THE GRADUATE RECORD EXAMINATION APTITUDE TEST AS A PREDICTOR OF GRADUATE STUDENT PERFOPMANCE

A Thesis Presented to the Faculty of the Department of Psychology University of Houston

> In Partial Fulfillment of the Requirements for the Degree

Master of Arts

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Art Mayse

August 1967

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ABSTRACT

Today, graduate schools have many more applicants than they have professors or available space. Therefore, the university administrators must select only those students who have a high probability of succeeding in graduate school. Various methods of selection are used by the different graduate schools, but the Graduate Record Examination Aptitude Test (GRE-AT) is becoming a prime predictor variable. However, information on the validity of this test is varied and relatively sparse. Also, since each university has its own standards, local studies should periodically be made to evaluate its requirements.

The purpose of this study was to analyze data related to the use of the Graduate Record Examination Aptitude Test (GPE-AT) for admission to the graduate school of a large university of the South. Answers were sought to such questions as: "What is the relationship, if any, between scores on the GRE-AT and grades made in academic courses at the graduate level?" "Of what value are GRE-AT scores as predictors of success in graduate school?"

The sample group consisted of 115 students who entered the graduate school in the fall of 1963 and were enrolled in major areas in the College of Arts and Sciences. Other criteria met by the group were: (1) They had GRE-AT scores recorded with the graduate school; (2) Their previous academic averages were available; (3) They had completed at least one graduate course, other than "special problems" courses; (4) They were United States citizens; and (5) They met other 1963-64 graduate school admission requirements.

The basic data were obtained from departmental summary sheets and a copy of each student's permanent record card, which were provided by the Dean of the Graduate School. The summary sheets provided: (1) student's name, (2) registration number, (3) major, (4) previous academic average (PAN), (5) GRE-Verbal score, (6) GRE-Quantitative score, (7) GRE-Total score. The copy of each subject's permanent record card provided the student's complete graduate academic record subsequent to his admission to graduate school, and, for students previously enrolled in this same university, the previous academic record, along with date of birth, nejor area, etc. From this basic data additional data were computed, such as age, number of graduate hours (NGH), and graduate grade point average (CGPA).

Since the primary purpose of this study was to evaluate the use of the GRE-AT for predicting academic success at the graduate level, these scores were the prime predictor variables studied. The criteria of success were: (1) the student maintained a cumulative GGPA of 3.0 or higher, or (2) the student was awarded an advanced degree. Other variables that the GRE-AT was correlated with were the previous academic average (PAA), the number of graduate hours completed (NGH), and the student age at the time of enrollment.

Pearson's Product-Moment Correlation was used for finding the relationships between the GRE-AT scores and the variables of GGPA, age and NGH. The Bi-Serial Correlation was used for the variables of PAA and academic success. Expectancy tables and decision theory graphs were, also, constructed for the relationships between the GRE-AT and the two variables of GGPA and academic success.

The major conclusions that were drawn from the analysis of the data in this study are as follows:

The relationship of the GRE-AT and GGPA was low.
 However, the GRE-V and GRE-T were significant at the .01
 level of confidence.

2. The PAA showed roughly the same relationship with the GRE-AT as did the GGPA with the GRE.

3. The correlation between PAA and GGPA was .38. However, this was significant at the .01 level and was probably depressed by such factors as preselection of the sample and the small range of graduate grades. 4. The decision theory graphs for the relationship of the GRE and GGPA showed: (a) 98 of the 100 students with CGPA's of 3.0 and above made 400 or above on the GRE-V, (b) 85 of the 100 students with 3.0 or above made 400 or above on the GRE-Q, and (c) 82 of the 100 students with a GGPA of 3.0 or greater made 900 on the GRE-T. The false positives and misses on these graphs show why the relationships of the GRE-AT and GGPA were low.

5. Under the present admission requirements, 18 students or 18 per cent of the group who have since maintained a 3.0 or greater GGPA would have been barred from graduate school if the GRE-AT had been the only admission requirement. This is, also, 15.7 per cent of the sample group.

6. On the basis of this study, students who would not meet the current admission requirements (GRE-T score of 900 or more) did succeed. On the other hand, students who would meet present requirements for admission did not succeed.

7. The GRE-AT seems to be a fairly good supplementary tool for academic prediction. However, it should be used in conjunction with other predictors, such as PAA and/or as a confirmation of ability.

The limitations of a study of this type are too numerous to make any absolute statements. It was not possible to control many of the subject and environmental variables which could have biased the results. Also, a relatively small, homogeneous sample group, enrolled in fairly heterogeneous majors could have considerably lowered the relationships of the GRE-AT with the criteria. Therefore, the above conclusions should be considered in view of these limitations.

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CHAPTER I

INTRODUCTION AND STATEMENT OF THE PROBLEM

Introduction

There is a greater need today than ever before in the history of mankind for every educated person to have not only a broad background in the natural sciences, the social sciences, and the arts; but also to be very well learned in his specific field. In our complex society, this need is satisfied by the graduate school. This requirement does not go unheeded as the graduate schools are overflowing with applications. There are not enough professors or space for all those who apply.

A necessity, then, arises for the selection of only those students who have the academic ability and motivation to complete graduate school satisfactorily. The Craduate Record Examination Aptitude Test (GRE-AT) is one of the several instruments employed in selecting applicants for admission to graduate schools. Many graduate schools throughout the country require the GRE-AT as a prerequisite for admission. Many use it as the sole predictor of academic success or else in conjunction with such other predictor variables as the undergraduate grade point average (UGGPA). However, relatively few studies have been made to support the predictive validity of the GPE-AT. Educational Testing Service (ETS), the publishers of the GRE, is the only large source of documented information. Also, there seems to be no studies available on which to base decisions as to where a selective cut-off score should be set.

The large university of the South involved in this study began requiring applicants for admission to the Graduate School to submit a GRE-AT profile in the fall of 1963 for research purposes only. The test was a requirement, but it was not used for admission purposes. In short, the GPE scores in no way affected admission. In the fall of 1964, however, the present admission requirements were initiated. A minimum total score of 900 on the GRE-AT was required for those students who had a previous academic average (PAA) of 2.6 and up to but not including 3.0 for the last sixty semester hours. The catalogue states that for those students who have a 3.0 PAA or greater for the last sixty hours, the GRE scores will not affect admission. This is based on a 4.0 grading system.

Statement of the Problem

The purpose of this study was to analyze data related to the use of the Graduate Record Examination, Aptitude Test (GRE-AT) for admission to this graduate school. Answers were sought to such questions as: "What is the relationship, if

any, between scores on the GRE-AT and grades made in academic courses at the graduate level?" "Of what value are GRE-AT scores as predictors of success in graduate school?"

Need for the Study

This particular study was needed at this university because: (1) each university has its own standards, (2) studies should be made to evaluate these standards, and (3) somewhat adequate data were available for the desired studies.

Each institution sets certain academic standards and requirements. These are governed by local and state laws, a board of regents, and the university administration. Such factors as the quantity and quality of the applicants, the facilities of the institution, the degree of academic sophistication of the university, and the demands made by society as a whole must be considered. Consequently, two universities will seldom have the same requirements nor will these requirements remain constant for any period of time.

Therefore, the requirements must continually be evaluated to insure that they are compatable with these factors. The administration must constantly insure that they are not only screening out those students who do not have the necessary academic aptitude, but also that they are allowing an opportunity to the greatest possible number of applicants who have the potential for academic success. This is best accomplished by taking recent academic data of an institution and setting up local norms. These norms indicate the current production standards of the university and its students. From the analysis of these norms, a particular administration can make future executive decisions and adjustments.

Limitations of the Study

The limitations in a study of this type are numerous. Only those students who met the following criteria were included:

- Entered the graduate school with majors in the College of Arts and Sciences for the fall of 1963.
- 2. Had taken the GRE-AT.
- 3. Had completed at least three semester hours of graduate work, other than special problems courses.
- 4. Were United States citizens.

Other sample and criteria limitations were that the sample consisted only of 115 subjects and that it was preselected due to the basic admission requirement that a student must have a 2.5 overall UGGPA or a 3.0 PAA for the last 60 semaster hours. Also, the differences in the number of graduate hours were not weighted and the PAA had to be considered as a dichotomy for correlation purposes. The latter was due to the graduate school staff recording the PAA's as 3.0+ for some GPA's of 3.0 and greater.

Next, there were many external variables which entered into the limitations of this study. No consideration was given to the financial status, working status, socio-economic status, marital status or dependent status of the subjects. The travel time to and from college could, also, affect academic success as might the sex of the subject and the educational background of the parents. Similarly, the emotional maturity, personal adjustment and motivation of the subjects were not available.

In addition, such internal factors as instructor variables and physical variables were not controlled. For example, there are many differences in the teaching methods, evaluation methods, and grading methods of the professors. Also, the classrcom temperature, lighting, and noise level as well as the classrcoms themselves vary greatly.

Moreover, the findings of this study may not necessarily make it possible to predict academic success within individual departments nor to predict success of students in other graduate schools.

CHAPTER II

REVIEW OF THE LITERATURE

The published literature is relatively sparse relating to a predictive test of such prominence and usage as the Graduate Record Examination Aptitude Test (GRE-AT). Although many graduate schools utilize this test for appraising applicants for admission, relatively few published studies were found in the literature about the GRE or its validity.

The unpublished literature is somewhat more fertile. However, by the very fact that it is unpublished, the dissemination of and access to such information is limited.

Consequently, the publishers of the GRE, the Educational Testing Service (ETS), has periodically published special reports on the GRE-AT which present predictive information that they have compiled. Also, several of these reports contain summaries of published and unpublished validity studies on the GRE-AT. Thus, the following is a review of all available studies and/or information that were found from these three sources.

General reviews of the GRE-AT were not researched completely by the author as these are subjective rather than empirically objective. However, a general sampling follows: The reviews of the Sixth Mental Measurements Yearbook (20) were quite critical for the lack of validity data, particularly in the test manuals. Willingham (20) recommended that information pertaining to the validity should be included in the score interpretation booklet. He, also, mentioned that a review of the available research showed that the relationship between the graduate grade point average (CGPA) and the GRE-AT scores ranged from moderately high to zero and was even smaller when a criterion less common was used. He recommended the GRE-AT as a good measure of verbal and quantitative ability, but called for more validity studies to be made on its usefulness in selecting graduate students. He particularly emphasized the need for more local studies.

In his review, French (5), also, concurred on the sparseness of validity data.

In a journal article, Speer (18) evaluated the GRE-AT as not suitable in the selection of graduate engineering students. He felt that selection should include measurement or evaluation of personal characteristics; factual knowledge pertaining to the area to be pursued at the graduate level; general and specific aptitudes; and undergraduate achievement, particularly in the field of graduate study. Since the GRE-AT overemphasizes some non-essential areas for prediction and neglects some essential areas, it is, therefore, of doubtful value for the selection of graduate

students in engineering.

The studies in the literature, among other things, showed that the relationship between the scores of the GRE-AT and graduate student performance was generally quite varied and relatively low. Many of the results were significant, but this was due more to the sample size (N) rather than the degree of the correlation.

