	0	0	1	0	0	80

TABLE III

SCATTER DIAGRAM SHOWING THE RELATIONSHIP BETWEEN THE ACT COMPOSITE SCORES AND THE GRADE-POINT AVERAGES OF FEMALE SOPHOMORES MAJORING IN BUSINESS ADMINISTRATION

r = .767

Grade-Point Averages	ACT Composite Scores																					
	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	f
4.0																						0
3.5 - 3.9																	1	1				2
3.0 - 3.4										2						2	2	1				7
2.5 - 2.9						1					1	1	1	1	2	1	2					10
2.0 - 2.4					1			2	1	2	3		1		1							11
1.5 - 1.9			1		1	1		2		1												6
1.0 - 1.4									1													1
Below 1.0																						0
f	0	0	1	0	2	2	0	4	2	5	4	1	2	1	3	3	5	2	0	0	0	37

TABLE IV

SCATTER DIAGRAM SHOWING THE RELATIONSHIP BETWEEN THE ACT COMPOSITE SCORES AND THE GRADE-POINT AVERAGES OF SOPHOMORES MAJORING IN BUSINESS ADMINISTRATION

r = .473

Grade-Point Averages	ACT Composite Scores																				
	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	f
4.0																						0
3.5 - 3.9														1			1	1				3
3.0 - 3.4										2				1		2	2	1				8
2.5 - 2.9				1		1				1	1	1	2	2	4	4	2					19
2.0 - 2.4				2	2	1	1	5	2	4	6	2	2	3	4	1			1			36
1.5 - 1.9			1		3	3	2	3	4	8	3	3	4	4	3	2						43
1.0 - 1.4									1	3	1	1	1									7
Below 1.0						1																1
f	0	0	1	3	5	6	3	8	7	18	11	7	9	11	11	9	5	2	1	0	0	117

TABLE V

SCATTER DIAGRAM SHOWING THE RELATIONSHIP BETWEEN THE ACT COMPOSITE SCORES AND THE GRADE-POINT AVERAGES OF MALE JUNIORS MAJORING IN BUSINESS ADMINISTRATION

$r = .525$

Grade-Point Averages	ACT Composite Scores																				
	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	f
4.0																						0
3.5 - 3.9															1						1	2
3.0 - 3.4														1		2	1					4
2.5 - 2.9								1	1	1	1		2		1	2	3		1			13
2.0 - 2.4			1		1		1	3	4	2	7	1	3	4	2	5	1	2	1			38
1.5 - 1.9					2		2	3	3	2	6	1	1	2	1							23
1.0 - 1.4																						0
Below 1.0																						0
f	0	0	1	0	3	0	3	7	8	5	14	2	6	7	5	9	5	2	2	0	1	80

TABLE VI

SCATTER DIAGRAM SHOWING THE RELATIONSHIP BETWEEN THE ACT COMPOSITE SCORES AND THE GRADE-POINT AVERAGES OF FEMALE JUNIORS MAJORING IN BUSINESS ADMINISTRATION

r = .759

Grade-Point Averages	ACT Composite Scores																					
	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	f
4.0																						0
3.5 - 3.9															1		1	1				3
3.0 - 3.4										1		1	1		1	1						5
2.5 - 2.9												1				1						2
2.0 - 2.4									1	2	2	1	1									7
1.5 - 1.9						3			1					1								5
1.0 - 1.4																						0
Below 1.0																						0
f	0	0	0	0	0	3	0	0	2	3	2	3	2	1	2	2	1	1	0	0	0	22

TABLE VII

SCATTER DIAGRAM SHOWING THE RELATIONSHIP BETWEEN THE ACT COMPOSITE SCORES AND THE GRADE-POINT AVERAGES OF JUNIORS MAJORING IN BUSINESS ADMINISTRATION

$r = .535$

Grade-Point Averages	ACT Composite Scores																					
	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	f
4.0																						0
3.5 - 3.9															2		1	1			1	5
3.0 - 3.4										1		1	1	1	1	3	1					9
2.5 - 2.9								1	1	1	1	1	2		1	3	3		1			15
2.0 - 2.4			1		1		1	3	5	4	9	2	4	4	2	5	1	2	1			45
1.5 - 1.9					2	3	2	3	4	2	6	1	1	3	1							28
1.0 - 1.4																						0
Below 1.0																						0
f	0	0	1	0	3	3	3	7	10	8	16	5	8	8	7	11	6	3	2	0	1	102

TABLE VIII

SCATTER DIAGRAM SHOWING THE RELATIONSHIP BETWEEN THE ACT COMPOSITE SCORES AND THE GRADE-POINT AVERAGES OF MALE SENIORS MAJORING IN BUSINESS ADMINISTRATION

r = .440

Grade-Point Averages	ACT Composite Scores																				
	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	f
4.0																						0
3.5 - 3.9												1										1
3.0 - 3.4												1	1		1			1	1			5
2.5 - 2.9					1					3	1			1			1	1				8
2.0 - 2.4	1					1	3	4	4	1	5	4	2	4	1	1	1					32
1.5 - 1.9	1						1		2	1	1		2	1								9
1.0 - 1.4																						0
Below 1.0																						0
f	2	0	0	0	1	1	4	4	6	5	7	6	5	6	2	1	2	2	1	0	0	55

TABLE IX

SCATTER DIAGRAM SHOWING THE RELATIONSHIP BETWEEN THE ACT COMPOSITE SCORES AND THE GRADE-POINT AVERAGES OF FEMALE SENIORS MAJORING IN BUSINESS ADMINISTRATION

r = .622

Grade-Point Averages	ACT Composite Scores																					
	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	f
4.0																						0
3.5 - 3.9																		1				1
3.0 - 3.4																						0
2.5 - 2.9							1						1									2
2.0 - 2.4										1	3	1		1								6
1.5 - 1.9																						0
1.0 - 1.4																						0
Below 1.0																						0
f	0	0	0	0	0	0	1	0	0	1	3	1	1	1	0	0	0	1	0	0	0	9

TABLE X

SCATTER DIAGRAM SHOWING THE RELATIONSHIP BETWEEN THE ACT COMPOSITE SCORES AND THE GRADE-POINT AVERAGES OF SENIORS MAJORING IN BUSINESS ADMINISTRATION

r = .462

Grade-Point Averages	ACT Composite Scores																				
	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	f
4.0																						0
3.5 - 3.9												1						1				2
3.0 - 3.4												1	1		1			1	1			5
2.5 - 2.9					1		1			3	1		1	1			1	1				10
2.0 - 2.4	1					1	3	4	4	2	8	5	2	5	1	1	1					38
1.5 - 1.9	1						1		2	1	1		2	1								9
1.0 - 1.4																						0
Below 1.0																						0
f	2	0	0	0	1	1	5	4	6	6	10	7	6	7	2	1	2	3	1	0	0	64

TABLE XI

SCATTER DIAGRAM SHOWING THE RELATIONSHIP BETWEEN THE ACT COMPOSITE SCORES AND THE GRADE-POINT AVERAGES OF MALES MAJORING IN BUSINESS ADMINISTRATION

$r = .406$

Grade-Point Averages	ACT Composite Scores																					
	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	f
4.0																						0
3.5 - 3.9												1		1	1						1	4
3.0 - 3.4												1	1	2	1	2	1	1	1			10
2.5 - 2.9				1	1			1	1	5	2		3	2	3	5	4	1	1			30
2.0 - 2.4	1		1	2	2	2	5	10	9	5	15	7	6	11	6	7	2	2	2			95
1.5 - 1.9	1				4	2	5	4	9	10	10	4	7	7	4	2						69
1.0 - 1.4						1				2	1	1	1									6
Below 1.0										1												1
f	2	0	1	3	7	5	10	15	19	23	28	14	18	23	15	16	7	4	4	0	1	215

TABLE XII

SCATTER DIAGRAM SHOWING THE RELATIONSHIP BETWEEN THE ACT COMPOSITE SCORES AND THE GRADE-POINT AVERAGES OF FEMALES MAJORING IN BUSINESS ADMINISTRATION

$r = .745$

Grade-Point Averages	ACT Composite Scores																				
	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	f
4.0																						0
3.5 - 3.9															1		2	3				6
3.0 - 3.4										3		1	1		1	3	2	1				12
2.5 - 2.9						1	1				1	2	2	1	2	2	2					14
2.0 - 2.4					1			2	2	5	8	2	2	1	1							24
1.5 - 1.9			1		1	4		2	1	1				1								11
1.0 - 1.4									1													1
Below 1.0																						0
f	0	0	1	0	2	5	1	4	4	9	9	5	5	3	5	5	6	4	0	0	0	68

TABLE XIII

SCATTER DIAGRAM SHOWING THE RELATIONSHIP BETWEEN THE ACT COMPOSITE SCORES AND THE GRADE-POINT AVERAGES OF MAJORS IN BUSINESS ADMINISTRATION

r = .489

Grade-Point Averages	ACT Composite Scores																					
	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	f
4.0																						0
3.5 - 3.9												1		1	2		2	3			1	10
3.0 - 3.4										3		2	2	2	2	5	3	2	1			22
2.5 - 2.9				1	1	1	1	1	1	5	3	2	5	3	5	7	6	1	1			44
2.0 - 2.4	1		1	2	3	2	5	12	11	10	23	9	8	12	7	7	2	2	2			119
1.5 - 1.9	1		1		5	6	5	6	10	11	10	4	7	8	4	2						80
1.0 - 1.4						1			1	2	1	1	1									7
Below 1.0										1												1
f	2	0	2	3	9	10	11	19	23	32	37	19	23	26	20	21	13	8	4	0	1	283

Distribution of Grade-Point Averages. The grade-point averages were tallied in steps to fit the 4.0 grading scale. For the total sample only one tally is recorded for the Below 1.0 step, and ten tallies are in the 3.500 - 3.999 step. No tallies are in the 4.0 step. In nine distributions the grade-point averages cluster in the 2.000 - 2.499 step sufficiently to result in means ranging within this step. In the other three distributions the grade-point averages cluster in the 2.500 - 2.999 step to result in means within this step. Since tallies for the entire sample fall within ± 3 sigmas, a normal distribution can be assumed for the grade-point averages.

Correlations. In these graphic scattergrams it is immediately observable in every distribution that the scatter of the tally marks is from the lower-left to the upper-right corners. This indicates that the correlations are positive. They range from .767 for sophomore females to a low of .288 for sophomore males. It may be readily observed from the distributions in Table II that the correlation for the total sample would have been considerably higher than .489 if more of the sophomore males with ACT scores clustering around the mean for that subgroup had achieved at least 2.0 grade-point averages rather than averages below this point. Apparently, non-intellectual factors contributed to the underachievement of the sophomore males; but, since it is not the purpose of this thesis to evaluate such factors, nothing more than just this passing comment will be made.

Though these frequency distributions make it possible for some preliminary analysis to be made of the data, there are other devices which provide more detailed and meaningful statistics. These statistics are summarized in Tables XIV, XV, and XVI.

Statistics of the ACT Composite Scores

Since the arithmetic mean is the most representative measure of central tendency for a statistical study, the means of the ACT composite scores were calculated for the subgroups. These data, along with the standard deviations, are in Table XIV.

Means. The means range from 18.125 for junior males to 17.090 for senior males. When the difference of 1.035 is considered, the range is small indeed. It is interesting to note that the junior males lead the males of all the classes and that the junior class with a mean of 18.068 leads the classes.

The senior females with a mean of 17.888 rank first over junior and sophomore females with means of 17.863 and 17.756, respectively. For the total female group the mean

TABLE XIV

STATISTICS OF THE ACT COMPOSITE SCORES
OF BUSINESS ADMINISTRATION MAJORS
DIFFERENTIATED BY CLASS AND SEX

Class	Males			Females			Total		
	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.
Soph.	80	17.175	3.419	37	17.756	4.135	117	17.358	3.671
Junior	80	18.125	3.739	22	17.863	3.415	102	18.068	3.673
Senior	55	17.090	3.718	9	17.888	2.845	64	17.203	3.619
Total	215	17.506	3.649	68	17.808	3.762	283	17.579	3.679

is 17.808. Thus, it is seen that the means for females are greater than for males in every instance except one--junior males, as already indicated.

