AN ANALYSIS OF THE RELATIONSHIP OF SELECTIVE FACTORS TO THE SCHOLASTIC SUCCESS OF NON-HIGH SCHOOL GRADUATES WHO ATTENDED TEXAS TECHNOLOGICAL COLLEGE FROM 1954 TO 1964 AS REVEALED BY RECORDED COLLEGE DATA

A Dissertation
Presented to
the Faculty of the College of Education
University of Houston

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Education

by

James R. Tarter

August 1965

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ABSTRACT

This study was an analysis of selected recorded data to determine the effect of certain selective variables on the scholastic success of non-high school graduates who attended Texas Technological College from the Fall Semester 1954 through the Spring Semester 1964. It was further limited to those non-high school graduates who had been graduated or had withdrawn as of June 1964. A total of 151 students who were not graduated from high school and who were enrolled during this period of time were included in this study.

The student's permanent record provided the data for inclusion in this study. In addition to the scholastic record, a number of other variables were included: sex, age at time of admission, total number of high school units presented upon admission, number of semesters attended, total number of semester hours attempted, school in which enrolled within Texas Technological College, college major, degree earned, and size of the high school attended. The scores these students made on the battery of tests required by the Committee on Admissions were obtained from the files of the Testing and Counseling Center.

All data were coded and punched on data cards and then analyzed in a factoral analysis of variance design using the IBM 1620 computer. In addition, a factor analysis was made

to clarify further the relationship between the variables and scholastic success.

The findings of this study were based completely on the selected group of non-high school graduates and their scholastic success in relation to definite influencing factors. Seventy-eight percent of the group were male students. In all analyses the female students consistantly had greater academic success than did their male counterparts. The mean grade-point average for the males was .93 and for the females, 2.48. In all cases those students in the twenty to twenty-nine age group out-performed those thirty years of age and over.

The male students who presented between nine and twelve high school units upon admission usually achieved better than those who presented fewer units. The female students, however, exceeded the males no matter how many high school units the females presented upon admission. This fact was particularly true of those females who entered either a spring semester or a summer term. No relationship was found between the pattern of high school units and scholastic success.

Both sexes from high schools with an enrollment of over 500 students consistantly made higher scores on the entrance examinations and were more successful academically than those students from the smaller high schools.

The volume of student enrollment decreased as the span of semesters attended increased. Eighty-five percent of the selected group attended from only one to five semesters. Sixteen percent of this group failed and were not eligible to continue at the end of the first semester. Eleven percent withdrew before completing a full semester.

The non-high school graduate enrollment was distributed among five schools, with the largest group, fifty-three percent, enrolled in the School of Arts and Sciences. Twenty-seven percent were enrolled in the School of Business Administration, and thirteen percent, five percent, and two percent in the Schools of Engineering, Agriculture, and Home Economics respectively. Ten bachelor's degrees and three Master's degrees were earned by the group of non-high school graduates.

This study substantiates the findings of other studies concerning the scholastic success in college of non-high school graduates. A properly motivated student of average aptitude who was not graduated from high school can, after three years of high school, compete successfully in college with high school graduates, though performance for the freshman year may be at a lower level.

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THE PROBLEM AND ITS INVESTIGATION

A student, twenty-one years of age or over, who was not graduated from high school and has not attended another college may be admitted conditionally as a freshman to Texas Technological College without having met all of the formal requirements for admission. Such admission is granted only to an applicant who shows by testing, interviews, and previous educational experiences that he is above average in ability. His approval must be recommended by the Committee on Admissions.

In the years following World War II many students who were not high school graduates presented themselves for admission to Texas Technological College. These students had quit high school before graduation to enter the armed service. Upon release from the service they were beyond the normal high school age, but had the desire to continue their education. The admission requirements were modified in order to give these non-high school graduates the opportunity to continue their education.

I. THE PROBLEM

This study was an analysis of selected recorded college data to determine the effect of certain selective factors on the

scholastic success of non-high school graduates who attended Texas Technological College during the ten-year period from 1954 to 1964.

II. PURPOSE OF THE STUDY

A review of the records in the office of the Registrar at Texas Technological College indicated that no study had been made to determine the scholastic success of the non-high school graduates who attended Texas Technological College. It appeared timely that such a study be made in view of past and present national concern for the welfare of the student who is not graduated from high school.

It was the purpose of this study to determine the extent to which non-high school graduates admitted to Texas Technological College from 1954 to 1964 have been scholastically successful and to analyze the relationship of certain factors to their scholastic success.