One of the better studies was conducted at Florida State University (8) on ninety-six graduate education students. The following relationships were found between GRE-AT scores and GGPA: (1) GPE-V .40, (2) GPE-Q .47, (3) GRE-T .47.

Another such study was conducted by Rupiper (3) at the University of Oklahoma. He reported that of twenty-five doctoral candidates in education, those who had received a doctoral degree, also, had received higher scores on the GRE-AT.

A third study which found fairly high correlations between the GRE-AT scores and CGPA was made by Sleeper (17). The subjects were twenty-four females who successfully completed a Master's degree program in occupational therapy. The following coefficients were found: (1) GRE-V .37, (2) GRE-Q .49, and (3) GRE-T .54.

On the other hand, there are some studies which suggest that the GRE-AT is not a satisfactory <u>general</u> predictor or at least not when it is used by itself. Also, some of these studies indicate that some other variable, such as the

undergraduate grade point average (UGGPA), is as good or better a predictor than the GRE.

Madaus and Walsh (13) found in a study with 569 graduate students at a New England university that the relationship between the GRE-AT and the GGPA was significant but low. The coefficients were .19 and .13 for the GRE-V and GRE-Q, respectively. When the individual departments were considered, the correlations varied above and below these. Also, over half of the departments did not have significant relationships. This was either due to the size of the coefficient or of the sample or both.

In addition, the author suggested that regression analysis for GRE scores was not an efficient or helpful method of presentation for graduate school administrators. Moreover, he later computed and organized this data into expectancy tables which ETS published for demonstration purposes. The tables are much more efficient for use in administrative decisions (12).

Similarly, Borg (1) concluded that if the GRE-AT is used alone as a predictor, it is of little value in the graduate program at Utah State University. He based this judgement on a study he made at this university using 175 graduate students who were Master's degree candidates in elementary, secondary and administrative education. They had taken the GRE-AT during the last five years and had at least fifteen semester hours of graduate work. The

correlations of the GRE-V and GRE-Q scores with GGPA was .36 and .37, respectively.

Law (11) investigated the predictive ability of a test battery composed of the GRE-AT and the GRE area tests. The sample was forty-six doctoral candidates in the School of Education at the University of Southern California. Scores on the total comprehensive examination and grades in certain core subjects were the criterion variables. Of the fortysix students, twenty-two passed and twenty-four failed. The coefficients of correlation of the GRE-AT with these criteria ranged from .31 to .72. However, the relationships ranged from -.08 to .47 for the group that passed as compared to the range of .20 to .75 for the group that failed.

In a study of thirty-six Master's degree recipients at the University of Detroit, Conway (8) found that the relationship between GGPA in education courses and several predictor variables was: (1) GRE Advanced Education Test .14, (2) GRE-V .27, (3) GRE-Q .23, (4) GRE-T .33, (5) UGGPA in education .49, (6) UGGPA .57.

Capps and Decosta (2) conducted a study at South Carolina State College with forty-four education graduate students. They found that the relationship between success in four required graduate education courses and several predictor variables was: (1) GRE Area Tests .29, (2) GRE Advanced Education Test .49, (3) GRE-AT .34, (4) UGGPA .42. A combination of the GRE Advanced Test, GPE-AT and UCGPA yielded .57 whereas a combination of the Advanced GRE Test, GRE-AT, National Teachers Test and UGGPA yielded .59. The authors, also, mentioned that such factors as preselection of the sample, the small range of the grades and other imperfections of the criteria limited the relationship.

In addition to the studies showing only varied and relatively low predictive relationships, some emphasized or implied a fairly large inter-departmental variance in correlations. Further, one of the scores of the GRE-AT seemed to be a better predictor than the other two for a specific department. This is considered by some authors to be mainly due to the difference of abilities required for the different departments. In the previous study by Madaus and Walsh (13), the variations in the predictive relationships when the individual departments were considered could have been due to this.

Besco (8) made a study of the relationship between GRE-AT scores and success in graduate school in each of seven departments at Purdue University. The sample size was 331 graduate students and the criteria was GGPA and faculty ratings. The following are the coefficients of the GPE-V and GRE-Q scores, respectively.

.05	.30
.23	.27
.47	.03
.51	.01
.14	.39
	.05 .23 .47 .51 .14

Psychology		
Clinical	.32	.00
Experimental	.47	.57
Sociology	.37	.56

Using a sample of 119 graduate research fellows, King and Besco (7) conducted a study in several departments at Purdue University to evaluate the GRE-AT as a predictor of in-school success of Purdue Research Foundation Fellows. Faculty ratings and GGPA were the criteria. The authors found a significant but low relationship only between GRE-V scores and the criteria. They concluded that the study had demonstrated a slight but useful relationship for this section of the GRE and that a minimum performance score for it would tend to eliminate an appreciable number of low performance fellows. However, the lower GRE-Q correlation was considered to be partially due to a high and less variable distribution of scores. More sensitive statistical methods would have to be used to detect the correct relationship. In addition, they recommended that expectancy tables be used to set cutoff scores and because of the large departmental variance of GPE scores, the cut-off scores should be on a departmental rather than a university-wide basis.

Thorpe (8) conducted a study to determine the value of the GRE-AT in selecting graduate students in English. The sample consisted of forty-four graduate students who had completed the course work for the doctorate degree and for whom GRE scores were available before admission. He found that

80 per cent of the students who had 700 or higher GRE-V scores also had average to above average course performance while 61 per cent who had scores below 700 received below average grades. He concluded that there was a distinct correlation for the GRE-V, but the GRE-Q did not show any significant relationship. However, he recommended that the GRE-V relationship was not great enough to warrant blind reliance on test scores in admitting or refusing candidates, and that the selective use of GRE scores alone can be very dangerous.

White (8) made a study on the relationship of graduate school success in chemistry and several predictor variables. The criterion was GGPA. The correlations were: (1) GRE-V .28, (2) GRE-Q .41, (3) GRE Advanced Chemistry Test .40, (4) UGGPA-Chemistry .40, and (5) overall UGGPA .44. Also, the GRE-Q score seemed to be a better predictor for chemistry majors. Moreover, multiple correlations showed even higher coefficients with the largest being obtained when three variables were combined.

Carlen (3), in a study at a large university of the South, correlated GGPA with the three scores of the GRE-AT for 113 graduate students who were enrolled in the several majors under the College of Arts and Sciences. He found that the GRE-V was the best predictor, and that a multiple correlation of the three GEE scores was only slightly higher. The following are the correlations for the GRE-V, GRE-Q, and

GRE-T, respectively:

All Students	.30	.01	.17
Science	.13	.04	.10
Non-science	.48	.30	.44
English	.76	.61	.76
Mathematics	.04	.02	.04
Psychology	.46	.55	.55
Physics	.50	.42	.48

In the studies previously cited by Law, Borg, Capps and White, a recurring thought that was either concluded or implied was that the combined results of several predictors seemed much more valid than only one predictor. Also, Thorpe recommended that selective use of GRE scores alone can be very dangerous. Other studies that emphasized this position are as follows:

Robertson and Nielson (16), in a study at the University of Florida, found that the relationship between the mean of the GRE-V and GRE-Q scores (GPE-mean) and faculty ratings of fifty psychology graduate students was statistically significant, but predictively weak. They, also, found that the UGGPA in mathematics and science (UGGPA M-S) was a better predictor, but that a combination of the two (GPE-mean and UGGPA M-S) gave the best prediction. The coefficients were: (1) GRE-V .27, (2) GRE-Q .20, (3) GREmean .29, (4) UGGPA M-S .37, and (5) GRE-mean and UCGPA M-S .44. The authors concluded that some of the factors which contributed to the low relationships were: (1) homogenity of the sample due to preselection, (2) the fallibility of any type of faculty ratings, and (3) the inability to control emotional maturity and personal adjustment.

Robertson and Hall (15) made a similar study at the University of Florida one year later with seventy-three psychology graduate students. They found that the GRE-mean was now a better predictor of the criterion variable (faculty ratings) than either UGGPA or the Miller Analogies Test (MAT). However, a weighted combination of the three yielded an even higher relationship. The coefficients were: (1) GRE-mean .25, (2) GRE-V .22, (3) GRE-Q .13, (4) MAT .19, and (5) UGGPA .20. The authors concluded that prediction could be improved to some extent by using a composite score that represents a combination of differentially weighted predictors.

A study by Osburne and Sanders (14) did not deal directly with the validity of the GRE-AT. However, it did present an important factor that should be considered in the selection of graduate students. They found that for the 1807 graduate students that took the GRE-AT between 1946 and 1952 at the University of Georgia, there was a decline in test scores and acquired knowledge with an increase in age. This concurs with theories and studies on intelligence and mental age.

For the sake of presenting the position of Educational Testing Service (ETS) on some of the points mentioned in the above studies, reference will be made to several ETS publications.

First, in a survey of studies made at Harvard, Yale, Princeton, Iowa, Michigan, Columbia and Vanderbilt; Lannholm and Schrader (10) found that a combination of scholastic aptitude tests and undergraduate grades produce a more effective prediction than is obtained by undergraduate grades alone.

A similar position is presented by ETS (4) in their score interpretation manual.

Although many studies have shown a positive relationship between the test scores and performance in graduate study, it has also been found that an even better prediction results when the test scores are used with the undergraduate record, the combination showing a higher relationship with graduate school success than is obtained with either variable used alone.

Moreover, Vaughn (19), a former director of the GRE,

stated,

Finally, the Graduate Record Office represents a conservative position with respect to the use of the test results. However well refined, however carefully validated, tests are but one tool with which the education works. All the Graduate Record Examinations, and any other tests prepared and used in our testing projects, can be of some assistance at various stages in higher education. None of these tests, however, can reduce the task of student appraisal to a routine business.

The position of ETS on the validity of the GRE-AT at a specific university and the use of local norms in student selection is set forth in the following excerpts:

Assessing the validity of scores on a test for prediction involves determining the relationship between the scores and some evaluation of degree of success in graduate study. The resulting statistic, or validity coefficient, furnishes an indication of the power of the test when used for the purpose of predicting the particular success criterion in question. For various reasons, the magnitude of the validity coefficient for a given test may differ from one graduate school, or one department within a graduate school, to another (4).

The extent to which GRE scores predict success in graduate school is far from perfect and varies considerably from school to school and from field to field. The fact that astronomy majors, for example, tend to have high scores on the quantitative section of the Aptitude Test does not mean these students do well in astronomy. Other factors besides high quantitative aptitude are important to achievement. Although persons with high Aptitudes or Achievement Test scores generally achieve better than persons with low scores, the efficiency of the GRE tests in predicting achievement cannot be determined until validity studies in a particular major field at a particular university or college are conducted (6).

To supplement these data, it is often extremely worthwhile for an institution to assemble its own data for evaluating local performances on the Graduate Record Examinations. Local performance tables based on the results of one or more years of testing make it possible to compare the performance of a student with those of others who have had educational experiences similar to his own. The locally prepared distributions also facilitate comparisons among successive classes or between one college and another (4).

This GRE Special Report (8) presents brief summaries of several studies of the relationship between scores on various Graduate Record Examinations and success in graduate study. It has two principal purposes: (1) to illustrate different approaches to a study of this subject, and (2) to stimulate other graduate schools to design and carry out studies of their own.