Standard Deviations. Since the means alone are somewhat inadequate for complete analysis of the characteristics of a particular set of scores, the standard deviation was calculated for each subgroup. This measure of variability, based on the theory of the normal curve, indicates how much the scores in a distribution deviate from the mean. Approximately two-thirds of the scores will fall between a point that is one standard deviation, or sigma, below the mean and a point that is one deviation above the mean (±1 sigma). The remaining one-third of the cases will be more than one standard deviation away from the mean.

To be within ±3 sigmas, the scores for the total males would have to range from 28.453 to 6.559. Likewise, the scores for the females would have to range from 29.094 to 6.522; and the scores for the total sample, undifferentiated by sex, would have to range from 28.616 to 6.542. From the sigmas it was evident that a normal distribution existed with the actual range of 27 to 7 for the 283 cases being examined.

TABLE XV

STATISTICS OF THE GRADE-POINT AVERAGES
OF BUSINESS ADMINISTRATION MAJORS
DIFFERENTIATED BY CLASS AND SEX

Class	Males				Females				Total			
	N	Mean	S.D.	S.E. Mean	N	Mean	S.D.	S.E. Mean	N	Mean	S.D.	S.E. Mean
Soph.	80	2.031	.435	.048	37	2.573	.596	.099	117	2.203	.552	.051
Junior	80	2.230	.427	.048	22	2.623	.613	.133	102	2.315	.500	.049
Senior	55	2.332	.399	.054	9	2.428	.464	.164	64	2.345	.410	.051
Total	215	2.182	.440	.030	68	2.570	.589	.072	283	2.275	.508	.030

as well as the total sample, fall within ±3 sigmas. Thus, it can be assumed that a normal distribution existed for the sample being analyzed.

Standard Error of the Mean. At this stage of analyzing the data an interest should be expressed in the sample mean as an estimate of the population mean. Since it is important to know how far such sample means may be expected to depart from the population mean, the standard error of a mean was calculated for each subgroup in the sample and used to set up confidence limits.

Since the means range from 2.623 for junior females to 2.031 for sophomore males, these two will be used as examples to illustrate the ranges of the true mean of the population. For the junior females it can be asserted that the true mean lies between the mean and ±1 SE or, in this case, from 2.490 to 2.756 with a limited degree of confidence. Specifically, the chances are two in three, or about 68 times out of 100, that these means could be expected to be right. If the true mean is asserted to be between the mean of the sample and ±2 SE, or between 2.357 and 2.889 in this case, it could be expected to be right about 95 percent of the time. Within the limits of ±3 SE the confidence limits would be nearly 100 cases out of 100, or more exactly, 99.74 cases out of 100.

Likewise, for sophomore males it can be asserted with 68 percent confidence that the true mean will lie between 1.983 and 2.079, or with 95 percent confidence that it will lie between 1.935 and 2.127.

III. SUMMARY

The input data on the student sample of 283 cases, differentiated by class and sex, were processed by programmed formulas on the IBM 1620 Computer. An analysis of preliminary findings was made through frequency distributions, statistics of the ACT composite scores, and statistics of the grade-point averages.

From the frequency distribution tables it was found that the ACT composite scores ranged from 7 to 27, with the scores for each subgroup and for the total sample falling within ± 3 sigmas from the means.

Likewise, for the grade-point averages it was found that tallies for the entire sample fell within ± 3 sigmas from the mean. Such distributions of scores and grade-point averages assured a normal distribution in every instance.

The scatter diagrams also indicated positive correlations as the tally marks tended to be distributed from the lower-left to the upper-right corners. These findings were substantiated in further analysis of the means and correlations.

The means of the ACT composite scores ranged from 18.125 for junior males to 17.090 for senior males. The junior males led the males of all the classes, and the junior class with a mean of 18.068 led the classes. The senior females had a mean of 17.888, and the total females had a mean of 17.808. It was interesting to note that the means for females were greater than for males in every instance except one--junior males.

The means of the grade-point averages ranged from 2.623 for junior females to 2.031 for sophomore males. The senior class led the classes with 2.345. The senior males led the males of all classes with 2.332; whereas, the junior females with 2.623 led the females of all classes. The four subgroups of females held the highest rankings. Again, the usual aspect of sex difference was evident--that, in general, women's grades are higher than men's.

In connection with the means of the grade-point averages, the standard error of the mean made it possible to set up confidence limits.

All the statistics reported in this chapter are important, of course, but none have yet indicated the exact relationship between the grade-point averages achieved by the students in the sample and the ACT composite scores. Without the knowledge of the extent to which one measure varies with the other, predictions are impossible. The next chapter presents the statistical findings regarding correlations.

CHAPTER IV

CORRELATIONS

Calculations were made to obtain the product-moment correlation coefficient, a number which expresses the relationship between two or more variables, for each subgroup. These data, with the standard error of the coefficient of correlation, are summarized in Table XVI.

I. STATISTICAL FINDINGS

The correlations range from .767 for sophomore females, to .288 for sophomore males. The junior class leads the classes with a correlation of .535, followed by the sophomore class with .473 and the senior class with .462. The junior males lead the males of all classes with a correlation of .525 as compared with .440 for senior males and .288 for the sophomore males. The ranges for the females are from .767 to .622 with the sophomore females in the lead, as already indicated, and the junior females and senior females in second and third places, respectively. The correlation for the females in the total sample is .745 compared with .406 for the total males. For the total sample, undifferentiated by sex, the correlation is .489.

As in the statistics for the means of the grade-point averages, the four highest correlations are for the

TABLE XVI

STATISTICS OF THE CORRELATIONS BETWEEN ACT COMPOSITE SCORES AND GRADE-POINT AVERAGES OF BUSINESS ADMINISTRATION MAJORS DIFFERENTIATED BY CLASS AND SEX

	Males			Females			Total		
Class	N	R	S.E. R	N	R	S.E. R	N	R	S.E. R
Soph.	80	.288	.103	37	.767	.068	117	.473	.072
Junior	80	.525	.081	22	.759	.092	102	.535	.070
Senior	55	.440	.109	9	.622*	.216	64	.462	.099
Total	215	.406	.057	68	.745	.054	283	.489	.045

*The r for senior females is not reliable at the .05 level. All others are significant at the .01 level.

four subgroups of females--sophomore, junior, total, and senior females, in that order. Here, again, is evidence that the results of this study follow the sex pattern that women are academically more predictable than men.

II. EVALUATION OF THE CORRELATIONS

Four factors will be considered in the evaluation of the correlations: strength of relationship, findings in prior research, reliability, and probable limits.

Strength of Relationship

The actual size of the correlations must, of course, be taken into account. According to Guilford's interpretation referred to in Chapter II, page 18, of this thesis, eight of the correlations fall within the .40 - .70 range, which suggests a moderate or substantial relation. The correlations for three subgroups of females--sophomore, junior, and total females--fall within the range of .70 - .90 which is considered to carry a marked or high relationship. Only one correlation falls in the .20 - .40 range; this is the correlation of .288 for sophomore males. This is a definite but low or small relationship. For the total sample, the correlation of .489 is considered to be a good, moderate, or substantial relationship.

Findings in Prior Research

The second point to be taken into consideration in evaluating an obtained correlation depends upon what has been found from past experience. In prior research, as reviewed in Chapter II of this thesis, researchers reported correlations ranging from .17 to .70, with averages clustering around .47 to .50. Since the correlations of this study range from .288 to .767, with the correlation of .489 for the total sample, it can be assumed that they fit satisfactorily into the historical perspective.

Reliability

Using the first two factors alone oversimplifies the evaluation of the worth of the correlations. Therefore, it is necessary to realize that an obtained correlation must be evaluated in terms of its reliability. There are several formulas for determining whether an obtained coefficient of correlation is significantly different from zero. However, for the purposes of this study, a convenient procedure is available by reference to the Wallace-Snedecor tables[1] showing the coefficients of correlation significant at the 5 percent level and at the 1 percent level for varying degrees of freedom (always N - 2).

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[1] J. P. Guilford, *Fundamental Statistics in Psychology and Education* (New York: McGraw-Hill Book Company, 1950), pp. 609-610.

Examination of the table shows that all subgroups of this study, except the senior females, have correlational values significant at the .01 level. When N is 9 (7 degrees of freedom), as in the case of the senior females, the minimum correlations required are .666 and .798, at the 5 percent and 1 percent levels, respectively. Even though the obtained correlation of .622 approaches statistical significance at the .05 level, the exact amount of correlation would be exceedingly uncertain and practically worthless because of the small sample. Even the smallest obtained correlation of .288 for 80 sophomore males at least reaches the level of .287 required for statistical significance at the .01 level.

All other values of the correlations exceed the requirements for statistical significance at the .01 level. When N is 37 (35 degrees of freedom), as in the case of sophomore females, the minimum correlation required at this level is .418, as compared to the obtained correlation of .767. For junior females, the obtained correlation of .759 exceeds the minimum correlation of .537 for 20 degrees of freedom.

The correlation of .406 for 215 males would have been statistically significant at only 40 degrees of freedom. Similarly, for 68 females the obtained correlation of .745 would have been significant at only 9 degrees of freedom; and for the total sample of 283 cases the correlation of .489 would have been significant at only 25 degrees of freedom.

Thus, it can be ascertained that with two exceptions, senior females and sophomore males, the correlational values greatly exceed the statistically significant levels.

Probable Limits

The fourth and last factor considered in the evaluation of the correlations is the standard error of the correlation. It is important to know how far such sample correlations may be expected to depart from the population correlation; therefore, the standard error of the correlation was calculated for each subgroup in the sample and used to set up probable limits. Since the correlations range from .288 for sophomore males to .767 for sophomore females, these two correlations will be used for illustrative purposes.

With an obtained correlation of .767 for the sophomore females, it can be asserted that whatever the population correlation may be, an obtained correlation would not deviate from it more than .068 with a confidence indicated by odds of 2 to 1. There are less than 5 chances in 100 that the sample correlation would depart more than .136 from the population value, and less than 1 chance in 100 that the sample correlation would depart more than .175 above or below it (this being equal to 2.58 standard errors). Within the limits of ± 3 standard errors of the correlation, the range would be .563 to .971. The confidence limits would be nearly 100 cases out of 100, or more exactly, 99.74 cases out of 100. The obtained correlation of .767, consequently, seems well placed in a position removed from zero or negative correlations.

Likewise, for sophomore males it can be asserted with about 68 percent confidence that the sample correlation will not deviate from the population correlation more than .103 and would lie between .185 and .391. With 95 percent confidence it can be expected to lie between .082 and .494. There would be only one chance in 100 that the deviation would be as much as .265 (this being equal to 2.58 standard errors), or within the probable limits of .023 and .553. This places the correlation of .288 for sophomore males in a position removed from zero or negative correlations. However, within the limits of ± 3 standard errors, the confidence limits would be nearly 100 cases out of 100, or more exactly 99.74 cases out of 100 would lie between -.021 and .597. From this, it can be seen how even negative coefficients might arise by random sampling. The problem becomes more serious when the correlations are very small numerically and the samples are not large enough to result in boundaries of deviation definitely clear of zero.

Consideration of the other subgroups indicates that, with this one exception of the sophomore males, the obtained correlational values are removed from zero or negative correlations.

III. SUMMARY

In order to find the relationship between ACT composite scores and scholastic achievement to determine the predictive validity of such scores, calculations were made to obtain the product-moment correlation coefficient for each subgroup. The correlations ranged from .767 for sophomore females to .288 for sophomore males. The junior class led the classes with a correlation of .535. The junior males led the males of all classes with .525. The females had correlations ranging from .767 to .622.

The correlation for the total females was .745 compared to .406 for the total males. For the total sample, undifferentiated by sex, the correlation was .489.

The four subgroups of females had the four highest correlations. The sex pattern occurred again, resulting in evidence that women are academically more predictable than men.