The results of this study may prove useful to the following:

1. Admissions officials of colleges and universities in which non-high school graduates are in attendance or may apply for admission;

2. Counselors and personnel workers in colleges and universities as a reference in the counseling of future non-high school graduates admitted to college; and

3. Counselors and administrative officials vested with the responsibility of administering high school educational programs.

III. LIMITATIONS OF THE STUDY

This investigation was limited to an analysis of certain selective factors to determine the effect on the scholastic success of the non-high school graduates who attended Texas Technological College from 1954 to 1964. It was further limited to those non-high school graduates who had been graduated or had withdrawn from Texas Technological College as of June 1964. A total of 151 students who were not graduated from high school and who were enrolled during this period of time were included in the study.

The data relating to the non-high school graduates were used to discover possible scholastic-success relationships between these students according to definite variables. These variables included:

1. Sex
2. Age at time of admission
3. Total number of high school units presented upon admission
4. Size of high school attended
5. Scores on recognized selective tests:
   a. American Council on Education Psychological Examination: Quantitative, Linguistic, Total;

b. Co-Operative English Examination, Provisional Form OM: English Usage, Spelling, Vocabulary, Total;

c. California Multiple Aptitude Test: Arithmetic Reasoning, Arithmetic Computation;

d. Otis-Gamma Mental Ability Test.

IV. DEFINITION OF TERMS

In order to make the meaning clear, pertinent terms used in this study were defined as follows:

Non-high school graduate. A person twenty-one years of age or over who was not graduated from high school and was admitted to Texas Technological College on the basis of scores on recognized selective tests, personal interviews, and previous educational experiences.

Scholastic success. The extent to which the non-high school graduate was successful at Texas Technological College as determined by grade-point average.

Grade points. Grade points of 4, 3, 2, and 1 assigned for the grades A, B, C, and D, respectively, for each semester hour of credit value of the course in which the grade was received. All other grades had no grade points assigned.

Grade-point average. The grade-point average for a semester determined by dividing the total number of grade points acquired during that semester by the total number of

semester hours of all courses in which the student was registered for that semester. In the same manner, the over-all grade-point average was obtained by dividing the total number of grade points earned in all courses for which the student had registered by the total number of semester hours of all courses for which the student had registered. Repeated registrations were counted in the totals.

Cell. The divisions within the tally sheet in which the students included in this study were tallied according to sex, age, high school units completed, and size of high school attended.

Replications. The number of individual students per cell who were subjected to the same statistical treatment or analysis.

V. PROCEDURES AND SOURCES USED IN SECURING THE SELECTED DATA

The subjects of this study, 151 students, were enrolled in Texas Technological College during the ten-year period from 1954 to 1964. The specific data used in this study were obtained from the following sources at Texas Technological College:

1. Office of Admissions. The list of students comprising this study was obtained from the master audit volumes listing the students who were enrolled at Texas

Technological College during the ten-year period from 1954 to 1964.

2. Office of the Registrar. The list of students obtained from the Office of Admissions was used to locate the permanent record of each student comprising this study. A master work sheet was devised on which the data were recorded from the permanent record of each student. The following information was recorded on a separate master work sheet[1] for each student:

a. Sex
b. Age at time of admission
c. Total number of high school units presented upon admission
d. Number of semesters of attendance at Texas Technological College
e. Total number of semester hours attempted
f. Grade-point average by specific semester
g. Total grade-point average
h. School in which enrolled within Texas Technological College
i. College major
j. Degree earned
k. Size of high school attended.

3. Testing and Counseling Center. The list of students obtained from the Office of Admissions was then used to secure

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[1]See Appendix A.

the scores each student comprising this study made on the test battery required by the Committee on Admissions. The test battery included the following tests:

a. American Council on Education Psychological Examination: Quantitative, Linguistic, Total;

b. Co-Operative English Examination, Provisional Form OM: English Usage, Spelling, Vocabulary, Total;

c. California Multiple Aptitude Test: Arithmetic Reasoning, Arithmetic Computation;

d. Otis-Gamma Mental Ability Test.

4. Directory of Secondary Day Schools, 1958-1959[2] supplied the size of the high school attended by the students comprising this study.

VI. ORGANIZATIONAL PLAN FOR THE STUDY

Chapter II presents a review of the literature and research available on non-high school graduates who have attended various institutions of higher learning and on the prediction of academic success.

Chapter III provides the procedures and methods of investigation used in this study.

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[2]United States Department of Health, Education and Welfare, Directory of Secondary Day Schools, 1958-1959 (Washington: Office of Education, 1961).

Chapter IV presents a discussion of the findings on the non-high school graduates who attended Texas Technological College during the ten-year period from 1954 to 1964.