And lastly, the practices and comments of the graduate schools using the GPE-AT were compiled in a survey made by ETS (9). Some of these were as follows: All of the graduate schools indicated by their replies that the applicant's undergraduate record was first reviewed and evaluated in some way. The next most frequently used data were test scores. In some instances, letters of reference and interviews were employed.

Most graduate schools used more than one kind of information. However, only a few used any kind of weighting method. The majority used the more subjective or clinical approach which relied upon past experience and insight to weight and evaluate the graduate study potential of the applicant.

For the universities that used the GRE-AT as a general requirement for admission, only half utilized an established minimum score. The cut-off score varied from school to school. In some, the level differed for different departments. The minimum score generally involved either a composite or an average score of the GRE-V and the GRE-Q scores. The method by which this score was arrived at varied from statistical studies to subjective opinions.

Some universities reported that a few students had scored high on the GRE, but had yet failed to do successful graduate work. Lack of motivation, poor adjustment to the methods of graduate study, emotional problems, changes of interests, instability and lack of application were cited as the reasons. Possible explanations for those cases of low

GRE scores and subsequent good performance in graduate study were: (1) failure to take the tests seriously, (2) special motivation and extra effort, and (3) inability of the student to perform on a standardized test.

A few cases were reported in which the test scores have helped to select capable students who, otherwise, would have been overlooked or rejected. Students who had poor undergraduate records for reasons other than lack of intellectual ability fell into this category.

Several points were set forth in the literature which the reader should be aware of in order to have a true picture of the GRE-AT. They are:

- There is no published validity for the GRE in the test manuals. Seemingly the reason for this is that there is so much variance between and within graduate schools that ETS feels it would be unethical to list one validity coefficient for all situations.
- Educational Testing Service does suggest and recommend local studies at all universities that use the GRE.
- 3. The literature showed that the validity ranges from moderately high to zero, depending on the criterion used. Much of the time, it is significant, but this is more due to the sample size than

the size of the coefficient.

- 4. Some of the studies found that the validity was better when it was used as a departmental requirement. This would mean that the GRE-AT would be more helpful if each department had its own cut-off scores.
- 5. Much of the literature emphasized that the GRE-AT was much more efficient when used in a battery of predictors. Some of the authors concluded that it was dangerous to select or reject a student blindly on only the GRE-AT or any other aptitude test. Also, no test can reduce the task of student appraisal to a routine business.
- The GRE-AT does not measure such subjective factors as motivation, emotional stability or maturity.
- 7. The scores of the GRE decrease with age. This means that an older person probably would make a lower score than a younger person with the same ability.
- Some students score high on the GRE-AT, yet fail to do successful graduate work. However, when given the opportunity, some low scorers succeed.
- 9. The GRE-AT has helped to select capable students who, otherwise, would have been overlooked or rejected.

CHAPTER III

THE SAMPLE GROUP, VARIABLES, AND PROCEDURES

The Sample Group

The sample group consisted of 115 students who were accepted by the graduate school of a large university of the South for the Fall Semester, 1963, and for whom basic data were available. (See Appendix for the 1963-64 graduate school admission requirements.) These students, who were enrolled for graduate programs within the College of Arts and Sciences, had GRE-AT scores recorded with the graduate school and had completed at least one course in graduate school. The sample included seventy males and forty-five females, ranging in age from 21 to 50 at the time of enrollment.

Of the total number of students accepted for graduate work in the Fall of 1963 with majors in the College of Arts and Sciences, several were not included in the above sample. Those not included were primarily in one or more of the following categories: (1) had not completed any graduate work after admission, (2) records were lacking with respect to some basic data, and/or (3) students matriculated as "foreign

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students." There was a total of twenty-two such students.

The Variables

In order to evaluate the GRE scores as predictors of academic success at the graduate level; Verbal, Quantitative, and Total scores of the GRE-AT became the predictor variables in this study.

As is usually the case in similar studies of this type, considerable difficulty was experienced in defining success in terms of specific criteria. The variables considered as criteria of success were graduate grade point average (GGPA) and academic success. Academic success is here defined as the student maintaining a cumulative GGPA of 3.0 or higher, or the student receiving an advanced degree. Other variables that the GRE-AT was correlated with were previous academic average (PAA), the number of graduate hours completed (NGH), and student age at the time of enrollment.

The Procedures

The Dean of the Graduate School provided departmental summary sheets which listed certain basic information on those students who were admitted to the graduate school in the Fall of 1963 and who had majors in the College of Arts and Sciences. This information included: (1) student name, (2) student registration number, (3) student major, (4) previous academic average (PAA), (5) Graduate Record Examination Verbal score (GRE-V), (6) Graduate Record Examination Quantitative score (GRE-Q), and (7) Graduate Record Examination total
score (GRE-T).

In addition, copies of the permanent record cards were provided for each student listed. The complete academic record of the student subsequent to his admission to graduate school appeared on these transcripts along with date of birth, major area, etc. It was, therefore, possible to compute other data, such as age, number of graduate hours (NGH), graduate grade point average (GGPA), and the number of graduate grades of C received.

The basic data for the 115 members of the sample group are presented in Table I. It consists of: (1) subject number, (2) student major, (3) NGH, (4) age, (5) GGPA, (6) PAA, (7) GRE-V, (8) GRE-Q, and (9) GRE-T. In order to insure the confidential nature of these data, each student was given a number and these are listed in the table in a random order. The subject number, also, facilitates reading the table.

Both the PAA and the GGPA are based upon a A equal to 4, B equal to 3, C equal to 2, D equal to 1, and F equal to 0. Other grades recorded, such as an "I" for an incomplete in a course were not included. In a considerable number of instances, the FAA was only listed as 3.0+ for those students who had greater than a 3.0 average.

The scores of the GRE-AT were recorded in the system of scaled score units where the mean is usually 500 and the .

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BASIC DATA FOR SAMPLE GROUP

GRE-AT Scores

Subject No.	Major	NGH	Age	GGPA	PAA	v	Q	Т
1	BIO	39	23	2.9	2.5	440	430	870
2		8	25	3.5	3.0	460	370	830
3	11	21	23	2.6	3.0	490	610	1100
4	**	6	35	2.5	3.0	410	350	760
5	••	7	22	3.1	2.3	440	450	890
6	•	10	48	2.2	3.0	230	390	620
7	**	29	30	3.8	3.0+	570	520	1090
8	11	35	23	2.7	2.7	500	570	1070
9	M	3	22	3.0	3.1	520	650	1170
10	M	18	25	3.2	3.0+	520	480	1000
11	11	31	26	3.1	3.2	490	510	1000
12	BIOPHY	16	24	3.1	2.6	740	660	1400
13	*1	73	25	3.8	3.2	540	620	1160
14	11	51	23	3.7	2.4	770	740	1510
15	*	77	21	2.8	2.9	650	630	1280
16	CHM	29	25	3.6	3.0	470	540	1010
17	99	18	23	3.4	3.1	530	820	1350
18	99	23	22	3.3	2.6	390	510	900
19	11	34	23	3.8	3.0+	400	450	850
20	ENG	21	39	3.4	2.4	400	480	880
21	99	24	22	3.8	3.0+	640	520	1160
22	**	21	37	3.8	4.0	530	440	970
23	88	6	24	3.5	3.0+	570	470	1040
24	**	6	22	4.0	3.0+	670	700	1370
25	**	30	23	3.6	3.0+	540	350	890
26	11	30	22	3.8	3.0	750	620	1370
27	91	6	45	3.0	2.9	480	450	930
28	*	24	26	4.0	3.0+	630	440	1070
29	*	24	29	3.8	2.6	660	430	1090
30	H	9	23	3.3	2.7	500	500	1000
31	π	6	25	4.0	3.0	670	550	1220
32	**	3	24	3.0	2.7	570	400	970
33	M	9	38	3.7	3.4	540	520	1060
34	n	3	25	4.0	3.5	570	400	970
35	м	24	35	4.0	2.5	600	540	1140
36	10	21	31	4.0	3.0+	690	490	1180
37	14	21	27	4.0	. 3.0	550	350	900
38	10	24	23	. 3.9	2.9	660	550	1210