Four factors were considered in the interpretation of the correlations: strength of relationship, findings in prior research, reliability, and probable limits.

Eight of the correlations suggested a moderate or substantial relationship. The correlations for three subgroups of females fell within the range carrying a marked or high relationship; whereas, the correlation for sophomore males was the only one falling within the range interpreted as low or small relationship. The correlation of .489 for the entire sample was considered to be good, moderate, or substantial.

Findings in prior research indicated correlations ranging from .17 to .70, with averages clustering around .50. It was assumed, therefore, that the findings of the present study fitted satisfactorily into the historical perspective.

With the exception of correlations for sophomore males and senior females, it can be asserted with confidence that the obtained correlations were well placed in positions removed from zero or negative correlations. In the first instance, the correlation approached zero within 2.58 standard errors of the correlation; and within -3 standard errors, it became negative. The smaller the correlation and the smaller the sample, the more likely is this to occur. The coefficient of correlation for the senior females was not statistically significant at the .05 level because of the extremely small number of cases.

Predictions from the correlations are presented in the next chapter.

CHAPTER V

PREDICTIONS FROM CORRELATIONS

When two variables are known, predicting one from the other can be determined merely by looking at the data. However, when determining a coefficient for predictive purposes, there is no particular concern with predicting about the sample, but in generalizing for the future. In the future, when only one variable is known, it would be helpful to predict what is likely to be true on the other variable. Such predictions are made from correlations by means of regression equations and the standard error of estimate.

I. THE REGRESSION EQUATION

With the information of what has been true in the past--the means for each variable and the degree of relationship between them--it is possible to use the obtained statistics later with only one set of data available to estimate the other variable. Such estimates may be predicted by means of a regression equation, which is the equation of a "regression line." This explains how it is possible to predict the most likely grade-point averages from the known ACT composite scores.

The Regression Line

By choosing several ACT composite scores and inserting them in the applicable regression equation, the resulting data would be the corresponding grade-point averages for each ACT score used. The data, if plotted graphically, would fall on a line of best fit, or the regression line, that would represent the mean values of one variable for each possible value of the other variable, or the trend of the points on a scatter diagram.

Graphic Illustrations

Such a graphic method will often prove to be a suitable procedure. Using the data available in this study, the regression coefficients were computed for use in the regression equations applicable to the three subgroups of males, females, and the total sample. Several ACT composite scores were chosen at random and inserted in the regression equation applicable to the subgroup concerned. When the regression lines are drawn as in Figures 1, 2, and 3, for any value of X (ACT composite score) one can follow vertically to the regression line and note the corresponding Y value (estimated grade-point average) at this point. One can read to the nearest unit with sufficient accuracy for practical work.

<u>Total Males</u>. For instance, by referring to Figure 1, it is possible to predict estimated grade-point averages

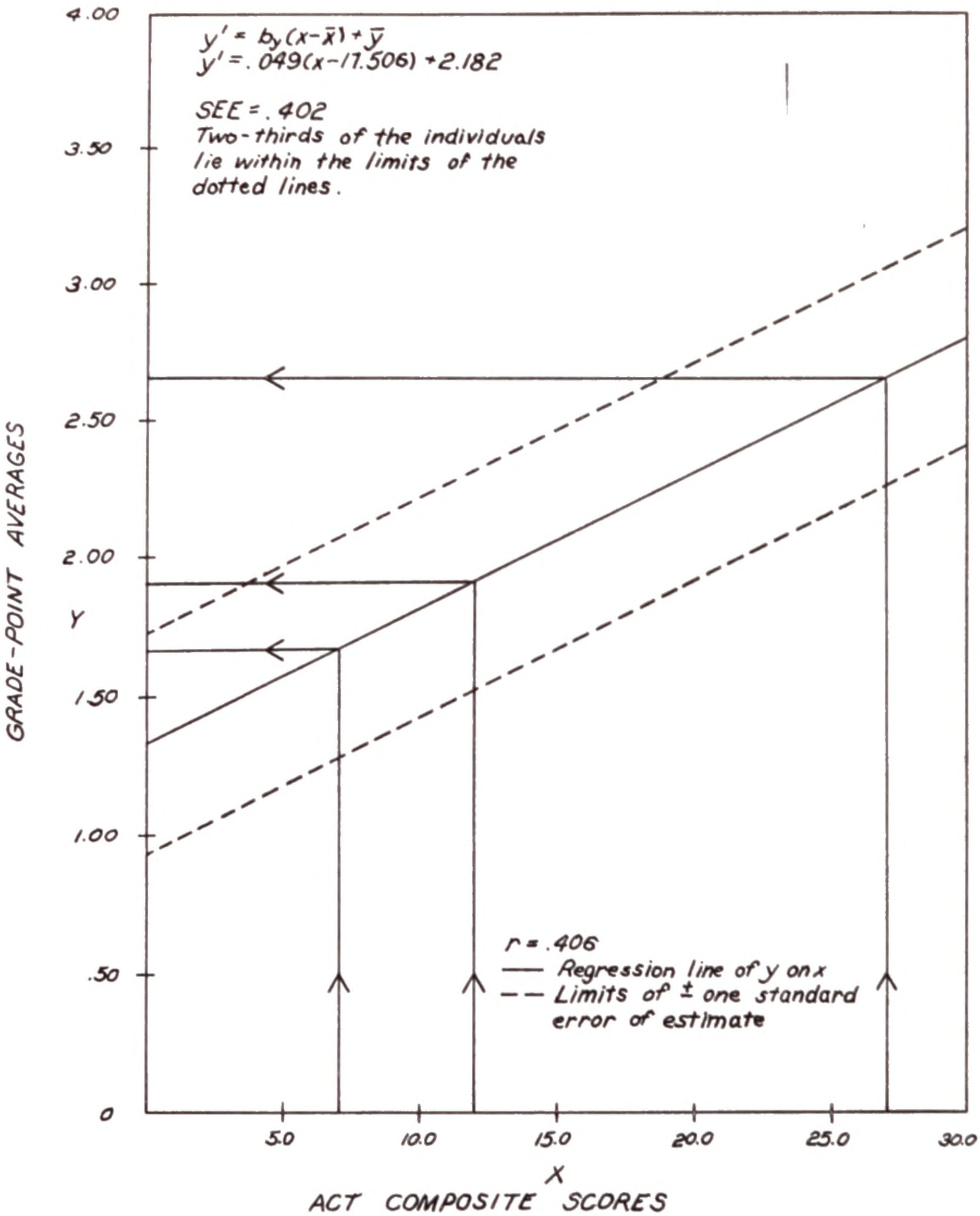

FIGURE 1.

REGRESSION LINE PREDICTING ESTIMATED GRADE-POINT AVERAGES FOR MALES MAJORING IN BUSINESS ADMINISTRATION for the total males of the sample. The ACT composite scores of 7 and 27 would be of interest as they represent the lowest and highest scores for this particular subgroup. As the cut-off score for admission to Sam Houston State College at the time this study was originated, 12 would be of special interest, also.

Reading vertically from the points of 7 and 27 on the base line of X to the regression line and across to the corresponding Y values, one finds the grade-point averages of 1.666 and 2.648, respectively. Likewise, for the ACT score of 12, the estimated grade-point average is 1.912. It is to be noted that this average is below 2.0, which is a "C" average required for graduation.

Total Females. For the total females in the sample, the lowest and highest ACT composite scores are 9 and 24. Corresponding grade-point averages are 1.541 and 3.293. To be noted again is the fact that the predicted grade-point average of 1.892 for the score of 12 is below 2.0. The regression line providing these predictions is plotted in Figure 2.

Total Sample. Grade-point averages for the total sample are predicted from the regression line in Figure 3. Since the ACT scores range from 7 to 27, these two scores are used as examples. They provide corresponding grade-point averages of 1.560 and 2.912, respectively. For the

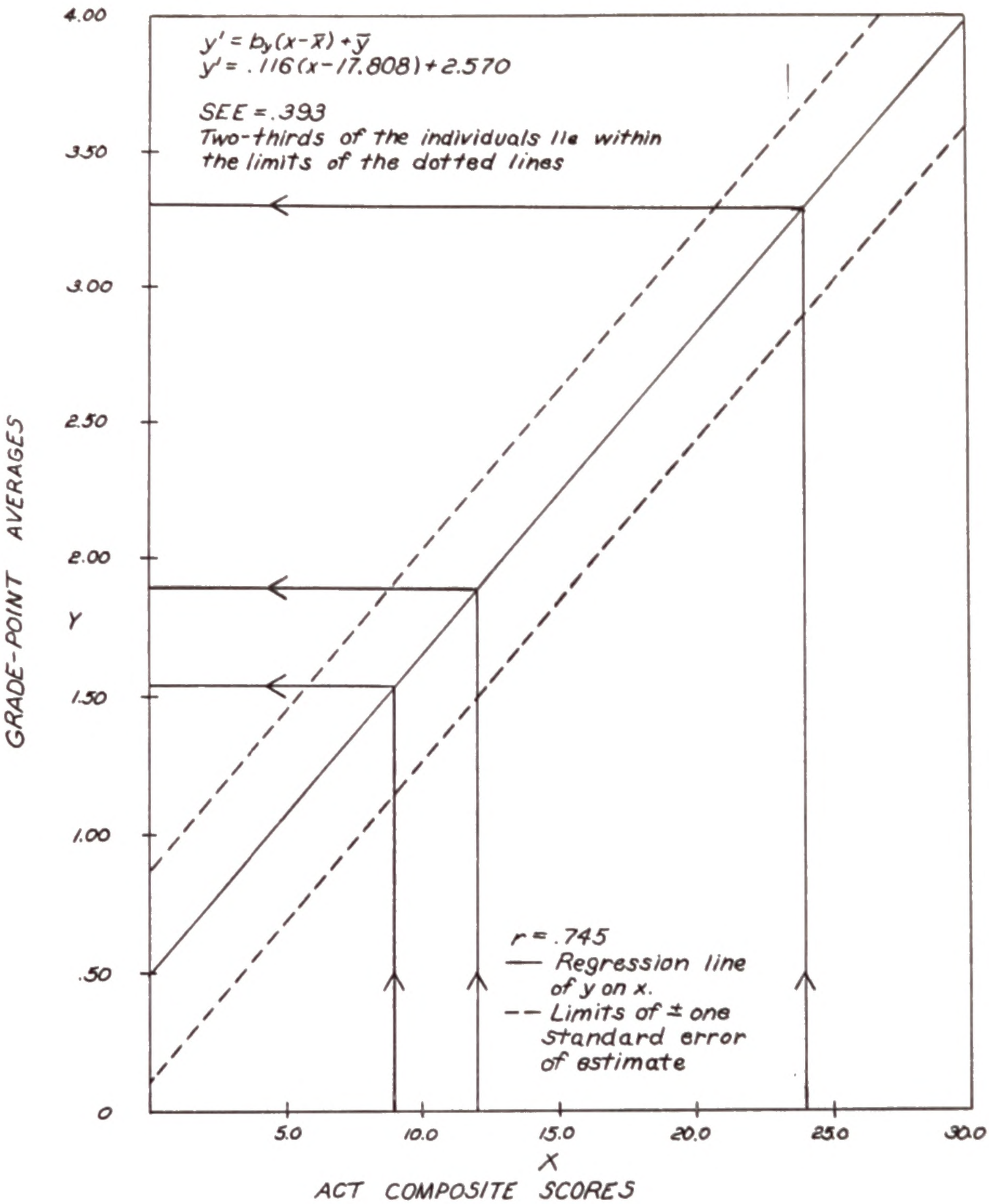

FIGURE 2.