Chapter V contains the summary, conclusions, and recommendations derived from the findings this study reveals.

CHAPTER II

REVIEW OF LITERATURE AND RESEARCH

I. INTRODUCTION

This study has been concerned with selected recorded data on students who were not graduated from high school and who attended Texas Technological College from 1954 to 1964. Studies pertaining to the academic success of non-high school graduates who attended various institutions of higher learning and those which dealt with prediction of academic success were reviewed. Relatively few recent studies of academic success in college of non-high school graduates were found in the literature.

These studies revealed that since the close of World War II American colleges have received numerous applications for admission from non-high school graduates. Their education had been interrupted because of the operation of various factors other than just intelligence.[1] The majority of these students would not return to high school in order to be graduated before applying to institutions of higher learning because most of them were beyond the normal high school age. Dammon tells us that the college admission requirements were

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[1]Clarence H. Dammon, "Admission Without High School Graduation," Journal of the American Association of Collegiate Registrars, XIX (July, 1944), 471-485.

modified in order to give these non-high school graduates the opportunity to continue their education. These admission requirement modifications can be grouped under two general headings: first, the modification to permit the dovetailing of high school and college with provision for the eventual granting of the high school diploma, and second, the modification to allow for the admission of the non-graduates without provision for high school graduation.[2]

The search for an acceptable admissions policy has been proceeding for generations. Admissions standards are indispensable to prevent chaotic conditions from developing in our colleges; however, a degree of flexibility is beneficial to both the student and the college. By their policies colleges determine to a large degree who is to be educated. If the colleges are to serve society as true educational leaders, and thus meet the demands that society places upon them, it is imperative that there is a belief in flexibility and in mature consideration of the individual differences of those students desiring admission. John Johnston in 1924 made the following statement emphasizing the need for a closer working agreement between the secondary schools and colleges:

> An institution whose resources are limited only by the wealth of a state and the goodwill of its people, and whose aim is to give those people the support they

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[2] Ibid., p. 471.

> furnish--must undertake to make the most of capable young people, rejecting none by a hard rule and sufficiently proven. However, if it can be shown that the performance of the applicant gives ground for predicting with only negligible error those individuals who fail in college work, the college can act on such information and would not be justified in neglecting this means of improving its service to society.[3]

If the admissions officer can adopt the viewpoint stated by Charles Davis[4] of Michigan that the entrance requirements ordinarily are neither a line of demarcation nor an average of acceptance, but rather a point of view from which the admissions officer looks at any application, he may then be both objective and flexible in his judgments.

II. STUDIES ON SCHOLASTIC SUCCESS

Increasing interest in the policy of admission to college of non-high school graduates has been manifested in the past several years by the number of studies reported in the literature on the experience of various institutions with this practice. These studies fall logically into two groups: (1) admission of relatively mature persons who for various reasons did not attend or failed to complete high school, and (2) accelerated students who were admitted to

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[3]John Johnston, "Predicting Success or Failure in College at the Time of Entrance," School and Society, XX (July, 1924), 32.

[4]Charles Davis, A Survey of Transfer Admissions in Colleges and Universities (Ann Arbor, Michigan: The University of Michigan Press, 1940).

colleges by special arrangement prior to completion of high school. The following studies have uniformly indicated that the practice of admitting carefully selected younger students has been highly successful in terms of scholastic performance of these students.

In 1934 Detchen[5] kept records on thirteen superior students who had not been graduated from high school and who were admitted to The University of Louisville on an experimental basis. They were graduated from the University at the end of the Spring Semester in 1938. The purpose of the experiment was to promote for superior students a better articulation between high school and college. The experiment was highly successful and Detchen urged at its completion "the abandonment of all fixed lists of required college entrance credits, the consideration of differentiated curriculums suited to various levels of ability and preparation, and, in short, the entire adaptation of our higher education to individual differences."[6]

Berg and Larsen[7] studied the records of thirty-six students who were admitted to the University of Illinois in

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[5]Lily Detchen, "College Education Without High School Graduation," School Review, XLVII (March, 1939), 182-191.

[6]Ibid., p. 191.

[7]Irwin A. Berg and Robert P. Larsen, "A Comparative Study of Students Entering College One or More Semesters Before Graduation from High School," Journal of Educational Research, XXXIX (September, 1945), 33-40.

1943 one or two semesters before high school graduation. The requirements for admission under this accelerated program included rank in upper quarter of high school class, recommendation by high school principal and several teachers, passing of a test battery above the seventy-fifth percentile on College of Agriculture freshman norms, and social and emotional maturity at a satisfactory level as determined by a clinical psychologist. The group earned grades averaging 3.91, which was slightly more than one standard deviation above the all-University freshman grade-point average. The performance of the accelerated group on a battery of tests was also slightly more than one standard deviation above the all-freshman performance on the same test battery. The group also made a satisfactory personal and social adjustment to college.