24

Subject No. Major NGH Age GGPA PAA V Q T 39 ENG 24 26 3.9 3.0+ 730 540 1270 40 FRE 21 29 4.0 3.0+ 470 700 1170 41 " 18 43 3.5 3.0 700 430 1130 42 " 24 23 3.2 3.0 590 580 1170 43 GEO 6 25 3.0 2.1 480 480 960 44 " 6 26 1.0 2.4 510 420 930 45 GER 6 34 3.5 3.0 530 460 990 47 " 24 40 3.5 3.0 500 1180 50 " 24 32 3.0 3.0 400 800 1100	-						GRE-AT Scores			
39 ENG 24 26 3.9 3.0+ 730 540 1270 40 FRE 21 29 4.0 3.0+ 470 700 1170 41 " 18 43 3.5 3.0 700 430 1130 42 " 24 23 3.2 3.0 590 580 1170 43 GEO 6 25 3.0 2.1 480 480 960 44 " 6 26 1.5 2.7 420 930 45 GER 6 34 3.5 2.9 530 350 880 47 " 24 40 3.5 3.0 500 1340 47 " 24 22 3.2 2.6 430 450 880 50 " 24 32 3.0 710 740 1450 51 " 24 </th <th>Subject No.</th> <th>Major</th> <th>NGH</th> <th>Age</th> <th>GGPA</th> <th>PAA</th> <th>v</th> <th>Q</th> <th>Т</th>	Subject No.	Major	NGH	Age	GGPA	PAA	v	Q	Т	
40 FRE 21 29 4.0 3.0+ 470 700 1170 41 * 18 43 3.5 3.0 700 430 1130 42 • 24 23 3.2 3.0 590 580 1170 43 GEO 6 25 3.0 2.1 480 480 960 44 * 6 26 1.0 2.4 510 420 930 45 GER 6 34 3.5 3.0 530 390 920 46 HIS 12 26 1.5 2.7 420 930 47 * 24 40 3.5 3.0 580 760 1340 49 * 24 32 3.0 3.0 680 500 1180 51 * 24 22 3.2 2.6 430 450 860 52 * 6 27 3.5 3.0 710 740 1450 <tr< td=""><td>39</td><td>ENG</td><td>24</td><td>26</td><td>3.9</td><td>3.0+</td><td>730</td><td>540</td><td>1270</td></tr<>	39	ENG	24	26	3.9	3.0+	730	540	1270	
41 * 18 43 3.5 3.0 700 430 1130 42 * 24 23 3.2 3.0 590 580 1170 43 GEO 6 25 3.0 2.1 480 480 960 44 * 6 26 1.0 2.4 510 420 930 45 GER 6 34 3.5 3.0 530 390 920 46 HIS 12 26 1.5 2.7 420 930 47 * 24 40 3.5 2.9 530 350 880 48 * 21 22 3.4 3.0 680 500 1130 50 * 24 22 3.2 2.6 430 450 880 51 * 24 22 3.0 3.0 570 430 1000 54 * 45 31 3.9 3.0 570 1330 1000	40	FRE	21	29	4.0	3.0+	470	700	1170	
42 * 24 23 3.2 3.0 590 580 1170 43 GEO 6 25 3.0 2.1 480 480 960 44 * 6 26 1.0 2.4 510 420 930 45 GER 6 34 3.5 3.0 530 390 920 46 HIS 12 26 1.5 2.7 420 520 940 47 * 24 40 3.5 2.9 530 350 880 48 * 21 22 3.7 3.0+ 580 760 1340 49 * 24 22 3.2 2.6 430 450 880 51 * 24 22 3.2 2.6 430 450 880 52 * 6 27 3.5 3.0 570 430 1000 54 * 45 31 3.9 3.0 710 740 1450	41	4	18	43	3.5	3.0	700	430	1130	
43 GEO 6 25 3.0 2.1 480 480 960 44 " 6 26 1.0 2.4 510 420 930 45 GER 6 34 3.5 3.0 530 390 920 46 HIS 12 26 1.5 2.7 420 520 940 47 " 24 40 3.5 2.9 530 350 880 48 " 21 22 3.7 3.0+ 580 760 1340 50 " 24 32 3.0 3.0 680 500 1180 51 " 24 22 3.2 2.6 430 450 860 52 " 6 27 3.5 3.0 570 430 1000 54 " 45 31 3.9 3.0 710 740 1450 55 " 57 23 3.5 3.4 610 720 1330	42	85	24	23	3.2	3.0	590	580	1170	
44 * 6 26 1.0 2.4 510 420 930 45 GER 6 34 3.5 3.0 530 390 920 46 HIS 12 26 1.5 2.7 420 520 940 47 * 24 400 3.5 2.9 530 350 880 48 * 21 22 3.7 3.0+ 580 760 1340 49 * 24 22 3.4 3.0 530 460 990 50 * 24 22 3.4 3.0 530 460 990 51 * 24 22 3.2 2.6 430 450 880 52 * 6 27 3.5 3.0 570 430 1000 54 * 45 31 3.9 3.0 710 740 1450 55 * 57 23 3.5 3.4 610 720 1330	43	GEO	6	25	3.0	2.1	480	480	960	
45 GER 6 34 3.5 3.0 530 390 920 46 HIS 12 26 1.5 2.7 420 520 940 47 " 24 40 3.5 2.9 530 350 880 47 " 24 40 3.5 2.9 530 350 880 48 " 21 22 3.7 3.0+ 580 760 1340 49 " 24 22 3.7 3.0+ 580 500 1180 51 " 24 22 3.0 3.0 680 500 1180 52 " 6 27 3.5 3.0 710 740 1450 53 " 45 31 3.9 3.0 710 740 1450 54 " 45 21 3.2 3.0+ 670 660 1330 55 " 57 23 3.0 3.0+ 70 1220 <t< td=""><td>44</td><td>88</td><td>6</td><td>26</td><td>1.0</td><td>2.4</td><td>510</td><td>420</td><td>930</td></t<>	44	88	6	26	1.0	2.4	510	420	930	
46 HIS 12 26 1.5 2.7 420 520 940 47 * 24 40 3.5 2.9 530 350 880 48 * 21 22 3.7 3.0+ 580 760 1340 49 * 24 22 3.4 3.0 530 460 990 50 * 24 32 3.0 3.0 680 500 1180 51 * 24 22 3.2 2.6 430 450 860 52 * 6 27 3.5 3.0 710 740 1450 53 MTH 3 22 3.0 3.0+ 680 690 1370 56 * 3 24 4.0 3.0+ 670 660 1330 57 * 6 30 2.0 2.1 420 580 1000 58 * 45 21 3.2 3.0+ 670 660 1330 <td>45</td> <td>GER</td> <td>6</td> <td>34</td> <td>3.5</td> <td>3.0</td> <td>530</td> <td>390</td> <td>920</td>	45	GER	6	34	3.5	3.0	530	390	920	
47 * 24 40 3.5 2.9 530 350 880 48 * 21 22 3.7 3.0+ 580 760 1340 49 * 24 22 3.4 3.0 530 460 990 50 * 24 32 3.2 2.6 430 450 880 51 * 24 22 3.2 2.6 430 450 880 52 * 6 27 3.5 3.0 570 430 1000 53 MTH 3 22 3.0 3.0+ 420 680 1100 54 * 45 31 3.9 3.0 710 740 1450 55 * 57 23 3.5 3.4 610 720 1330 56 * 3 24 4.0 3.0+ 670 660 1330 57 * 6 30 2.0 2.1 420 580 1000	46	HIS	12	26	1.5	2.7	420	520	940	
48 * 21 22 3.7 3.0+ 580 760 1340 49 * 24 22 3.4 3.0 530 460 990 50 * 24 32 3.0 3.0 680 500 1180 51 * 24 22 3.2 2.6 430 450 880 52 * 6 27 3.5 3.0 570 430 1000 53 MTH 3 22 3.0 3.0+ 420 680 1100 54 * 45 31 3.9 3.0 710 740 1450 55 * 57 23 3.5 3.4 610 720 1330 56 * 3 24 4.0 3.0+ 670 660 1330 57 * 6 30 2.0 2.1 420 580 1000 58 * 45 21 3.2 3.0+ 670 620 1320 <td>47</td> <td>•</td> <td>24</td> <td>40</td> <td>3.5</td> <td>2.9</td> <td>530</td> <td>350</td> <td>880</td>	47	•	24	40	3.5	2.9	530	350	880	
49 " 24 22 3.4 3.0 530 460 990 50 " 24 32 3.0 3.0 680 500 1180 51 " 24 22 3.2 2.6 430 450 880 52 " 6 27 3.5 3.0 570 430 1000 53 MTH 3 22 3.0 3.0+ 420 680 1100 54 " 45 31 3.9 3.0 710 740 1450 55 " 57 23 3.5 3.4 610 720 1330 56 " 3 24 4.0 3.0+ 670 660 1330 58 " 45 21 3.2 3.0+ 670 720 1390 61 " 9 24 3.0 3.0+ 720 630 1350 62 " 24 25 3.0 3.0+ 720 630 1350 <td>48</td> <td>Ħ</td> <td>21</td> <td>22</td> <td>3.7</td> <td>3.0+</td> <td>580</td> <td>760</td> <td>1340</td>	48	Ħ	21	22	3.7	3.0+	580	760	1340	
50 " 24 32 3.0 3.0 680 500 1180 51 " 24 22 3.2 2.6 430 450 860 52 " 6 27 3.5 3.0 570 430 1000 53 MTH 3 22 3.0 3.0+ 420 680 1100 54 " 45 31 3.9 3.0 710 740 1450 55 " 57 23 3.5 3.4 610 720 1330 56 " 3 24 4.0 3.0+ 680 690 1370 57 " 6 30 2.0 2.1 420 580 1000 58 " 45 21 3.2 3.0+ 670 660 1330 59 " 18 26 2.8 3.3 3.0+ 720 1390 61 " 9 24 3.0 3.0+ 720 630 1350 <td>49</td> <td>II</td> <td>24</td> <td>22</td> <td>3.4</td> <td>3.0</td> <td>530</td> <td>460</td> <td>990</td>	49	II	24	22	3.4	3.0	530	460	990	
51 * 24 22 3.2 2.6 430 450 860 52 * 6 27 3.5 3.0 570 430 1000 53 MTH 3 22 3.0 3.0+ 420 680 1100 54 * 45 31 3.9 3.0 710 740 1450 55 * 57 23 3.5 3.4 610 720 1330 56 * 3 24 4.0 3.0+ 680 690 1370 57 * 6 30 2.0 2.1 420 580 1000 58 * 45 21 3.2 3.0+ 670 660 1330 59 * 18 26 2.8 3.3 560 560 1120 61 * 9 24 3.0 3.0+ 720 630 1350 62 * 24 25 3.5 3.0+ 530 670 1200 <td>50</td> <td>Ħ</td> <td>24</td> <td>32</td> <td>3.0</td> <td>3.0</td> <td>680</td> <td>500</td> <td>1180</td>	50	Ħ	24	32	3.0	3.0	680	500	1180	
52 # 6 27 3.5 3.0 570 430 1000 53 MTH 3 22 3.0 3.0+//420 680 1100 54 # 45 31 3.9 3.0 710 740 1450 55 # 57 23 3.5 3.4 610 720 1330 56 # 3 24 4.0 3.0+//420 680 690 1370 57 # 6 30 2.0 2.1 420 580 1000 58 # 45 21 3.2 3.0+// 670 660 1330 59 # 18 26 2.8 3.3 560 560 1120 60 # 3 29 4.0 3.0+ 720 630 1350 61 # 9 24 3.0 3.0+ 730 610 1000 63 # 9 24 2.2 2.8 3.1 720 630	51		24	22	3.2	2.6	430	450	880	
53 MTH 3 22 3.0 3.0+ 420 680 1100 54 * 45 31 3.9 3.0 710 740 1450 55 * 57 23 3.5 3.4 610 720 1330 56 * 3 24 4.0 3.0+ 680 690 1370 57 * 6 30 2.0 2.1 420 580 1000 58 * 45 21 3.2 3.0+ 670 660 1330 59 * 18 26 2.8 3.3 560 560 1120 60 * 3 29 4.0 3.0+ 670 720 1390 61 * 9 24 3.0 3.0+ 730 1220 63 * 9 26 3.3 3.1 490 730 1220 64 * 6 25 3.5 3.0+ 530 670 1200 <t< td=""><td>52</td><td></td><td>6</td><td>27</td><td>3.5</td><td>3.0</td><td>570</td><td>430</td><td>1000</td></t<>	52		6	27	3.5	3.0	570	430	1000	
54 * 45 31 3.9 3.0 710 740 1450 55 * 57 23 3.5 3.4 610 720 1330 56 * 3 24 4.0 3.0+ 680 690 1370 57 * 6 30 2.0 2.1 420 580 1000 58 * 45 21 3.2 3.0+ 670 660 1330 59 * 18 26 2.8 3.3 560 560 1120 60 * 3 29 4.0 3.0+ 670 720 1390 61 * 9 24 3.0 3.0+ 720 630 1350 62 * 24 25 3.0 3.0+ 720 630 1350 62 * 24 25 3.0 3.0+ 730 1220 64 * 6 25 3.5 3.0+ 730 660 1390 <	53	MTH	3	22	3.0	3.0+	420	680	1100	
55 * 57 23 3.5 3.4 610 720 1330 56 * 3 24 4.0 3.0+ 680 690 1370 57 * 6 30 2.0 2.1 420 580 1000 58 * 45 21 3.2 3.0+ 670 660 1330 59 * 18 26 2.8 3.3 560 560 1120 60 * 3 29 4.0 3.0+ 670 630 1350 62 * 24 25 3.0 3.0+ 700 1200 63 * 9 26 3.3 3.1 490 730 1220 64 * 6 25 3.5 3.0+ 530 670 1200 65 * 22 23 3.3 2.3 660 790 1450 66 * 3 22 2.8 3.1 720 700 1420	54	**	45	31	3.9	3.0	710	740	1450	
56 * 3 24 4.0 3.0+ 680 690 1370 57 * 6 30 2.0 2.1 420 580 1000 58 * 45 21 3.2 3.0+ 670 660 1330 59 * 18 26 2.8 3.3 560 560 1120 60 * 3 29 4.0 3.0+ 670 720 1390 61 * 9 24 3.0 3.0+ 720 630 1350 62 * 24 25 3.0 3.0+ 700 600 1000 63 * 9 26 3.3 3.1 490 730 1220 64 * 6 25 3.5 3.0+ 530 670 1200 65 * 22 23 3.3 2.4 20 3.0+ 730 660 1390 67 * 24 22 2.8 3.1 720	55	n	57	23	3.5	3.4	610	720	1330	