REGRESSION LINE PREDICTING ESTIMATED GRADE-POINT AVERAGES FOR FEMALES MAJORING IN BUSINESS ADMINISTRATION

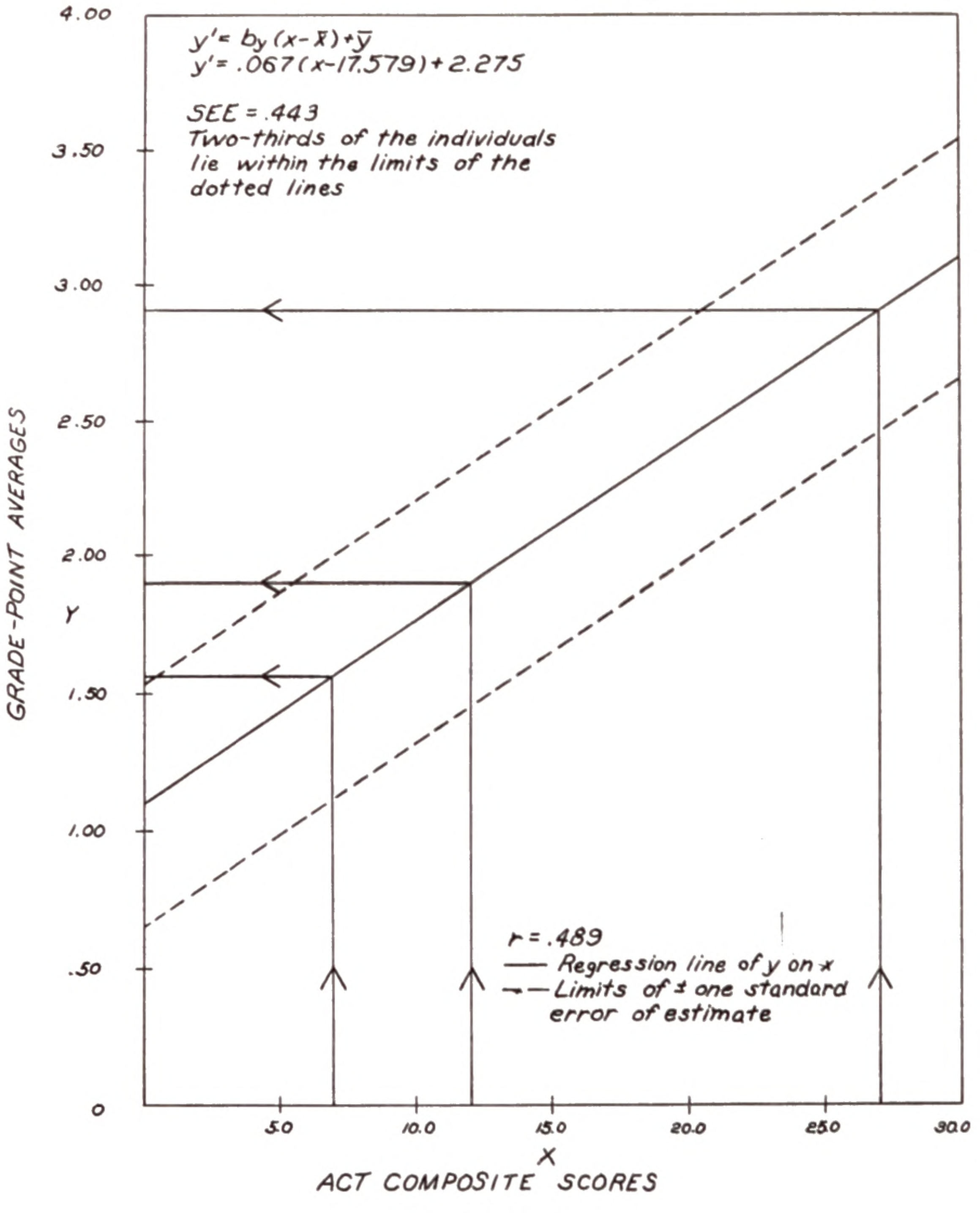

FIGURE 3.

REGRESSION LINE PREDICTING ESTIMATED GRADE-POINT AVERAGES FOR MAJORS IN BUSINESS ADMINISTRATION score of 12 the predicted grade-point average is 1.898, again below 2.0.

Errors in Prediction

So far, it would seem that the predictions would be perfect. However, there is variability expressed in terms of the standard error of estimate. Correlation coefficients provide the basis for predicting values of a criterion from knowledge of obtained test scores. The standard error of estimate indicates how much predicted criterion values and obtained criterion values are likely to differ. Interpretation of the standard error of estimate is accomplished in very much the same way a standard deviation is interpreted; that is, by stating the chances that the obtained criterion value will lie between any limits that may be specified. Reference is made again to Figures 1, 2, and 3 for illustration of the standard error of estimate.

Total Males. When predicting estimated grade-point averages based on the ACT composite scores for total males, the average dispersion of observed measurements is given by the standard error of estimate of .402. Two-thirds of the observed cases would be expected to lie within the limits of plus or minus .402 from the estimated grade-point averages. This situation is illustrated graphically in Figure 1. There is the regression line, along which the predicted grade-point averages lie; and in dotted lines are the limits of one standard error of estimate on either side of it. Had a point been plotted for every individual, about two-thirds of them would fall between the two dotted lines.

With the ACT composite score of 7, already referred to for this subgroup, and the corresponding grade-point average of 1.666, the odds are 2 to 1 that any individual whose ACT score is 7 will not fall below 1.264 or go above 2.068. For the score of 12, the odds are 2 to 1 that the individual's grade-point average will not fall below 1.510 or go above 2.314. Likewise, an individual whose ACT score is 27 will not fall below 2.246 or go above 3.050.

Total Females. Referring to Figure 2 again for the total females, one can make the same observation that two-thirds of the individuals would lie within the limits of plus or minus the standard error of estimate of .393 from the estimated grade-point averages. With the ACT composite score of 9 and the predicted grade-point average of 1.541, the odds are 2 to 1 that any individual whose ACT score is 9 will not fall below 1.148 or go above 1.934. For the score of 12 the odds are 2 to 1 that the individual's grade-point average will not fall below 1.499 or go above 2.285. Likewise, an individual whose ACT score is 24 will not fall below 2.900 or go above 3.686.

<u>Total Sample</u>. The standard error of estimate of .443 for the total sample sets the limits within which two-thirds of the individuals would be expected to lie. Figure 3 graphically illustrates the limits of plus or minus one standard error of estimate. For the ACT scores and corresponding grade-point averages already referred to for this subgroup, the odds are 2 to 1 that any individual whose score is 7 will not fall below 1.117 or go above 2.003. For the score of 12, an individual will fall between 1.455 and 2.341. Likewise, an individual whose ACT score is 27 will not fall below 2.469 or go above 3.355.

Since it would seem impractical to plot graphically every ACT composite score and the corresponding predicted estimated grade-point averages, only three scores for each of three subgroups were used for illustrative purposes. However, the statistical results of having applied the appropriate regression equation to each subgroup are presented in tables in the next section.

II. INTERPRETATION OF ESTIMATED GRADE-POINT AVERAGES

Using the data available in this study, computations were made to obtain the applicable regression coefficient to be used in the regression equation for each subgroup concerned. Then, each ACT composite score was inserted in the equation to predict the corresponding estimated grade-point average. These findings and the standard error of estimate for each subgroup are summarized in Tables XVII through XX. It is to be noted that predictions are made for all standard composite scores ranging from 1 (low) to 36 (high), even though some of them are beyond the range of the ACT scores in the original data of each subgroup.

Predictions can be made very easily for any individual by referral to the appropriate table to obtain the estimated grade-point average for a particular ACT score and by computations with the standard error of estimate to establish the limits within which the individual would likely fall. However, in order to be consistent with the graphic plotting of predictions for the total sample on pages 82, 84, and 85, predictions are made for the lowest and highest ACT composite scores and the cut-off score of 12 for each of the other subgroups. As 28 is the composite score just beyond the upper range of the total sample, predictions are made also for this score in the subgroups. Other scores are mentioned if observations seem relevant.

Sophomore Class

Estimated grade-point averages for sophomores are presented in Table XVII.

TABLE XVII

ESTIMATED GRADE-POINT AVERAGES PREDICTED FROM CORRELATIONS BY MEANS OF REGRESSION EQUATIONS BASED ON ACT COMPOSITE SCORES FOR SOPHOMORE BUSINESS ADMINISTRATION MAJORS

ACT Comp. Score	Estimated Grade-Point Averages			ACT Comp. Score	Estimated Grade-Point Averages		
	Males	Females	Total		Males	Females	Total
1	1.437	.718	1.037	19	2.098	2.711	2.320
2	1.474	.829	1.108	20	2.135	2.822	2.391
3	1.511	.940	1.179	21	2.172	2.932	2.462
4	1.547	1.050	1.250	22	2.208	3.043	2.533
5	1.584	1.161	1.322	23	2.245	3.154	2.605
6	1.621	1.272	1.393	24	2.282	3.264	2.676
7	1.658	1.382	1.464	25	2.318	3.375	2.747
8	1.694	1.493	1.536	26	2.355	3.486	2.818
9	1.731	1.604	1.607	27	2.392	3.596	2.890
10	1.768	1.714	1.678	28	2.429	3.707	2.961
11	1.804	1.825	1.749	29	2.465	3.818	3.032
12	1.841	1.936	1.821	30	2.502	3.929	3.103
13	1.878	2.047	1.892	31	2.539	4.039	3.175
14	1.915	2.157	1.963	32	2.575	4.150	3.246
15	1.951	2.268	2.034	33	2.612	4.261	3.317
16	1.988	2.379	2.106	34	2.649	4.371	3.389
17	2.025	2.489	2.177	35	2.686	4.482	3.460
18	2.061	2.600	2.248	36	2.722	4.593	3.531

Standard Error of Estimate: Males .416; Females .382; Total .486

Males. For sophomore males one can make the prediction that two-thirds of the individuals would lie within the limits of plus or minus .416 from the estimated grade-point averages. The odds are 2 to 1 that any individual whose ACT score is 10 will not fall below 1.352 or go above 2.184. For the score of 12, with the same odds, the individual's grade-point average will not fall below 1.425 or go above 2.257. Likewise, an individual whose ACT score is 25 will not fall below 1.902 or go above 2.734. The range of predicted grade-point averages, therefore, is 1.352 to 2.734 for two-thirds of the sophomore males if only the scores within the range of the original data are used. However, if there should be a sophomore male with a score of 28, for example, the estimated grade-point average would be predicted to be 2.429. The odds are 2 to 1 that this individual's grade-point average will not fall below 2.013 or go above 2.845.

Females. Two-thirds of sophomore females would lie within the limits of plus or minus the standard error of estimate of .382 from the estimated grade-point averages. With the ACT composite score of 9 and the predicted grade-point average of 1.604, the odds are 2 to 1 that any individual whose score is 9 will not fall below 1.222 or go above 1.986. For the score of 12 the odds are the same that the individual's grade-point average will not fall below 1.554 or go above 2.318. Likewise, an individual whose score is 24 will not fall below 2.882 or go above 3.646. If there should be a sophomore female with a score of 28, the estimated grade-point average is predicted to be 3.707 with the range from 3.325 to 4.089, which exceeds 4.0. Also to be noted are the scores of 31 through 36 for sophomore females. These predict estimated grade-point averages in excess of 4.0. Of course, on the 4.0 grading scale it is impossible for an individual to achieve a grade-point average greater than all "A's." However, it may be assumed that individuals having these scores would be expected to have the potential of achieving the highest possible academic success. The high correlation of .767 in this case would be especially significant in that female students have been more consistent in achieving their potential.

Total Sophomores. For majors in the sophomore class the lowest and highest ACT composite scores are 9 and 25. Corresponding grade-point averages are 1.607 and 2.747. With a standard error of estimate of .486, the odds are 2 to 1 that any individual whose ACT score is 9 will not fall below 1.121 or go above 2.093. Likewise, an individual whose ACT score is 25 will not fall below 2.261 or go above 3.233. The estimated grade-point average for the score of 12 is 1.821, which is below the "C" average of 2.0.

Two-thirds of these sophomores with scores within the range of those in the original data of this study would be expected to have grade-point averages lying between 1.335 and 2.307. An individual with a score of 28 would be expected to have an estimated grade-point average of 2.961. The odds are 2 to 1 that his obtained average will not fall below 2.475 or go above 3.447.