57 " 6 30 2.0 2.1 420 580 1000 58 " 45 21 3.2 3.0+ 670 660 1330 59 " 18 26 2.8 3.3 560 560 1120 60 " 3 29 4.0 3.0+ 670 720 1390 61 " 9 24 3.0 3.0+ 720 630 1350 62 " 24 25 3.0 3.0+ 400 600 1000 63 " 9 26 3.3 3.1 490 730 1220 64 " 6 25 3.5 3.0+ 530 670 1200 65 " 22 23 3.3 2.3 660 790 1450 66 " 3 22 4.0 3.0+ 730 660 1390 67 " 24 22 2.8 3.1 720 700 1420 <td>56</td> <td>**</td> <td>3</td> <td>24</td> <td>4.0</td> <td>3.0+</td> <td>680</td> <td>690</td> <td>1370</td>	56	**	3	24	4.0	3.0+	680	690	1370	
58 * 45 21 3.2 3.0+ 670 660 1330 59 * 18 26 2.8 3.3 560 560 1120 60 * 3 29 4.0 3.0+ 670 720 1390 61 * 9 24 3.0 3.0+ 720 630 1350 62 * 24 25 3.0 3.0+ 400 600 1000 63 * 9 26 3.3 3.1 490 730 1220 64 * 6 25 3.5 3.0+ 530 670 1200 65 * 22 23 3.3 2.3 660 790 1450 66 * 3 22 4.0 3.0+ 730 660 1390 67 * 24 22 2.8 3.1 720 700 1420 68 MUS 9 24 4.0 2.7 480 250 730 <td>57</td> <td>-</td> <td>6</td> <td>30</td> <td>2.0</td> <td>2.1</td> <td>420</td> <td>580</td> <td>1000</td>	57	-	6	30	2.0	2.1	420	580	1000	
59 18 26 2.8 3.3 560 560 1120 60 3 29 4.0 3.0+ 670 720 1390 61 9 24 3.0 3.0+ 720 630 1350 62 24 25 3.0 3.0+ 720 630 1350 62 24 25 3.0 3.0+ 740 600 1000 63 9 26 3.3 3.1 490 730 1220 64 6 25 3.5 3.0+ 530 670 1200 65 22 23 3.3 2.3 660 790 1450 66 3 22 2.8 3.1 720 700 1420 68 MUS 9 24 4.0 2.7 480 250 730 69 38 23 3.7 2.9 410 390 800 70 POL 18 25 3.7 3.0+ 590 540	58	**	45	21	3.2	3.0+	670	660	1330	
60 " 3 29 4.0 3.0+ 670 720 1390 61 " 9 24 3.0 3.0+ 720 630 1350 62 " 24 25 3.0 3.0+ 720 630 1350 62 " 24 25 3.0 3.0+ 740 600 1000 63 " 9 26 3.3 3.1 490 730 1220 64 " 6 25 3.5 3.0+ 530 670 1200 65 " 22 23 3.3 2.3 660 790 1450 66 " 3 22 4.0 3.0+ 730 660 1390 67 " 24 22 2.8 3.1 720 700 1420 68 MUS 9 24 4.0 2.7 480 250 730 69 " 38 23 3.7 2.9 410 390 800 <td>59</td> <td></td> <td>18</td> <td>26</td> <td>2.8</td> <td>3.3</td> <td>560</td> <td>560</td> <td>1120</td>	59		18	26	2.8	3.3	560	560	1120	
61 " 9 24 3.0 3.0+ 720 630 1350 62 " 24 25 3.0 3.0+ 400 600 1000 63 " 9 26 3.3 3.1 490 730 1220 64 " 6 25 3.5 3.0+ 530 670 1200 65 " 22 23 3.3 2.3 660 790 1450 66 " 3 22 4.0 3.0+ 730 660 1390 67 " 24 22 2.8 3.1 720 700 1420 68 MUS 9 24 4.0 2.7 480 250 730 69 " 38 23 3.7 2.9 410 390 800 70 POL 18 25 3.7 3.0+ 590 540 1130 71 " 24 23 4.0 3.0 450 250 700 <td>60</td> <td></td> <td>3</td> <td>29</td> <td>4.0</td> <td>3.0+</td> <td>670</td> <td>720</td> <td>1390</td>	60		3	29	4.0	3.0+	670	720	1390	
62 " 24 25 3.0 3.0+ 400 600 1000 63 " 9 26 3.3 3.1 490 730 1220 64 " 6 25 3.5 3.0+ 530 670 1200 65 " 22 23 3.3 2.3 660 790 1450 66 " 3 22 4.0 3.0+ 730 660 1390 67 " 24 22 2.8 3.1 720 700 1420 68 MUS 9 24 4.0 2.7 480 250 730 69 " 38 23 3.7 2.9 410 390 800 70 POL 18 25 3.7 3.0+ 590 540 1130 71 " 24 23 4.0 3.0 450 250 700 73 PHI 27 22 3.4 3.0 520 400 920 </td <td>61</td> <td></td> <td>9</td> <td>24</td> <td>3.0</td> <td>3.0+</td> <td>720</td> <td>630</td> <td>1350</td>	61		9	24	3.0	3.0+	720	630	1350	
63 "9 26 3.3 3.1 490 730 1220 64 "6 25 3.5 3.0+ 530 670 1200 65 "22 23 3.3 2.3 660 790 1450 66 "3 22 4.0 3.0+ 730 660 1390 67 "24 22 2.8 3.1 720 700 1420 68 MUS 9 24 4.0 2.7 480 250 730 69 "38 23 3.7 2.9 410 390 800 70 POL 18 25 3.7 3.0+ 590 540 1130 71 "24 23 4.0 3.0 450 250 700 73 PHI 27 22 3.4 3.0 520 480 1000 74 PSY 24 38 3.4 3.0+ 520 400 920 75 "75 25 3.8 2.1	62	m	24	25	3.0	3.0+	400	600	1000	
64 6 25 3.5 3.0+ 530 670 1200 65 22 23 3.3 2.3 660 790 1450 66 3 22 4.0 3.0+ 730 660 1390 67 24 22 2.8 3.1 720 700 1420 68 MUS 9 24 4.0 2.7 480 250 730 69 38 23 3.7 2.9 410 390 800 70 POL 18 25 3.7 3.0+ 590 540 1130 71 24 23 4.0 3.0 450 250 700 72 72 24 3.4 3.0 520 1140 72 72 24 3.4 3.0 520 480 1000 74 PSY 24 38 3.4 3.0+ 520 400 920 75 75 25 3.8 2.1 650 500	63	W	9	26	3.3	3.1	490	730	1220	
65 * 22 23 3.3 2.3 660 790 1450 66 * 3 22 4.0 3.0+ 730 660 1390 67 * 24 22 2.8 3.1 720 700 1420 68 MUS 9 24 4.0 2.7 480 250 730 69 * 38 23 3.7 2.9 410 390 800 70 POL 18 25 3.7 3.0+ 590 540 1130 71 * 24 23 4.0 3.0+ 620 520 1140 72 * 22 24 4.0 3.0+ 520 500 1000 71 * 22 24 4.0 3.0+ 520 480 1000 72 * 22 24 3.8 3.4 3.0+ 520 400 920 75 * 75 25 3.8 2.1 650 500	64		6	25	3.5	3.0+	530	670	1200	
66 * 3 22 4.0 3.0+ 730 660 1390 67 * 24 22 2.8 3.1 720 700 1420 68 MUS 9 24 4.0 2.7 480 250 730 69 * 38 23 3.7 2.9 410 390 800 70 POL 18 25 3.7 3.0+ 590 540 1130 71 * 24 23 4.0 3.0+ 620 520 1140 72 * 22 24 4.0 3.0 450 250 700 73 PHI 27 22 3.4 3.0 520 480 1000 74 PSY 24 38 3.4 3.0+ 520 400 920 75 * 75 25 3.8 2.1 650 500 1150 76 * 33 50 3.3 3.0+ 420 340 7	65	FT	22	23	3.3	2.3	660	790	1450	
67 24 22 2.8 3.1 720 700 1420 68 MUS 9 24 4.0 2.7 480 250 730 69 38 23 3.7 2.9 410 390 800 70 POL 18 25 3.7 3.0+ 590 540 1130 71 " 24 23 4.0 3.0+ 620 520 1140 72 " 22 24 4.0 3.0+ 620 520 1140 72 " 22 24 4.0 3.0+ 520 500 1130 71 " 24 23 4.0 3.0+ 520 500 1140 72 " 22 24 4.0 3.0+ 520 400 920 73 PHI 27 22 3.4 3.0+ 520 400 920 74 PSY 24 38 3.4 3.0+ 520 400 920	66		3	22	4.0	3.0+	730	660	1390	
68 MUS 9 24 4.0 2.7 480 250 730 69 " 38 23 3.7 2.9 410 390 800 70 POL 18 25 3.7 3.0+ 590 540 1130 71 " 24 23 4.0 3.0+ 620 520 1140 72 " 22 24 4.0 3.0 450 250 700 73 PHI 27 22 3.4 3.0 520 480 1000 74 PSY 24 38 3.4 3.0+ 520 400 920 75 " 75 25 3.8 2.1 650 500 1150 76 " 33 50 3.3 3.0+ 420 340 760 77 " 35 23 3.3 2.4 620 650 1270 78 " 84 22 3.6 2.3 640 570 12	67	Ħ	24	22	2.8	3.1	720	700	1420	
69 38 23 3.7 2.9 410 390 800 70 POL 18 25 3.7 3.0+ 590 540 1130 71 " 24 23 4.0 3.0+ 620 520 1140 72 " 22 24 4.0 3.0 450 250 700 73 PHI 27 22 3.4 3.0 520 480 1000 74 PSY 24 38 3.4 3.0+ 520 400 920 75 " 75 25 3.8 2.1 650 500 1150 76 " 33 50 3.3 3.0+ 420 340 760 77 " 35 23 3.3 2.4 620 650 1270 78 " 84 22 3.6 2.3 640 570 1210 79 " 75 27 3.9 3.5+ 660 580 1240 <td>68</td> <td>MUS</td> <td>9</td> <td>24</td> <td>4.0</td> <td>2.7</td> <td>480</td> <td>250</td> <td>730</td>	68	MUS	9	24	4.0	2.7	480	250	730	
70 POL 18 25 3.7 3.0+ 590 540 1130 71 " 24 23 4.0 3.0+ 620 520 1140 72 " 22 24 4.0 3.0+ 620 520 1140 72 " 22 24 4.0 3.0+ 520 250 700 73 PHI 27 22 3.4 3.0 520 480 1000 74 PSY 24 38 3.4 3.0+ 520 400 920 75 " 75 25 3.8 2.1 650 500 1150 76 " 33 50 3.3 3.0+ 420 340 760 77 " 35 23 3.3 2.4 620 650 1270 78 " 84 22 3.6 2.3 640 570 1210 79 " 75 27 3.9 3.5+ 660 580 <t< td=""><td>69</td><td>51</td><td>38</td><td>23</td><td>3.7</td><td>2.9</td><td>410</td><td>390</td><td>800</td></t<>	69	51	38	23	3.7	2.9	410	390	800	
71 " 24 23 4.0 3.0+ 620 520 1140 72 " 22 24 4.0 3.0 450 250 700 73 PHI 27 22 3.4 3.0 520 480 1000 74 PSY 24 38 3.4 3.0+ 520 400 920 75 " 75 25 3.8 2.1 650 500 1150 76 " 33 50 3.3 3.0+ 420 340 760 77 " 35 23 3.3 2.4 620 650 1270 78 " 84 22 3.6 2.3 640 570 1210 79 " 75 27 3.9 3.5+ 660 580 1240	70	POL	18	25	3.7	3.0+	590	540	1130	
72 " 22 24 4.0 3.0 450 250 700 73 PHI 27 22 3.4 3.0 520 480 1000 74 PSY 24 38 3.4 3.0+ 520 400 920 75 " 75 25 3.8 2.1 650 500 1150 76 " 33 50 3.3 3.0+ 420 340 760 77 " 35 23 3.3 2.4 620 650 1270 78 " 84 22 3.6 2.3 640 570 1210 79 " 75 27 3.9 3.5+ 660 580 1240	71	10	24	23	4.0	3.0+	620	520	1140	
73 PHI 27 22 3.4 3.0 520 480 1000 74 PSY 24 38 3.4 3.0+ 520 480 1000 75 " 75 25 3.8 2.1 650 500 1150 76 " 33 50 3.3 3.0+ 420 340 760 77 " 35 23 3.3 2.4 620 650 1270 78 " 84 22 3.6 2.3 640 570 1210 79 " 75 27 3.9 3.5+ 660 580 1240	72	Ħ	22	24	4.0	3.0	450	250	700	
74 PSY 24 38 3.4 3.0+ 520 400 920 75 " 75 25 3.8 2.1 650 500 1150 76 " 33 50 3.3 3.0+ 420 340 760 77 " 35 23 3.3 2.4 620 650 1270 78 " 84 22 3.6 2.3 640 570 1210 79 " 75 27 3.9 3.5+ 660 580 1240	73	PHT	27	22	3.4	3.0	520	480	1000	
75 " 75 25 3.8 2.1 650 500 1150 76 " 33 50 3.3 3.0+ 420 340 760 77 " 35 23 3.3 2.4 620 650 1270 78 " 84 22 3.6 2.3 640 570 1210 79 " 75 27 3.9 3.5+ 660 580 1240	74	PSY	24	38	3.4	3.0+	520	400	920	
76 " 33 50 3.3 3.0+ 420 340 760 77 " 35 23 3.3 2.4 620 650 1270 78 " 84 22 3.6 2.3 640 570 1210 79 " 75 27 3.9 3.5+ 660 580 1240	75		75	25	3.8	2.1	650	500	1150	
77 35 23 3.3 2.4 620 650 1270 78 84 22 3.6 2.3 640 570 1210 79 75 27 3.9 3.5+ 660 580 1240	76		33	50	3.3	3,0+	420	340	760	
78 84 22 3.6 2.3 640 570 1210 79 75 27 3.9 3.5+ 660 580 1240	77	W	35	23	3.3	2.4	620	650	1270	
79 75 27 3.9 3.5+ 660 580 1240	78		84	22	3.6	~• •	640	570	1210	
	79	n	75	27	3.9	3,5+	660	580	1240	