Junior Class

Reference is made to Table XVIII for information concerning the junior class.

Males. For junior males of the original sample the lowest and highest ACT composite scores are 9 and 27 with corresponding grade-point averages of 1.681 and 2.764. The standard error of estimate of .363 limits the range in which two-thirds of the individuals are expected to fall; that is, 1.318 to 2.044 for the score of 9; 1.499 to 2.225 for 12; and 2.401 to 3.127 for 27. If a junior male should have a composite score of 28, the estimated grade-point average is predicted to be 2.824. The chances are two out of three that the individual's average will not fall below 2.461 or go above 3.187.

Females. Similarly, for junior females the standard error of estimate of .399 establishes the limits of 1.424 to 2.222 for two-thirds of the individuals with the score

TABLE XVIII

ESTIMATED GRADE-POINT AVERAGES PREDICTED FROM CORRELATIONS BY MEANS OF REGRESSION EQUATIONS BASED ON ACT COMPOSITE SCORES FOR JUNIOR BUSINESS ADMINISTRATION MAJORS

ACT Comp. Score	Estimated Grade-Point Averages			ACT Comp. Score	Estimated Grade-Point Averages		
	Males	Females	Total		Males	Females	Total
1	1.200	.323	1.068	19	2.283	2.778	2.383
2	1.260	.459	1.141	20	2.343	2.915	2.456
3	1.320	.596	1.214	21	2.403	3.051	2.529
4	1.380	.732	1.287	22	2.463	3.187	2.602
5	1.440	.869	1.360	23	2.523	3.324	2.675
6	1.501	1.005	1.433	24	2.583	3.460	2.748
7	1.561	1.141	1.506	25	2.643	3.597	2.821
8	1.621	1.278	1.580	26	2.704	3.733	2.894
9	1.681	1.414	1.653	27	2.764	3.869	2.967
10	1.741	1.551	1.726	28	2.824	4.006	3.040
11	1.801	1.687	1.799	29	2.884	4.142	3.113
12	1.862	1.823	1.872	30	2.944	4.279	3.186
13	1.922	1.960	1.945	31	3.004	4.415	3.259
14	1.982	2.096	2.018	32	3.065	4.551	3.332
15	2.042	2.233	2.091	33	3.125	4.688	3.405
16	2.102	2.369	2.164	34	3.185	4.824	3.478
17	2.162	2.505	2.237	35	3.245	4.961	3.551
18	2.222	2.642	2.310	36	3.305	5.097	3.624

Standard Error of Estimate: Males .363; Females .399; Total .422

of 12, and the limits of 3.061 to 3.859 for the score of 24. If scores of 28 through 36 should be obtained by junior females, the estimated grade-point averages are predicted to be above 4.0. Again, it may be assumed that these individuals would have the capacity to be highly successful academically.

Total Juniors. The standard error of .422 for the total junior majors sets the limits within which two-thirds of the individuals would be expected to lie. For the ACT score of 9 and the corresponding grade-point average of 1.653, the odds are 2 to 1 that those with the score indicated will not fall below 1.231 or go above 2.075. The limits for the scores of 12 and 27 are set at 1.450 to 2.294 and 2.545 to 3.389, respectively. An individual with the score of 28 would have a predicted grade-point average of 3.040. The odds are 2 to 1 that his obtained average will not fall below 2.618 or go above 3.462.

Senior Class

Predictions for seniors are summarized in Table XIX.

Males. The lowest and highest ACT composite scores for senior males are 7 and 25 with corresponding grade-point averages of 1.855 and 2.705. Two-thirds of the individuals with these scores would be expected to lie between 1.497 and 2.213, and between 2.347 and 3.063,

TABLE XIX

ESTIMATED GRADE-POINT AVERAGES PREDICTED FROM CORRELATIONS BY MEANS OF REGRESSION EQUATIONS BASED ON ACT COMPOSITE SCORES FOR SENIOR BUSINESS ADMINISTRATION MAJORS

ACT Comp. Score	Estimated Grade-Point Averages			ACT Comp. Score	Estimated Grade-Point Averages		
	Males	Females	Total		Males	Females	Total
1	1.571	.710	1.495	19	2.422	2.541	2.439
2	1.618	.811	1.548	20	2.469	2.642	2.492
3	1.665	.913	1.600	21	2.516	2.744	2.544
4	1.713	1.015	1.653	22	2.564	2.846	2.597
5	1.760	1.116	1.705	23	2.611	2.947	2.649
6	1.807	1.218	1.758	24	2.658	3.049	2.701
7	1.855	1.320	1.810	25	2.705	3.151	2.754
8	1.902	1.422	1.863	26	2.753	3.253	2.806
9	1.949	1.523	1.915	27	2.800	3.354	2.859
10	1.996	1.625	1.967	28	2.847	3.456	2.911
11	2.044	1.727	2.020	29	2.895	3.558	2.964
12	2.091	1.829	2.072	30	2.942	3.659	3.016
13	2.138	1.930	2.125	31	2.989	3.761	3.068
14	2.185	2.032	2.177	32	3.036	3.863	3.121
15	2.233	2.134	2.230	33	3.084	3.965	3.173
16	2.280	2.235	2.282	34	3.131	4.066	3.226
17	2.327	2.337	2.334	35	3.178	4.168	3.278
18	2.375	2.439	2.387	36	3.225	4.270	3.331

Standard Error of Estimate: Males .358; Females .363; Total .364

respectively. With the score of 12 the individual would be expected to have a grade-point average of 2.091, barely above 2.0. The limits of plus or minus the standard error of estimate are 1.733 and 2.449. The estimated grade-point average for a senior male with a score of 28 would be predicted to be 2.847. The odds are 2 to 1 that an individual with this score will not fall below 2.489 or go above 3.205.

Females. Predictions of estimated grade-point averages for senior females are presented in Table XIX; however, one is to be reminded that such predictions would be practically worthless, because the statistical findings are not significant at the .05 level due to the small number in this subgroup.

Total Seniors. For senior majors one can make the prediction that two-thirds of the individuals would lie within the limits of plus or minus .364 from the estimated grade-point averages. The lowest and highest ACT composite scores are 7 and 25 with corresponding grade-point averages of 1.810 and 2.754. Two-thirds of the individuals with these scores are expected to fall between 1.446 and 2.174 and between 2.390 and 3.118, respectively. For the score of 12 the limits are 1.708 and 2.436. It is to be noted that the estimated grade-point average for the score of 12 is 2.072, which is just barely above 2.0. Should a member of the senior class have a score of 28, it is predicted that he would have an estimated grade-point average of 2.911. The odds are 2 to 1 that such an individual would not fall below 2.547 or go above 3.275.

Total Sample

Predictions of estimated grade-point averages for the total sample, differentiated by sex, have already been presented by the graphic method. Further comments on the lowest and highest ACT composite scores and their corresponding estimated grade-point averages, as well as on the score of 12, are not necessary here; instead, one may refer to pages 81-88 of this study, if desired, and to Table XX for other predictions.

In addition, the ACT composite score of 28 is used here as an example in each of the subgroups. With the predicted grade-point average of 2.697 for males, two thirds of the individuals will not fall below 2.295 or go above 3.099.

The grade-point average of 3.760 is predicted for females. The range for these individuals would be from 3.367 to 4.153. The scores of 31 through 36 for females predict averages above 4.0. Individuals with these scores may be assumed to have the potential of achieving the highest possible academic success.

TABLE XX

ESTIMATED GRADE-POINT AVERAGES PREDICTED FROM CORRELATIONS BY MEANS OF REGRESSION EQUATIONS BASED ON ACT COMPOSITE SCORES FOR BUSINESS ADMINISTRATION MAJORS

ACT Comp. Score	Estimated Grade-Point Averages			ACT Comp. Score	Estimated Grade-Point Averages		
	Males	Females	Total		Males	Females	Total
1	1.372	.607	1.154	19	2.255	2.709	2.371
2	1.421	.724	1.222	20	2.304	2.826	2.439
3	1.470	.840	1.289	21	2.353	2.943	2.507
4	1.519	.957	1.357	22	2.402	3.060	2.574
5	1.568	1.074	1.425	23	2.452	3.176	2.642
6	1.617	1.191	1.492	24	2.501	3.293	2.709
7	1.666	1.308	1.560	25	2.550	3.410	2.777
8	1.715	1.424	1.628	26	2.599	3.527	2.845
9	1.764	1.541	1.695	27	2.648	3.644	2.912
10	1.814	1.658	1.763	28	2.697	3.760	2.980
11	1.863	1.775	1.830	29	2.746	3.877	3.047
12	1.912	1.892	1.898	30	2.795	3.994	3.115
13	1.961	2.008	1.966	31	2.844	4.111	3.183
14	2.010	2.125	2.033	32	2.893	4.228	3.250
15	2.059	2.242	2.101	33	2.942	4.344	3.318
16	2.108	2.359	2.168	34	2.991	4.461	3.385
17	2.157	2.476	2.236	35	3.041	4.578	3.453
18	2.206	2.592	2.304	36	3.090	4.695	3.521

Standard Error of Estimate: Males .402; Females .393; Total .443

With the ACT composite score of 28 and the predicted grade-point average of 2.980, the odds are 2 to 1 that any individual will not fall below 2.537 or go above 3.423.

It is to be noted again, however, that the regression equation and the standard error of estimate are used to predict the *estimated grade-point average* of an individual *within a range of possibilities*. The identification and proper use of such predictive data, as one of the factors contributing to the student's probable success in college, should result in more effective counseling in the selection and retention of students.

III. SUMMARY

Using the data available in this study, computations were made to obtain the applicable regression coefficient to be used in the regression equation for each subgroup concerned. Then, each ACT composite score was inserted in the equation to predict the corresponding estimated grade-point average. These findings and the standard error of estimate for each subgroup were summarized in tables. It was noted that predictions were made for all standard composite scores ranging from 1 to 36, even though some of them were beyond the range of the ACT scores in the original data of each subgroup.

Predictions were very easily made for any individual by referral to the appropriate table to obtain the estimated grade-point average for a particular ACT score and by computations with the standard error of estimate to establish the limits within which the individual would be expected to fall. The odds are 2 to 1 that any individual will not fall below one standard error of estimate or go above one standard error of estimate from the estimated grade-point average.

The estimated grade-point averages ranged from 1.541 for total females with an ACT composite score of 9 to 3.460 for junior females with a score of 24. Among the classes the sophomore class was lowest with 1.607 for a score of 9; the junior class was highest with 2.967 for a score of 27.

Among the male subgroups, the junior males were lowest with 1.681 for a score of 9 and highest with 2.764 for a score of 27. Among the female subgroups, the sophomore females were lowest with 1.604 for a score of 9. The junior females were highest with 3.460 for a score of 24.

The highest predictions were for the four subgroups of females--juniors, total, sophomores, and seniors, in that order. The total females had an estimated grade-point average of 3.293 for a score of 24, as compared to 2.648 for total males with a score of 27. Thus, the usual pattern of sex differences revealed itself again.

It was noted that ACT composite scores of 31 to 36, 28 to 36, 34 to 36, and 31 to 36, for the four subgroups of females predicted estimated grade-point averages above 4.0. Such predictions were interpreted as being indicative of potentially high academic success. However, it was pointed out that predictions for senior females were practically worthless, because the statistical findings were not significant at the .05 level.

An observation might be made regarding the cut-off score of 12. Only two subgroups, senior males and total seniors, had estimated grade-point averages above the 2.0 average required for graduation.

The identification and proper use of such predictive data, as one of the factors contributing to the student's probable success in college, should result in more effective counseling in the selection and retention of students in the School of Business at Sam Houston State College.

CHAPTER VI

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

I. SUMMARY

Introduction

Beginning with the years following World War II, a decided change in the American educational scene was first observed in the explosion of student population which sky-rocketed college enrollments. This tremendous growth in numbers has, in turn, increased the competition for admission. There is, also, a steadily growing awareness on the part of the various interested professions that an unwarranted number of students enter college without the necessary capacities to complete their academic work satisfactorily. Thus, colleges are faced with the responsibility of selecting those students who will be more successful academically than those who are not accepted. It is imperative, therefore, that admission and counseling personnel have adequate screening and selective devices for the prediction of academic success.

With these thoughts in mind, the writer conducted this study for the purpose of determining the relationship of the ACT composite score of the American College Testing Program Examination (ACT) to academic success in terms of the accumulative grade-point averages for majors in the

School of Business at Sam Houston State College, Huntsville, Texas. As grades are considered to be the essential criterion of success in college, it is the accuracy of the prediction of this type of success with which this study was concerned. The second purpose was to develop prediction equations for estimating grade-point averages, based on ACT composite scores, for individuals seeking admission to this curriculum in the future.

This study was begun by reviewing related research to analyze the statistical techniques that have been found to be effective by other researchers in predicting academic success. Background information was obtained from the periodical literature found in the Estill Library at Sam Houston State College, Huntsville, Texas, and in the M. D. Anderson Memorial Library at the University of Houston, Houston, Texas.

The investigation was limited to a homogeneous group of 283 students who were enrolled as majors in Business Administration in the fall semester of 1964. These students were differentiated by class and sex. The data for the statistical research were obtained from the records of the Dean of Admission and Registrar of Sam Houston State College.

The input data were processed by programmed formulas on the IBM 1620 Computer. Accuracy was assured by checking the computations with a second set of formulas and by manual calculations on a small subgroup. The output data were compiled into tables, evaluated, and interpreted. In the final writing of the thesis, suggestions of the supervising committee were followed in making corrections or revisions.

Preliminary Statistical Findings

An analysis of preliminary findings was made through frequency distributions, statistics of the ACT composite scores, and statistics of the grade-point averages.

From the frequency distribution tables it was found that the ACT composite scores ranged from 7 to 27, with the scores for each subgroup and for the total sample falling within ± 3 sigmas from the means.

Likewise, for the grade-point averages it was found that tallies for the entire sample fell within ± 3 sigmas from the mean. Such distributions of scores and grade-point averages assured a normal distribution in every instance.

The scatter diagrams also indicated positive correlations as the tally marks tended to be distributed from the lower-left to the upper-right corners. These findings were substantiated in further analysis of the means and correlations.

✓ The means of the ACT composite scores ranged from 18.125 for junior males to 17.090 for senior males. The junior males led the males of all the classes, and the junior class with a mean of 18.068 led the classes. The senior females had a mean of 17.888, and the total females had a mean of 17.808. It was interesting to note that the means for females were greater than for males in every instance except one--junior males.

The means of the grade-point averages ranged from 2.623 for junior females to 2.031 for sophomore males. The senior class led the classes with 2.345. The senior males led the males of all classes with 2.332; whereas, the junior females with 2.623 led the females of all classes. The four subgroups of females held the highest rankings. Again, the usual aspect of sex difference was evident--that, in general, women's grades are higher than men's.

In connection with the means of the grade-point averages, the standard error of the mean made it possible to set up confidence limits.

Correlations

In order to find the relationship between ACT composite scores and scholastic achievement to determine the predictive validity of such scores, calculations were made to obtain the product-moment correlation coefficient for each subgroup. The correlations ranged from .767 for sophomore females to .288 for sophomore males. The junior class led the classes with a correlation of .535. The junior males led the males of all classes with .525. The females had correlations ranging from .767 to .622.

The correlation for the total females was .745 compared to .406 for the total males. For the total sample, undifferentiated by sex, the correlation was .489.

The four subgroups of females had the four highest correlations. The sex pattern occurred again, resulting in evidence that women are academically more predictable than men.

Four factors were considered in the interpretation of the correlations: strength of relationship, findings in prior research, reliability, and probable limits.

Eight of the correlations suggested a moderate or substantial relationship. The correlations for three subgroups of females fell within the range carrying a marked or high relationship; whereas, the correlation for sophomore males was the only one falling within the range interpreted as low or small relationship. The correlation of .489 for the entire sample was considered to be good, moderate, or substantial.

Findings in prior research indicated correlations ranging from .17 to .70 with averages clustering around .50. It was assumed, therefore, that the findings of the present study fitted satisfactorily into the historical perspective.

With the exception of the senior females, all correlations were found to be significant at the .01 level. Even though the correlation for the senior females approached statistical significance at the .05 level, the exact amount of correlation would be exceedingly uncertain and practically worthless because of the small number of cases involved.

With the exception of correlations for sophomore males and senior females, it can be asserted with confidence that the obtained correlations were well placed in positions removed from zero or negative correlations. In the first instance, the correlation approached zero within -2.58 standard errors of the correlation; and within -3 standard errors it became negative. The smaller the correlation and the smaller the sample, the more likely is this to occur. The coefficient of correlation for the senior females was not statistically significant at the .05 level because of the extremely small number of cases.

Predictions from Correlations

Using the data available in this study, computations were made to obtain the applicable regression coefficient to be used in the regression equation for each subgroup concerned. Then, each ACT composite score was inserted in the equation to predict the corresponding estimated grade-point average. These findings and the standard error of estimate for each subgroup were summarized in tables. It was noted that predictions were made for all standard composite scores ranging from 1 to 36, even though some of them were beyond the range of the ACT composite scores in the original data of each subgroup.

Predictions were very easily made for any individual by referral to the appropriate table to obtain the estimated grade-point average for a particular ACT score and by computations with the standard error of estimate to establish the limits within which the individual would be expected to fall. The odds are 2 to 1 that any individual will not fall below or go above one standard error of estimate from the estimated grade-point average.

The estimated grade-point averages ranged from 1.541 for total females with an ACT composite score of 9 to 3.460 for junior females with a score of 24. Among the classes the sophomore class was lowest with 1.607 for a score of 9; the junior class was highest with 2.967 for a score of 27.

Among the male subgroups, the junior males were lowest with 1.681 for a score of 9 and highest with 2.764 for a score of 27. Among the female subgroups, the sophomore females were lowest with 1.604 for a score of 9. The junior females were highest with 3.460 for a score of 24.

The highest predictions were for the four subgroups of females--juniors, total, sophomores, and seniors, in that order. The total females had an estimated grade-point average of 3.293 for a score of 24, as compared to 2.648 for total males with a score of 27. Thus, the usual pattern of sex differences revealed itself again.

It was noted that ACT composite scores of 31 to 36, 28 to 36, 34 to 36, and 31 to 36, for the four subgroups of females predicted estimated grade-point averages above 4.0. Such predictions were interpreted as being indicative of potentially high academic success.

Only two subgroups, senior males and total seniors, with the cut-off score of 12 had estimated grade-point averages above the 2.0 average required for graduation.

II. CONCLUSIONS

Based on the analysis of the data in this study, the statistical findings support the following conclusions:

1. A normal distribution of ACT composite scores and the grade-point averages of the sample can be assumed in every instance.

2. The correlations between the ACT composite scores and the grade-point averages fit satisfactorily into the historical perspective.

3. The correlation for senior females is exceedingly uncertain and practically worthless because of the small number of cases involved.

4. All other correlations are statistically reliable due to their significance at the .01 level.

5. The reliability of the correlations is further established by the probable limits being well placed in positions significantly different from zero or negative correlations.

6. There is a significant sex difference--that is, in general, women are more predictable than men. However, the ACT scores of the females do not seem to be so much significantly greater to account for the difference in academic achievement. Therefore, it might be speculated that the usual aspect of sex difference may be due to such reasons as: women have better study habits than men; a smaller percent of women than men go to college; women who attend college are likely to be the more serious students; the less serious female students may withdraw from college early in their studies.

7. Generally, the ACT composite score of 12 does not predict grade-point averages indicative of the academic success necessary for graduation.

8. The ACT composite scores provide efficient predictability of successful college achievement within a range of possibilities.

III. RECOMMENDATIONS

The results of this study justify the following recommendations:

1. That counselors and advisers should be acquainted with the possibility of predicting the academic success of majors in Business Administration from the ACT composite scores. It is believed that the identification and proper use of such data, as one of the factors contributing to the student's probable success in college, would result in more effective selection of students for admission, with special reference to recommending the pursual or non-pursual of business as a course of study.

2. That a study should be made to determine the desirability of establishing a more effective cut-off score for admission.

3. That another predictive study similar to this one should be made in three to five years to determine whether or not changes in statistical findings would indicate that new equations should be developed.

4. Finally, that an extension of this research be made by estimating grade-point averages using the regression

equations derived in this study and by calculating the correlations between these estimates and the grade-point averages actually obtained by the new sample. If the correlations between estimated and obtained grade-point averages approach the magnitude of the original correlations reported in this study, it could then be indicated that the correlations obtained with the original group were not the result of chance factors.

BIBLIOGRAPHY

A. PERIODICALS

Abelson, Robert P., "Sex Differences in Predictability of College Grades," Educational and Psychological Measurement, Vol. 12, October, 1952, pp. 638-644.

Boyce, Richard W. and R. C. Paxson, "The Predictive Validity of Eleven Tests At One State College," Educational and Psychological Measurement, Vol. 25, Winter, 1965, pp. 1143-1147.

Brown, Frederick G. and Leroy Wolins, "An Empirical Evaluation of the American College Testing Program," Personnel and Guidance Journal, January, 1965, pp. 451-456.

Cosand, Joseph, "Admissions Criteria," College and University, Vol. 28, Spring, 1953, pp. 338-364.

DeSena, Paul A. and Louise A. Weber, "The Predictive Validity of the School and College Ability Test (SCAT) and the American College Test (ACT) At A Liberal Arts College for Women," Educational and Psychological Measurement, Vol. 25, Winter, 1965, pp. 1149-1151.

Emme, Earle E., "Predicting College Success," Journal of Higher Education, Vol. 13, 1942, pp. 263-267.

Foster, James M. and David G. Danskin, "The American College Test (ACT) Tested Three Ways," Personnel and Guidance Journal, Vol. 43, May, 1965, pp. 904-909.

Franz, Gretchen, Junius A. Davis, and Dolores Garcia, "Prediction of Grades From Pre-Admission Indices in Georgia Tax-Supported Colleges," Educational and Psychological Measurement, Vol. 18, Winter, 1958, pp. 841-844.

Funches, Delars, "A Correlation Between the ACT Scores and the Grade Point Averages of Freshmen at Jackson State College," College and University, Vol. 40, Spring, 1965, pp. 324-326.

Garrett, Harley F., "A Review and Interpretation of Investigations of Factors Related to Scholastic Success in Colleges of Arts and Science and Teachers Colleges," Journal of Experimental Education, Vol. 28, December, 1949, pp. 91-138.

Harris, Daniel, "Factors Affecting College Grades: A Review of the Literature, 1930-1937," Psychological Bulletin, Vol. 37, March, 1940, pp. 125-166

Holland, J. L., "The Research and Development Division in the American College Testing Program," Journal of Counseling Psychology, Vol. 13, Spring, 1966, pp. 117-119.

Juola, A. E., "Predictive Validity of Five College-Level Academic Aptitude Tests At One Institution," Personnel and Guidance Journal, Vol. 38, April, 1960, pp. 637-641.

Kahn, Harris and Erwin Singer, "An Investigation of Some of the Factors Related to Success or Failure of School of Commerce Students," The Journal of Educational Psychology, Vol. 40, 1949, pp. 107-117.

Mann, M. Jacinta, "The Prediction of Achievement in A Liberal Arts College," Educational and Psychological Measurement, Vol. 21, Summer, 1961, pp. 481-483.

Peters, Frank R. and Eugenia L. Plog, "The Effectiveness of the ACT for Selection and Placement at The Ohio State University," Educational Research Bulletin, December, 1961, pp. 232-241, 252.

Super, Donald E., "The Scholastic Aptitude Tests of the College Entrance Examination Board," Personnel and Guidance Journal, Vol. 42, December, 1963, pp. 406-409.