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						GRI	E-AT S	cores
Subject No.	Major	NGH	Age	GGPA	PAA	v	Q	T
80	PSY	75	22	3.3	2.6	470	440	910
81	88	27	27	3.1	3.1	690	480	1170
82	99	51	22	3.2	3.0+	510	360	870
83	*	84	26	3.6	2.6	500	490	990
84	**	25	22	3.5	2,5	420	260	680
85	*	54	23	3.7	3.0+	520	570	1090
86	M	12	26	2.2	2.6	480	400	880
87	M	51	30	3.8	3.0+	430	430	860
88		45	37	4.0	3.0+	730	600	1330
89	11	42	29	3.4	2.7	600	660	1260
90		36	22	3.2	2.7	440	400	840
91	Ħ	96	31	3.9	3.0+	660	420	1080
92		30	46	3.6	3.0+	620	390	1010
93	Ħ	78	23	3.6	2.8	610	620	1230
94		30	28	2.8	2.9	480	390	870
95	M	57	25	3.3	3.2	660	520	1180
96	Π	90	33	3.9	3.0+	600	450	1050
97		30	23	3.1	3.1	710	420	1130
98		9	42	3.7	2.6	480	430	910
99	M	24	41	3.2	2.1	520	480	1000
100	**	12	23	2.0	2.6	440	480	920
101	11	72	24	3.2	3.0	720	640	1360
102	н	69	23	3.4	2.6	520	540	1060
103	N	6	48	2.5	3.0	650	530	1180
104	39	51	27	3.4	3.0+	560	530	1090
105	Ħ	57	23	3.6	4.0	530	470	1000
106	**	12	38	4.0	2.8	420	360	780
107		36	38	3.7	3.0	510	460	970
108		39	28	4.0	3.0+	640	720	1360
109	19	57	35	3.0	2.9	500	400	900
110	n	90	25	3.5	2.8	650	580	1230
111	SPC	3	37	3.0	2.7	410	330	740
112	SPA	30	35	3.9	3.0	320	360	680
113	14	27	22	3.4	3.0	600	460	1060
114	11	9	27	4.0	3.2	620	630	1250
115	Ħ	6	31	3.0	2.5	500	420	920

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standard deviation is 100 for both the Verbal and the Quantitative scores. The Total score is simply the sum of the Verbal and Quantitative scores. Pearson's Product-Mement Correlation was used for finding the relationships between the GRE-AT scores and the variables of GGPA, age and NGH. The Bi-Serial Correlation was used for the criterion variables of PAA and success versus non-success. Expectancy tables and decision theory graphs were, also, constructed for the relationships between the GRE-AT and the two variables of GGPA and academic success.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

The Coefficients of Correlation and Other Basic Statistics

The means and standard deviations were computed for the following variables: (1) Graduate Record Examination-Verbal (GRE-V), (2) Graduate Record Examination-Quantitative(GRE-Q), (3) Graduate Record Examination-Total (GRE-T), (4) graduate grade point average (GGPA), (5) student age, and (6) number of graduate hours completed (NGH). They are presented in Table II. It will be noted that these statistics for the GRE scores are comparable to those of the norms set by Educational Testing Service (ETS). Also, the mean of the graduate grade point average (GGPA) is in the range of a B+ to an A-.

Coefficients of correlation were computed between the three predictive scores of the Graduate Record Examination (GRE) and the following variables: (1) graduate grade point average (GGPA), (2) previous academic average (PAA), (3) academic success as defined in Chapter III, (4) student age at the time of entering graduate school, and (5) the number of graduate hours (NCH) earned as of February 1967. Other coefficients that were computed were: (1) PAA vs. GGPA, (2) PAA vs. age, (3) PAA vs. NGH, (4) age vs. NGH, and (5) age vs. graduate school success. The correlation matrix for the 115 students of the sample group is presented in Table III.

TABLE II

MEANS	AND	ST	ANDA	RD	DEV	IATI	ONS	FOR	THE
PREDI	CTI	Æ J	AND	CRI	TER	ION	VARI	ABLE	S

Variables	Mean	SD
		• • •
GRE-V	555	106
GRE-Q	515	122
GRE-T	1070	197
GGPA	3.39	.54
Age	27.7	6.8
NGH	29.1	23.0

TABLE III

COEFFICIENTS OF INTER-CORRELATION AMONG PREDICTIVE AND CRITERION VARIABLES

Variable	s 1	2	3	4	5	6	7	8
GRE-V								
GRE-O	.48							
GRE-T	.84	.88						
GGPA	.34**	.08	.23**					
PAA	.27**	.19*	.26**	.39*	: *			
Aae	19*	33*	*30**	-	.08			
NĠH	.21*	.03	.16	-	14	15		
Success	.36**	.06	.23**	-	-	03	.22*	
*	*Significa	nt at	the .Cl	lev	rel of	confid	ence.	
	*Significa	nt at	the .05	5 lev	vel of	confid	ence.	

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The correlations between each of the GRE scores and GGPA are very low even though the relationships of the GRE-V and the GRE-T with the GGPA are statistically significant at the .01 level of confidence. The above findings concerning the predictive efficiency of the GRE scores agree with the general trend found in the literature when GGPA is used as the criterion of success. These results, also, agree in general with the findings of Carlen (3).

The small and possibly depressed relationships of the GRE scores with PAA may be partially due to the admission requirements that were in effect in 1963. The GRE scores did not then affect graduate school admission and, therefore, the motivation factor was low for attaining a high score. Consequently, a student may have had an average to high PAA, but yet have scored relatively low on the GRE-AT. Also, since this was the first year that the GRE-AT was administered at this university, test anxiety and lack of test sophistication could have affected the scores.

The correlation coefficient of .38 between PAA and GGPA indicates that there is some relationship. However, it is probably depressed somewhat by such factors as preselection of the sample and the small range of the graduate grades.

The negative relationship of the GRE-AT scores with age concurs with the study of Osburne and Sanders (14). It shows that there may be a decrease of acquired knowledge with age. If nothing else, the low relationship of GRE scores with the number of graduate hours (NGH) perhaps shows that the aptitude test does not measure subjective or external factors such as motivation, number of dependents, financial status, time spent working, etc.

The correlations between the GRE scores and graduate school success (as defined in Chapter III) compare well with those of the GRE scores and GGPA. This is at least partially due to the fact that one component of the defined success was to maintain a 3.0 GGPA.

Scattergrams, Expectancy Tables, and Decision Theory Graphs

In order that a more meaningful perspective be gained from the data of this study, expectancy tables were constructed. This had been recommended by several authors in the literature and, also, by the publishers of the GRE. The relationships of GRE-V scores and GGPA in an expectancy table format are shown in Table IV. Reading across the table, the reader can observe only a small increase in the percentage of the frequency of students with passing GGPA's as the GRE-V score increases. This tends to decrease at the higher end of the GRE-V score in two out of three grade categories. In the failing grade category (2.9 - less) the percentage decreases slightly with an increase in GRE-V score, but it, also, starts increasing at the upper end. However, this reversal of the percentage trend could be caused by a relatively small number of students in the cells at the upper end of the GRE-V scale.