Tiedeman, David V., "The American College Testing Program Examination," Personnel and Guidance Journal, Vol. 41, May, 1963, pp. 814-819.

Trump, Paul L., "The American College Testing Program," Journal of National Association of Women Deans and Counselors, Vol. 27, October, 1963, pp. 40-43.

Vick, Mary Catharine and John A. Hornaday, "Predicting Grade Point Average at A Small Southern College," Educational and Psychological Measurement, Vol. 22, Winter, 1962, pp. 795-798.

Watley, Donivan J., "The Effectiveness of Intellectual and Non-Intellectual Factors in Predicting Achievement for Business Students," The Journal of Educational Research, Vol. 57, April, 1964, pp. 402-408.

B. BOOKS

American College Testing Program. ACT Technical Report. Iowa City: ACT, 1965.

Bartz, Albert E. Elementary Statistical Methods for Educational Measurement. Minneapolis, Minnesota: Burgess Publishing Company, 1958.

Chauncey, Henry and John E. Dobbin. Testing: Its Place in Education Today. New York: Harper & Row, 1963.

Cronbach, Lee J. Essentials of Psychological Testing. New York: Harper and Brothers, 1949.

Garrett, Henry E. Elementary Statistics. New York: Longmans, Green and Company, 1956.

Guest, Lester. Beginning Statistics. New York: Thomas Y. Crowell Company, 1957.

Guilford, J. P. Fundamental Statistics in Psychology and Education. New York: McGraw-Hill Book Company, 1950.

Henry, Erwin R. "Predicting Success in College and University" in Fryer, Douglas H. and Erwin R. Henry, editors, Handbook of Applied Psychology. New York: Rinehart and Co., 1950, pp. 449-453.

Hillway, Tyrus. Introduction to Research. Boston: Houghton Mifflin Company, 1964.

Lavin, David E. The Prediction of Academic Performance. New York: Russell Sage Foundation, 1965.

Lyman, Howard B. Test Scores and What They Mean. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1963.

Smith, G. Milton. A Simplified Guide to Statistics for Psychology and Education, Third Edition. New York: Holt, Rinehart and Winston, Inc., 1962.

A P P E N D I C E S

APPENDIX A

ROSTER OF ORIGINAL DATA

ORIGINAL DATA

1	2	1	15	64	107	1.671
2	2	1	25	62	149	2.403
3	3	2	20	89	167	1.876
4	2	1	16	71	133	1.873
5	2	1	17	60	115	1.916
6	2	2	14	54	120	2.222
7	3	1	22	110	223	2.027
8	4	1	19	126	419	3.325
9	4	1	19	115	287	2.495
10	2	1	19	74	159	2.148
11	2	2	23	51	150	2.941
12	3	1	23	103	293	2.844
13	4	1	14	136	274	2.014
14	3	1	25	95	214	2.252
15	2	2	14	50	90	1.800
16	3	2	16	81	182	2.246
17	4	1	17	110	245	2.227
18	2	1	21	56	126	2.250
19	2	1	20	74	139	1.878
20	3	1	20	84	283	3.369
21	2	1	14	81	189	2.333
22	2	1	18	75	136	1.813
23	4	1	16	110	308	2.800
24	2	2	23	48	129	2.687
25	2	1	18	72	123	1.708
26	2	1	14	74	162	2.189
27	4	1	11	136	344	2.529
28	2	2	17	51	115	2.254
29	2	2	12	55	87	1.581
30	3	1	15	84	147	1.750

31	3	1	22	85	224	2.635
32	3	1	17	92	172	1.869
33	3	1	15	99	233	2.353
34	2	1	19	56	89	1.589
35	2	1	16	50	48	.960
36	2	1	17	66	120	1.818
37	4	2	24	118	428	3.627
38	3	2	18	71	148	2.084
39	2	2	21	60	176	2.933
40	4	1	17	120	277	2.308
41	2	1	13	45	88	1.955
42	3	1	22	85	259	3.047
43	4	1	14	120	254	2.116
44	4	1	25	114	355	3.114
45	3	1	17	107	197	1.841
46	2	1	14	51	117	2.294
47	2	1	11	48	90	1.875
48	3	1	21	104	202	1.942
49	3	1	21	105	279	2.657
50	2	1	20	80	164	2.050
51	4	1	7	131	237	1.809
52	4	2	17	127	315	2.480
53	3	1	24	102	236	2.313
54	2	1	21	74	128	1.729
55	3	1	15	104	196	1.884
56	3	1	17	92	193	2.097
57	2	2	23	51	163	3.196
58	3	1	17	102	169	1.656
59	2	2	14	64	134	2.093
60	2	2	11	68	149	2.191
61	4	1	15	127	255	2.007
62	4	1	18	130	293	2.253
63	2	1	16	51	106	2.078

64	3	1	13	102	176	1.725
65	4	1	20	113	248	2.194
66	2	2	18	54	140	2.592
67	2	2	17	64	136	2.125
68	4	1	18	114	406	3.561
69	2	1	21	71	115	1.619
70	3	1	19	87	169	1.942
71	2	1	20	81	148	1.827
72	2	1	10	79	201	2.544
73	2	1	22	70	138	1.971
74	4	1	15	115	205	1.782
75	3	1	19	98	235	2.397
76	2	1	16	57	104	1.824
77	3	1	14	88	184	2.090
78	2	1	17	43	91	2.116
79	4	1	19	137	243	1.773
80	2	2	11	80	157	1.962
81	2	2	21	60	168	2.800
82	2	2	16	75	175	2.333
83	3	1	23	108	304	2.814
84	3	1	20	81	189	2.333
85	3	2	18	108	312	2.888
86	2	1	18	46	83	1.804
87	2	1	20	65	118	1.815
88	3	1	19	101	272	2.693
89	2	1	12	68	127	1.867
90	4	1	15	133	300	2.255
91	3	2	12	98	174	1.775
92	2	1	16	61	109	1.786
93	4	2	17	132	282	2.136
94	3	1	15	106	213	2.009
95	4	1	13	111	248	2.234
96	3	1	17	112	231	2.062

97	4	1	16	115	303	2.634
98	4	2	17	122	248	2.032
99	2	2	12	79	201	2.544
100	3	1	14	116	193	1.663
101	2	2	15	91	134	1.472
102	4	1	19	123	235	1.910
103	3	1	16	105	217	2.066
104	3	1	16	79	199	2.518
105	2	1	20	89	247	2.775
106	3	1	15	81	175	2.160
107	3	1	22	104	228	2.192
108	4	1	14	124	269	2.169
109	2	1	19	78	137	1.756
110	3	1	17	81	171	2.111
111	2	1	19	74	187	2.527
112	3	1	23	80	160	2.000
113	4	1	18	128	274	2.140
114	3	2	12	112	222	1.982
115	4	1	18	126	284	2.253
116	2	2	9	66	110	1.666
117	3	1	9	105	243	2.314
118	2	2	16	75	154	2.053
119	4	1	17	111	259	2.333
120	2	2	22	56	156	2.785
121	3	2	24	82	299	3.646
122	2	2	19	78	213	2.730
123	3	2	22	81	271	3.345
124	3	2	17	85	211	2.482
125	3	1	22	104	318	3.057
126	4	1	20	132	338	2.560
127	4	1	17	124	236	1.903
128	2	1	16	82	134	1.634
129	2	1	17	57	82	1.438

130	2	1	21	74	167	2.256
131	3	2	16	80	242	3.025
132	3	1	24	94	189	2.010
133	2	2	23	63	237	3.761
134	2	2	17	68	168	2.470
135	3	1	14	81	124	1.530
136	2	1	20	48	169	3.520
137	2	1	21	44	121	2.750
138	2	2	14	75	144	1.920
139	4	1	13	119	290	2.436
140	2	2	19	48	110	2.291
141	3	2	12	85	159	1.870
142	2	1	19	66	119	1.803
143	3	2	15	85	164	1.929
144	2	2	24	49	161	3.285
145	3	1	13	92	187	2.032
146	2	1	16	55	80	1.454
147	2	2	24	46	163	3.543
148	2	1	17	53	96	1.811
149	3	1	25	83	213	2.566
150	2	1	22	71	170	2.394
151	2	2	16	79	137	1.734
152	4	1	21	111	348	3.135
153	2	1	12	65	95	1.461
154	2	1	22	54	104	1.925
155	2	1	19	54	76	1.407
156	3	1	13	121	240	1.983
157	3	1	17	101	218	2.158
158	2	1	21	71	181	2.549
159	2	1	10	76	162	2.131
160	3	1	20	104	217	2.086
161	3	1	20	121	208	1.719
162	4	2	20	112	241	2.151

163	2	2	22	78	264	3.384
164	2	2	23	54	182	3.370
165	4	1	15	126	283	2.246
166	3	2	21	95	353	3.715
167	4	1	20	124	273	2.201
168	2	1	22	82	237	2.890
169	2	1	15	91	153	1.681
170	3	1	19	79	161	2.037
171	3	2	16	77	192	2.493
172	2	1	16	72	164	2.277
173	3	2	19	106	349	3.292
174	4	1	13	135	270	2.000
175	2	2	16	53	171	3.226
176	2	1	21	47	116	2.468
177	3	1	18	86	197	2.290
178	2	2	22	59	206	3.491
179	2	1	20	47	98	2.085
180	4	1	21	121	301	2.487
181	2	1	16	65	96	1.476
182	2	1	18	61	131	2.147
183	3	2	23	86	308	3.581
184	4	2	18	123	268	2.178
185	4	1	18	107	327	3.056
186	4	1	15	116	219	1.887
187	2	1	20	47	114	2.425
188	2	1	16	76	201	2.644
189	3	1	18	87	168	1.931
190	4	1	13	118	216	1.830
191	2	1	12	73	146	2.000
192	4	1	17	114	266	2.333
193	3	1	20	90	178	1.977
194	4	1	16	97	184	1.896
195	2	1	16	80	153	1.912

196	4	1	19	129	282	2.186
197	4	1	17	128	326	2.546
198	2	1	11	50	81	1.620
199	3	2	19	88	213	2.420
200	3	1	21	105	250	2.380
201	2	1	12	61	95	1.557
202	4	1	20	120	227	1.891
203	2	1	17	79	160	2.025
204	3	1	20	80	175	2.187
205	3	1	16	112	207	1.848
206	2	2	20	49	133	2.714
207	3	2	15	106	227	2.141
208	4	1	16	125	348	2.784
209	4	2	13	124	316	2.548
210	3	1	11	109	225	2.064
211	2	1	13	76	164	2.157
212	2	2	15	47	114	2.425
213	2	1	11	79	163	2.063
214	4	1	23	111	261	2.351
215	4	1	16	109	232	2.128
216	2	1	13	74	137	1.851
217	2	1	14	89	136	1.528
218	4	2	19	107	275	2.570
219	3	2	21	84	256	3.047
220	3	1	17	109	198	1.816
221	4	1	15	115	236	2.052
222	3	1	22	110	267	2.427
223	2	1	15	71	132	1.859
224	3	1	15	102	187	1.833
225	3	1	11	104	197	1.894
226	2	1	17	47	114	2.425
227	3	1	19	109	228	2.091
228	4	1	24	112	301	2.687

229	2	2	21	71	176	2.478
230	3	1	21	94	337	3.585
231	2	2	16	47	151	3.212
232	2	1	10	51	120	2.352
233	4	1	12	110	228	2.072
234	4	1	14	117	251	2.145
235	4	1	20	121	280	2.314
236	3	1	17	87	154	1.770
237	3	1	23	80	206	2.575
238	3	2	17	78	177	2.269
239	3	1	15	86	217	2.523
240	3	2	18	92	276	3.000
241	2	1	18	66	87	1.318
242	3	1	17	80	205	2.562
243	3	1	14	105	220	2.095
244	3	2	22	81	212	2.617
245	4	1	7	118	251	2.127
246	4	1	24	118	366	3.101
247	3	1	20	78	178	2.282
248	3	1	14	103	197	1.912
249	3	1	16	82	165	2.012
250	3	1	14	104	228	2.192
251	4	1	20	127	263	2.070
252	2	1	20	72	127	1.763
253	2	1	20	48	144	3.000
254	3	1	17	88	191	2.170
255	3	1	17	109	263	2.412
256	3	1	23	84	266	3.166
257	2	1	16	75	140	1.866
258	2	1	22	51	145	2.843
259	3	1	14	108	276	2.555
260	3	1	27	97	341	3.515
261	3	1	22	86	200	2.325