TABLE IV

SCATTERGRAM AND EXPECTANCY TABLE FOR GRE-V AND GGPA

GRE SCORES	200-299	300-399	400-499	500-599	600-699	700-799	
GGPA	CF Totals					•	
	18(15.3%)	18(15.8%)	18(16,1%)	14(17.5%)	12(27.3%)	2(16.6%)	дa
4.0	0	0	4	2	10	2	Bp
3.5 -	41(35.7)	41(36.0)	40(35.7)	33(41.2)	17(38.6)	5(41.6)	A
3.9	0	l	7	16	12	5	в
3.0 -	41(35.7)	41(36.0)	40(35.7)	27(33.8)	12(27.3)	4(33.4)	A
3.4	0	l	13	15	8	4	в
2.9 -	15(13.3)	14(12.2)	14(12.5)	6(7.5)	3(6.8)	1(8.4)	А А
less	1	0	8	3	2	11	
Total	115(100%)	114(100%)	112(100%)	80(100%)	44(100%)	12(100%)	λ
Freq. & Percent- ages	l	2	32	36	32	12	В

^aA - Cumulative Frequencies (CF)

bB - Individual Cell Totals (ICT)

The GRE-Q and the GRE-T relationships with GGPA are shown in Tables V and VI, respectively. The same general trend is seen here for these variables except that in the 4.0 grade category, the GRE scores seem to have a higher relationship to success. However, the people who scored low on any section of the GRE-AT and received a GGPA of 4.0 decrease the validity correlation greatly.

The reader may note that the vertical distribution of percentages in all three tables (GRE-V, GRE-Q and GRE-T) form a fairly normal distribution at the lower end of the score scale, but this distribution shifts toward the higher grades (upward) as the GRE scores increase. This does show some differentiation power or validity of the GRE-AT.

Table VII presents a scattergram and statistical decision theory graph for the relationship of the GRE-V scores and CGPA. A horizontal line shows the 3.0 minimum GGPA cut-off for academic success in graduate school. A vertical line shows a GRE-V cut-off score of 400 or one standard deviation below the mean. At this cut-off score, it can be noted that the test would have accurately predicted that ninety-eight students (85.4 per cent of the sample group) would have received a GGPA of 3.0 or greater. This quadrant is called "positive hits."

On the other hand, only two students (1.7% of the sample group) would have been labled "false positives." That

	T.	A	B	L	E	V
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SCATTERGRAM AND EXPECTANCY TABLE FOR GRE-Q AND GGPA

GRE SCORES	200-299	300-399	400-499	500-599	600-699	700-799	800-899
GGPA	CF Totals						
	18(15.3%)	16(14.3%)	14(14.5%)	11(18.6%)	8(25.8%)	4(33.3%)	0(0%)Aa
4.0	2	2	3	3	4	4	0 Bp
3.5 -	41(35.7)	40(35.7)	32(33.4)	20(33.9)	8(25.8)	4(33.3)	0(0)A
3.9	1	8	12	12	4	4	0 В
3.0 -	41(35.7)	41(36.6)	38(39.6)	20(33.9)	12(38.7)	3(25.0)	1(100)A
3.4	0	3	18	8	9	2	1 B
2.9 -	15(13.3)	15(13.4)	12(12.5)	8(13.6)	3(9.7)	1(8.4)	0(0) A
less	0	3	4	5	2	l	0
Total	115(100%)	112(100%)	96(100%)	59(100%)	31(100%)	12(100%)	1(100%) A
Freg. & %	3	16	37	28	19	11	1 B

^aA - Cumulative Frequencies (CF)

^bB - Individual Cell Totals (ICT)

GRE SCORES	600-699	700-799	800-899	900-999	1000-1099	1100-1199	1200-1299	1300-1399	1400-1499	1500-1599	•
GGPA	CF Totals					··					•
4.0	18(15.3%)	18(16.1%)	15(14.1%)	15(16.3%)	13(17.8%)	12(24%)	8(25.8%)	6(33.3%)	0(0%)	0(0%)	Aa
	0	3	0	2	1	4	2	6	0	0	вb
3.5 -	41(35.7)	39(34.8)	39(36.8)	33(35.8)	28(38.4)	17(34)	12(38.8)	5(27.8)	2(40)	1(100)	A
3.9	2	0	6	5	11	5	7	3	1	1	в
3.0 -	41(35.7)	41(12.5)	39(36.8)	34(37.0)	25(34.2)	16(32)	9(29.0)	6(33.3)	2(40)	0(0)	A
3.4	0	2	5	9	9	. 7	3	4	2	0	в
2.9 -	15(13.3)	14(36.6)	13(12.3)	10(10.9)	7(9.6)	5(10)	2(6.4)	1(5.6)	1(20)	0(0)	A
less	1	1	3	3	2	3	1	0	1	0	
Total	115(100%)	112(100%)	106(100%)	92(100%)	73(100%)	50(100%)	31(100%)	18(100%)	5(100%)	1(100%)	A
percent- ages	3	6	14	19	23	19	13	13	4	1	В

^aA - Cumulative Frequencies (CF)

^bB - Individual Cell Totals (ICT)

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SCATTERGRAM AND EXPECTANCY TABLE FOR GRE-T AND GGPA

GRE SCORES	200- 299	300- 399		400- 499	500- 599	600- 699	700- 799
GGPA							
4.0	0	0	ore	4	2	10	2
3.5 - 3.9	0	1	fsco	7	16	12	5
3.0 - 3.4	0	1	ut-ol	13	15	8	4
	False po = 2(1	ositives .7%)	GRE-AT C		Positiv = 98(e hits 85.4%)	
	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	- <u></u>		criter	ion cut-o	ff	
2.9 - less	1	0		8	3	2	1
	Negativo = 1(	e hits .9%)			Misses	= 14(12%)	

SCATTERGRAM AND STATISTICAL DECISION THEORY GRAPH FOR GRE-V AND GGPA

# TABLE VII .

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is, had the GRE-AT been an admissions requirement in 1963, and a verbal cut-off score of 400 had been set, only two students would have been barred from graduate school who could have made a 3.0 or greater GGPA.

Again, with this cut-off score, only one student (.9%) would have been correctly identified as an academic failure (negative hit) or not been able to maintain a 3.0 or better GGPA. Conversely, with this cut-off score, the test would have missed (or allowed to enter) fourteen students (12%) who would prove to be academic failures. This quadrant is called the "misses" of the test.

In Table VIII it can be readily seen by the reader that for the GRE-Q relationship, the positive hits were eightyfive students (74 per cent), the false positives were fifteen students (13 per cent), the negative hits were three students (2.6 per cent), and the misses were twelve students (10.4 per cent).

Table IX shows a scattergram for the relationship of the CRE-T and GGPA with the current admission requirement cut-off score of 900. The positive hits were eighty-two students (71.3 per cent), the false positives were eighteen students (15.7 per cent), the negative hits were five students (4.3 per cent), and the misses were ten students (8.7 per cent).

The relatively large false positive quadrant of the GRE-Q and the GRE-T is one of the primary factors which decreases the correlations with GGPA. There are two conflicting

# TABLE VIII

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SCATTERGRAM AND STATISTICAL DECISION THEORY GRAPH FOR GRE-Q AND GGPA

GRE SCORES	200- 299	300- 399	400- 499	500- 599	600- 699	700- 799	800- 899
GGPA			1				
4.0	2	2	<u>با</u>	3	4	4	0
3.5 - 3.9	1	8	0 0 12	12	4	4	0
3.0 - 3.4	0	3		8	9	2	1
	False positi = 15(1	.ves .3%)	<u> GRE-AT_C</u>	Posit: = 85(	ive hit: 74%)	5	
			 C	riterio	n cut-o	ef	
2.9 - less	0	3	4	5	2	1	0
	Negati = 3(2,	ve hit 6%)	s	Misse	s = 12()	10.4%)	

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# TABLE IX

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SCATTERGRAM AND STATISTICAL DECISION THEORY GRAPH FOR GRE-T AND GGPA

GRE SCORE S	600- 699	700- 799	800- 899	900- 999	1000- 1099	1100- 1199	1200- 1299	1300- 1399	1400- 1499	1500- 1599
GGPA				1						
4.0	0	3	0	- 9101	1	4	2	6	0	0
3.5 - 3.9	2	0	6	s Jj	11	5	7	3	l	1
3.0 - 3.4	0	2	5	sut=0	9	7	3	4	2	0
	False = 18	positi 3(15.7%)	ves )	-GRE=AT.		Positi = 82	ve hits (71.3%)	l .		
					crit	erion c	ut-off			
2.9 - less	l	l	3	3	2	3	1	0	1	0
	Negati = 5	ive hit: (4.3%)	5			Misses	= 10(8	.7%)		

reasons which must be considered in relation to this problem: (1) These students lacked test motivation when they took the GRE-AT since it was not an admission requirement in Fall, 1963, and, therefore, they did not attain their maximum score, or (2) the cut-off score (currently 900 for the GRE-T) was too high for some students who had the ability to do graduate work, but could not do well on standardized tests. In this connection, it can be seen in Table IX that 100 out of 115 students (87 per cent of the sample group) attained a CGPA of 3.0 or better. Also, the false positive groups were much smaller in Tables VII and VIII (GRE-V and GRE-Q) when 400 each or 800 total was used as the GRE cut-off score.

Another quadrant which reduces the GRE-AT and GGPA relationship is the relatively high misses. Such reasons for this could be the lack of motivation or emotional stability to study, financial problems, dependents to support, etc.

In the use of decision theory, two diametrically opposed rationale control the position of the cut-off score and have to be considered: (1) The cut-off score should be set low enough to admit as many qualified persons as possible, at the risk of including more failures, and (2) the score should be set sufficiently high to exclude all but a few possible failures. The administrator of the test must make the decision as to which rationale is appropriate. A scattergram and expectancy table of the GRE-V versus a dichotomy of success and non-success is presented in Table X. The reader will observe that the trend of the percentages is similar to those presented in Table IV. As a matter of fact, the cumulative frequencies for the dichotomy of success and non-success is exactly the same as that for above and below a 3.0 GGPA (Table IV). This shows that for the relationship of GRE-V and success (as defined here) the GGPA is a very strong factor and indicator of academic success.

Tables XI and XII present the relationship GRE-Q and GRE-T versus success, respectively. The same observations can be made about the percentages and cumulative frequencies as were made for the GRE-V table.

Decision theory graphs are, also, integrated into Tables X, XI, and XII. Since the cumulative frequencies are the same as Tables VII, VIII, and IX; the positive hits, false positives, negative hits, and misses are, also, the same.