262	3	1	15	98	212	2.163
263	2	1	16	54	88	1.629
264	2	1	15	52	122	2.346
265	2	1	18	77	178	2.311
266	3	1	21	102	223	2.186
267	2	1	19	74	132	1.783
268	4	2	16	130	277	2.130
269	4	1	17	110	238	2.163
270	3	1	22	84	223	2.654
271	2	2	17	54	160	2.962
272	2	1	21	52	103	1.980
273	4	1	23	119	307	2.579
274	3	1	17	112	171	1.526
275	4	1	18	112	269	2.401
276	2	1	22	71	211	2.971
277	3	1	22	99	230	2.323
278	4	1	22	121	298	2.462
279	3	1	16	107	198	1.850
280	3	1	11	118	182	1.542
281	3	1	19	78	198	2.538
282	2	1	15	74	147	1.986
283	3	1	17	91	224	2.461

APPENDIX B

OUTPUT DATA ON STATISTICAL FINDINGS

SOPHOMORE MALES

STATISTICAL DATA ON ACT AND GPA

N	MX	MY	SDX	SDY	SEMY
80	17.175	2.031	3.419	.435	.048

R	SER	RG	SEE
.288	.103	.036	.416

ESTIMATED GPA FROM REGRESSION EQUATIONS

ACT	EGPA	ACT	EGPA
1	1.437	19	2.098
2	1.474	20	2.135
3	1.511	21	2.172
4	1.547	22	2.208
5	1.584	23	2.245
6	1.621	24	2.282
7	1.658	25	2.318
8	1.694	26	2.355
9	1.731	27	2.392
10	1.768	28	2.429
11	1.804	29	2.465
12	1.841	30	2.502
13	1.878	31	2.539
14	1.915	32	2.575
15	1.951	33	2.612
16	1.988	34	2.649
17	2.025	35	2.686
18	2.061	36	2.722

SOPHOMORE FEMALES

STATISTICAL DATA ON ACT AND GPA

N	MX	MY	SDX	SDY	SEMY
37	17.756	2.573	4.135	.596	.099

R	SER	RG	SEE
.767	.068	.110	.382

ESTIMATED GPA FROM REGRESSION EQUATIONS

ACT	EGPA	ACT	EGPA
1	.718	19	2.711
2	.829	20	2.822
3	.940	21	2.932
4	1.050	22	3.043
5	1.161	23	3.154
6	1.272	24	3.264
7	1.382	25	3.375
8	1.493	26	3.486
9	1.604	27	3.596
10	1.714	28	3.707
11	1.825	29	3.818
12	1.936	30	3.929
13	2.047	31	4.039
14	2.157	32	4.150
15	2.268	33	4.261
16	2.379	34	4.371
17	2.489	35	4.482
18	2.600	36	4.593

TOTAL SOPHOMORES

STATISTICAL DATA ON ACT AND GPA

N	MX	MY	SDX	SDY	SEMY
117	17.358	2.203	3.671	.552	.051

R	SER	RG	SEE
.473	.072	.071	.486

ESTIMATED GPA FROM REGRESSION EQUATIONS

ACT	EGPA	ACT	EGPA
1	1.037	19	2.320
2	1.108	20	2.391
3	1.179	21	2.462
4	1.250	22	2.533
5	1.322	23	2.605
6	1.393	24	2.676
7	1.464	25	2.747
8	1.536	26	2.818
9	1.607	27	2.890
10	1.678	28	2.961
11	1.749	29	3.032
12	1.821	30	3.103
13	1.892	31	3.175
14	1.963	32	3.246
15	2.034	33	3.317
16	2.106	34	3.389
17	2.177	35	3.460
18	2.248	36	3.531

JUNIOR MALES

STATISTICAL DATA ON ACT AND GPA

N	MX	MY	SDX	SDY	SEMY
80	18.125	2.230	3.739	.427	.048

R	SER	RG	SEE
.525	.081	.060	.363

ESTIMATED GPA FROM REGRESSION EQUATIONS

ACT	EGPA	ACT	EGPA
1	1.200	19	2.283
2	1.260	20	2.343
3	1.320	21	2.403
4	1.380	22	2.463
5	1.440	23	2.523
6	1.501	24	2.583
7	1.561	25	2.643
8	1.621	26	2.704
9	1.681	27	2.764
10	1.741	28	2.824
11	1.801	29	2.884
12	1.862	30	2.944
13	1.922	31	3.004
14	1.982	32	3.065
15	2.042	33	3.125
16	2.102	34	3.185
17	2.162	35	3.245
18	2.222	36	3.305

JUNIOR FEMALES

STATISTICAL DATA ON ACT AND GPA

N	MX	MY	SDX	SDY	SEMY
22	17.863	2.623	3.415	.613	.133

R	SER	RG	SEE
.759	.092	.136	.399

ESTIMATED GPA FROM REGRESSION EQUATIONS

ACT	EGPA	ACT	EGPA
1	.323	19	2.778
2	.459	20	2.915
3	.596	21	3.051
4	.732	22	3.187
5	.869	23	3.324
6	1.005	24	3.460
7	1.141	25	3.597
8	1.278	26	3.733
9	1.414	27	3.869
10	1.551	28	4.006
11	1.687	29	4.142
12	1.823	30	4.279
13	1.960	31	4.415
14	2.096	32	4.551
15	2.233	33	4.688
16	2.369	34	4.824
17	2.505	35	4.961
18	2.642	36	5.097

TOTAL JUNIORS

STATISTICAL DATA ON ACT AND GPA

N	MX	MY	SDX	SDY	SE..
102	18.068	2.315	3.673	.500	.049

R	SER	RG	SEE
.535	.070	.073	.422

ESTIMATED GPA FROM REGRESSION EQUATIONS

ACT	EGPA	ACT	EGPA
1	1.068	19	2.383
2	1.141	20	2.455
3	1.214	21	2.529
4	1.287	22	2.602
5	1.360	23	2.675
6	1.433	24	2.748
7	1.506	25	2.821
8	1.580	26	2.894
9	1.653	27	2.967
10	1.726	28	3.040
11	1.799	29	3.113
12	1.872	30	3.186
13	1.945	31	3.259
14	2.018	32	3.332
15	2.091	33	3.405
16	2.164	34	3.473
17	2.237	35	3.551
18	2.310	36	3.624

SENIOR MALES

STATISTICAL DATA ON ACT AND GPA

N	MX	MY	SDX	SDY	SEMY
55	17.090	2.332	3.718	.399	.054

R	SER	RG	SEE
.440	.109	.047	.358

ESTIMATED GPA FROM REGRESSION EQUATIONS

ACT	EGPA	ACT	EGPA
1	1.571	19	2.422
2	1.618	20	2.469
3	1.665	21	2.516
4	1.713	22	2.564
5	1.760	23	2.611
6	1.807	24	2.658
7	1.855	25	2.705
8	1.902	26	2.753
9	1.949	27	2.800
10	1.996	28	2.847
11	2.044	29	2.895
12	2.091	30	2.942
13	2.138	31	2.989
14	2.185	32	3.036
15	2.233	33	3.084
16	2.280	34	3.131
17	2.327	35	3.178
18	2.375	36	3.225

SENIOR FEMALES

STATISTICAL DATA ON ACT AND GPA

N	MX	MY	SDX	SDY	SEMY
9	17.888	2.428	2.845	.464	.164

R	SER	RG	SEE
.622	.216	.101	.363

ESTIMATED GPA FROM REGRESSION EQUATIONS

ACT	EGPA	ACT	EGPA
1	.710	19	2.541
2	.811	20	2.642
3	.913	21	2.744
4	1.015	22	2.846
5	1.116	23	2.947
6	1.218	24	3.049
7	1.320	25	3.151
8	1.422	26	3.253
9	1.523	27	3.354
10	1.625	28	3.456
11	1.727	29	3.558
12	1.829	30	3.659
13	1.930	31	3.761
14	2.032	32	3.863
15	2.134	33	3.965
16	2.235	34	4.066
17	2.337	35	4.168
18	2.439	36	4.270

TOTAL SENIORS

STATISTICAL DATA ON ACT AND GPA

N	MX	MY	SDX	SDY	SEMY
64	17.203	2.345	3.619	.410	.051

R	SER	RG	SEE
.462	.099	.052	.364

ESTIMATED GPA FROM REGRESSION EQUATIONS

ACT	EGPA	ACT	EGPA
1	1.495	19	2.439
2	1.548	20	2.492
3	1.600	21	2.544
4	1.653	22	2.597
5	1.705	23	2.649
6	1.758	24	2.701
7	1.810	25	2.754
8	1.863	26	2.806
9	1.915	27	2.859
10	1.967	28	2.911
11	2.020	29	2.964
12	2.072	30	3.016
13	2.125	31	3.068
14	2.177	32	3.121
15	2.230	33	3.173
16	2.282	34	3.226
17	2.334	35	3.278
18	2.387	36	3.331

TOTAL MALES

STATISTICAL DATA ON ACT AND GPA

N	MX	MY	SDX	SDY	SEMY
215	17.506	2.182	3.649	.440	.030

R	SER	RG	SEE
.406	.057	.049	.402

ESTIMATED GPA FROM REGRESSION EQUATIONS

ACT	EGPA	ACT	EGPA
1	1.372	19	2.255
2	1.421	20	2.304
3	1.470	21	2.353
4	1.519	22	2.402
5	1.568	23	2.452
6	1.617	24	2.501
7	1.666	25	2.550
8	1.715	26	2.599
9	1.764	27	2.648
10	1.814	28	2.697
11	1.863	29	2.746
12	1.912	30	2.795
13	1.961	31	2.844
14	2.010	32	2.893
15	2.059	33	2.942
16	2.108	34	2.991
17	2.157	35	3.041
18	2.206	36	3.090

TOTAL FEMALES

STATISTICAL DATA ON ACT AND GPA

N	MX	MY	SDX	SDY	SEMY
68	17.808	2.570	3.762	.589	.072

R	SER	RG	SEE
.745	.054	.116	.393

ESTIMATED GPA FROM REGRESSION EQUATIONS

ACT	EGPA	ACT	EGPA
1	.607	19	2.709
2	.724	20	2.826
3	.840	21	2.943
4	.957	22	3.060
5	1.074	23	3.176
6	1.191	24	3.293
7	1.308	25	3.410
8	1.424	26	3.527
9	1.541	27	3.644
10	1.658	28	3.760
11	1.775	29	3.877
12	1.892	30	3.994
13	2.008	31	4.111
14	2.125	32	4.228
15	2.242	33	4.344
16	2.359	34	4.461
17	2.476	35	4.578
18	2.592	36	4.695

TOTAL STUDENTS

STATISTICAL DATA ON ACT AND GPA

N	MX	MY	SDX	SDY	SEMY
283	17.579	2.275	3.679	.508	.030

R	SER	RG	SEE
.489	.045	.067	.443

ESTIMATED GPA FROM REGRESSION EQUATIONS

ACT	EGPA	ACT	EGPA
1	1.154	19	2.371
2	1.222	20	2.439
3	1.289	21	2.507
4	1.357	22	2.574
5	1.425	23	2.642
6	1.492	24	2.709
7	1.560	25	2.777
8	1.628	26	2.845
9	1.695	27	2.912
10	1.763	28	2.980
11	1.830	29	3.047
12	1.898	30	3.115
13	1.966	31	3.183
14	2.033	32	3.250
15	2.101	33	3.318
16	2.168	34	3.385
17	2.236	35	3.453
18	2.304	36	3.521

Vita was removed during scanning