# TABLE X

SCATTERGRAM,	EXE	PECTANC	Y T	ABLE	AND	DECISION	THEORY	GRAPH
	FOR	GRE-V	AND	ACAI	DEMIC	SUCCESS		

GR	E SCORES	200-299	300-399	400-499	500-599	600-699	700-799
		100( 87%)	100(87.7%)	98(87.5%)	74(92.5%)	41(93.2%)	11(91.7%)A ^a
SS		0	2	24	33	30	ll b
Succe		False posit = 2(1.7%)	ives .		Positive hi = 98(85.4	ts %)	
			 ^ (	 <  C    	riterion sco	re	
		15( 13 )	14(12.3)	14(12.5)	6(7.5)	3(6.8)	l( 8.3)A
cess		l	0	8	3	2	l B
-Suce	Total freq.	115(100%)	114(100% )	112(100%)	80(100%)	44(100%)	12(100%)A
NoN	and percentages	l	2	32	36	32	12 B
		Negative hi = 1( .9%)	its		Misses = 14	(12%)	

^aA - Cumulative Frequence (CF)

^bB - Individual Cell Totals (ICT)

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SCATTERGRAM, EXPECTANCY TABLE AND DECISION THEORY GRAPH FOR GRE-Q AND ACADEMIC SUCCESS

	GRE SCORES	200-299	300-399	400-499	500-599	600-699	700-799	800-899
		100( 87%)	97(86.6%)	84 (87.5%)	51(86.5%)	28(90.3%)	11(91.5%)	1(100%)A ^č
SSS		3	13	33	23	17	10	l B ^h
Succe		False pos: = 16(13	ب 9%) ، بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغانية بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالغاني بالمان بالغاني بالغاني بالغاني بالغاني بالماني بالماني بالماني بالماني بالماني بالماني بالماني بالماني بالماني بالماني بالماني بالماني بالماني بالماني بالماني بالماني بالماني بالماني بالماني ماني بالماني مان ماني مان مان مان مان مان مان مان مان مان مان مان مان مان مان		Positive h = 84(73.	its 1%)		
	_ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~				criterion s	core		
		15(13)	م بم 15(13.4)	12(12.5)	8(13.5)	3(9.7)	, 1( 8.5 )	0 A
ccess		0	3	4	5	2	1	0 B
n-Suc	Total freq.	115(100%)	112(100%)	96(100%)	59(100% )	31(100%)	12(100%)	1(100%)A
No	percentages	; 3	16	37	28	19	11	1 B
		Negative 1 = 3(2.69	nits 8)	1 · · · · · · · · · · · · · · · · · · ·	Misses = l	2(10.4%)		

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^aA - Cumulative Frequency (CF)

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bB - Individual Cell Totals (ICT)

	GRE SCORES	600-699	700-799	800-899	900-999	1000-1099	1100-1199	1200-1299	1300-1399	1400-1499	1500-159	: 99 •
		100( 87%)	98(87.5%)	93(87.8%)	82(89.1%)	6((90 4%)	45(90%)	29(95.6%)	17(94.5%)	4(80%)	1(100%	Aa
cess		2	5	11		21	16	12	13	3	1	Br
Suc		False posi = 18(15,	tives ,7%)	4			Positive h = 82(71.3	its (%)				
-10 40 40				 (			crite	rion score		~~~~~~~		
		15(13)	14(12.5)	13(12.2)	10(10.9)	( 5.6 )	5(10)	2(6.4)	1(5.5)	1 ( 20)	e( 0)	A
v.		ſ	Ŧ	3	3	>	3	1	0	1	0	k
acces	Total freq.	115(100%)	112(]00%)	106'100% )	92(100%)	73(1-02-)	50(100%)	31(100%)	-B(100%)	5(300%)	1/10(*)	7
Non-Sı	percentages	3	6	14	19	23	19	13	13	4	1	B ·
÷ ·		Negative h = 5(4.38	its ;)				Misses = 1	.0 (8.7%)				:

TABLE XII

SCATTERGRAM, EXPECTANCY TABLE AND DECISION THEORY GRAPH FOR GRE-T AND ACADEMIC SUCCESS

^aA - Cumulative Frequencies (CF)

^bB - Individual Cell Totals (ICT)

#### CHAPTER V

# SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

#### Summary

The purpose of this study was to analyze data related to the use of the Graduate Record Examination Aptitude Test (GRE-AT) for admission to the graduate school of a large university of the South. Answers were sought to such questions as: "What is the relationship, if any, between scores on the GRE-AT and grades made in academic courses at the graduate level?" "Of what value are GRE-AT scores as predictors of success in graduate school?"

The sample group consisted of 115 students who entered the graduate school in the fall of 1963 and were enrolled in major areas in the College of Arts and Sciences. Other criteria met by the group were: (1) They had GRE-AT scores recorded with the graduate school; (2) Their previous academic averages were available; (3) They had completed at least one graduate course, other than "special problems" courses; (4) They were United States citizens; and (5) They met other 1963-64 graduate school admission requirements. The basic data were obtained from departmental summary sheets and a copy of each student's permanent record card, which were provided by the Dean of the Graduate School. The summary sheets provided: (1) student's name, (2) registration number, (3) major, (4) previous academic average (PAA), (5) GRE-Verbal score, (6) GRE-Quantitative score, (7) GRE-Total score. The copy of each subject's permanent record card provided the student's complete graduate academic record subsequent to his admission to graduate school, and, for students previously enrolled in this same university, the previous academic record, along with date of birth, major area, etc. From this basic data additional data were computed, such as age, number of graduate hours (NGH), and graduate grade point average (GGPA).

Since the primary purpose of this study was to evaluate the use of the GRE-AT for predicting academic success at the graduate level, these scores were the prime predictor variables studied. The criteria of success were: (1) the student maintained a cumulative GGPA of 3.0 or higher, or (2) the student was awarded an advanced degree. Other variables that the CRE-AT was correlated with were the previous academic average (PAA), the number of graduate hours completed (NGH), and the student age at the time of cnrollment.

Pearson's Product-Moment Correlation was used for finding the relationships between the GRE-AT scores and the variables of GGPA, age and NGH. The Bi-Serial Correlation was used for the variables of PAA and academic success. Expectancy tables and decision theory graphs were, also, constructed for the relationships between the GRE-AT and the two variables of GGPA and academic success.

# Conclusions

The major conclusions that were drawn from the analysis of the data in this study are as follows:

1. The means and standard deviations for the GRE-AT scores of this sample were comparable to the norms set by Educational Testing Service (ETS).

2. The mean of GGPA was in the range of a B+ to an A-.

The GRE-AT tests intercorrelated well with each other.

4. The relationships of the GRE-AT and GGPA were low. However, the GRE-V and GRE-T were significant at the .01 level of confidence. These findings generally agree with the literature and with the study done by Carlen (3).

5. The PAA showed roughly the same relationship with the GRE-AT as did the GGPA with the GRE.

6. The correlation between PAA and GGPA was .38 (significant at the .01 level). However, this was probably depressed by such factors as preselection of the sample and the small range of graduate grades.

There was a small, but negative relationship of
 GRE-AT scores and age of the students.

8. From the GRE expectancy tables, the GRE-AT scores gave only a small amount of differentiation between those students who scored low on the GRE-AT but had a 3.0 or greater GGPA and those who scored high.

9. The decision theory graphs for the relationships of the GRE and GGPA showed: (a) 98 of the 100 students with GGPA's of 3.0 and above made 400 or above on the GRE-V, (b) 85 of the 100 students with 3.0 or above made 400 or above on the GRE-Q, and (c) 82 of the 100 students with a GGPA of 3.0 or greater made 900 on the GRE-T. The false positives and misses on these graphs show why the relationships of the GRE-AT and GGPA were low.

10. Under the present admission requirements, eighteen students or 18 per cent of the group who have since maintained a 3.0 or greater GGPA would have been barred from graduate school if the GRE-AT had been the only admission requirement. This is, also, 15.7 per cent of the sample group.

11. On the basis of this study, students who would not meet the current admission requirements (GRE-T score of 900 or more) did succeed. On the other hand, students who would meet present requirements for admission did not succeed.

12. The GRE-AT seems to be a fairly good supplementary tool for academic prediction. However, it should be used in conjunction with other predictors, such as PAA and/or as a confirmation of ability.

The limitations of a study of this type are too numerous to make any absolute statements. Many subject and environmental variables (as listed in Chapter I) were not controlled and could have biased the results. Also, a relatively small, homogeneous sample group, enrolled in fairly heterogeneous majors could have considerably lowered the relationships of the GRE-AT with the criteria. Therefore, the above conclusions should be considered in view of these limitations.

#### Recommendations

While this study did not reveal any concrete evidence, it did point out some important and possibly correct conclusions.

 Major decisions in evaluation of the GPE-AT as a variable for predicting academic success should be withheld until further studies can be made over all the potential data.

2. Additional studies should be made on the relationships of the GRE-AT and academic success in specific majors. Research design that tries to predict academic success in diverse academic fields is quite unrealistic because of the differences in the patterns of student abilities needed. Also, the grading standards vary from department to department.

3. Validity studies should continue to be made to evaluate the local university requirements.

4. More valid studies will be obtained when it becomes possible to use only the variable of graduate degree attainment as the criterion. 5. Despite its bias, the GGPA is still the second best indicator of graduate school success.

6. As a general graduate school admission's requirement, emphasis should be placed on the verbal and total score sections of the GRE-AT.

7. Moreover, as a general admission's requirement, a GRE-T cut-off score of 800 would be more realistic. Even though this would let in more possible failures, it would, also, let in more students that would succeed.

8. Furthermore, a subjective selection method is needed for those students who fail to meet the present admission requirements. It is suggested that this be a recommendation from both the student's advisor and departmental chairman. This would give the real late starters an opportunity, but allow the departmental chairman to make the final decision as to the student's qualifications for conditional acceptance.

9. The use of the GRE-AT should be continued at the university involved in this study. However, it should be used in combination with other predictor variables, such as the PAA. As has been known and accepted in psychology for some time, the more that is known about a person, the more that can be predicted about him.

10. Finally, the GRE-AT should be used in the capacity of a supplementary and confirming tool of selection rather

than a primary one. It should not be allowed to become a panacea as there is no simple, cut and dried method of measuring human ability. No test can reduce the task of student appraisal to a routine business.

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#### APPENDIX

# ADMISSION REQUIREMENTS FOR MASTER'S PROGRAM

- Bachelor's degree earned in an accredited institution with a minimum undergraduate grade point average of 2.5 (C+), or 3.0 (B) over the last 60 semester hours attempted.
- Personal interview with the Dean of the Graduate School or his designated representative.
- 3. Presentation of the results of the General Aptitude Test of the Graduate Record Examination. The examination should be taken prior to registration. Applicants for admission to the College of Business Administration will take the Admission Test for Graduate Study in Business in place of the Graduate Record Examination.

Upon recommendation of the departmental chairman, the Dean of the Graduate School may admit conditionally those students not meeting the grade point requirement, in order to enable them to pursue graduate study and to meet graduate standards. Those students must complete a minimum of six semester hours of advanced courses under graduate discipline with grades of B or better in addition to the minimum <u>requirements</u> for the master's degree. These courses are to be specified by the department involved and must be completed during the first semester of enrollment. Until this condition is removed, the student may not enroll for more than 12 hours a semester.

<u>Specific Departmental Requirements</u>. Individual departments may establish other specific requirements for admission to graduate study. Students may make inquiry of the department of their major before seeking admission.

# ADMISSION REQUIREMENTS FOR DOCTOR'S PROGRAM

- Master's degree or the equivalent with a minimum grade point average of 3.0 (B) on all prior graduate work completed at an accredited institution.
- 2. Passing scores on qualifying examinations.