At the University of Minnesota, Henry H. Kronenberg studied the records of 144 non-high school graduates who were admitted from 1930 to 1934. These students presented from 4 to 8½ high school units. Upon completion of the study, Kronenberg concluded:

> The fact that a student does not meet the entrance requirements fully seems to be of little importance in conditioning his success in the general college. On the basis of the records made by the individuals studied here it appears doubtful that the general

college is justified in insisting upon strict adherence to its stated requirements.[8]

In a study at the University of Arkansas, Bent[9] observed the progress of fifty-four non-high school graduates who attended the University from 1923 to 1943, nine women and forty-five men. The average age of the students was 24.5 years. The average number of entrance units presented was 6.2, and twenty-four of the students had no high school units. The average length of time the group attended the University was 3.9 semesters; the average number of semester hours earned was 53.8. Five of the students left before earning any credits. Nineteen were graduated, and four of the nineteen were graduated with honors.

Bent concluded from the findings of these cumulative data over a score of years that the practice of admitting carefully selected students who were not graduated from high school is effective and should be continued.

Using 1,500 students at the VanPort Extension Center of the Oregon State System of Higher Education, Putnam[10]

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[8]Henry H. Kronenberg, "Validity of Curriculum Requirements for Admission to the General College of the University of Minnesota," (unpublished Ph.D. dissertation, University of Minnesota, 1935).

[9]Rudyard K. Bent, "Scholastic Records of Non-High School Graduates Entering the University of Arkansas," Journal of Educational Research, XL (October, 1946), 108-115.

[10]Phil H. Putnam, "Scholastic Achievement of GED Students at VanPort Extension Center," School and Society, LXVI (August, 1947), 161-163.

made a study of scholastic achievement by students who were admitted by their high school diplomas and students who were admitted after successfully completing the General Educational Development test battery. He kept records on the grade-point averages of these students and of their scholastic ratings (whether on the honor roll or on probation) and on withdrawals. From these data Putnam stated that on the basis of the above records, high school graduation is not essential to successful scholastic achievement in college; that a properly motivated student of average aptitude can, after three years of high school, compete successfully in college with high school graduates; but that similar students with two years or less of high school attendance will be seriously handicapped and will have difficulty in doing successful college work.

During the period from September 1945 to June 1947 seventy-two non-high school graduates were admitted to degree programs at the University of Wisconsin on recommendation of a special admissions counselor. A study was conducted by Milligan, Lins, and Little[11] to determine the academic success of these students.

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[11]E. E. Milligan, L. J. Lins, and Kenneth Little, "The Success of Non-High School Graduates in Degree Programs at the University of Wisconsin," School and Society, LXVII (January, 1948), 27-29.

The grade-point average at the end of the first semester in the University was taken as the criterion of success. The grade-point average was correlated with certain measures available. These measures were (1) number of high school units completed, (2) percentile rank on the American Council on Education Psychological Examination, and (3) scores made on various GED tests. Eighty-seven percent of the students in the study completed the first semester.

After an examination of the data the following conclusions were reached:

> There was no apparent relationship between the number of high school units completed and success in college.
>
> "Correctness and Effectiveness of Expression," GED Test I, the composite of the five GED tests, and the American Council on Education Psychological Examination were found to be the best measures used in terms of predicting college success.[12]

All of the preceding studies have reported results generally favorable to the practice of admitting carefully selected students who were not graduated from high school. The studies which follow submit findings which might be termed essentially negative.

Arthur W. Hartung, in a study made at the University of Tennessee Junior College, Martin, Tennessee, involving fifty-nine students who were admitted on the basis of GED

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[12] Ibid., p. 29.

tests, pointed out that the presence of similar characteristics in cases of unsatisfactory academic progress seemed to single out one particular group of students whose training appeared less successful than that of students as a whole. This group consisted of students who offered GED test scores for entrance rather than the customary high school diploma. Only five of the fifty-nine students completed the two-year junior college program. The grade-point average for the GED students in general was less than that required for continued acceptance by the institution.

On the basis of the findings of this study, Hartung stated:

> Thus, local experiences would indicate that training for students who have not completed high school or its equivalent is not successful in most cases, and that ordinarily a GED test score has not proved to be a satisfactory substitute for high school work.[13]

A study conducted by Mumma[14] at the Johns Hopkins University was concerned with the widespread use of the High School Level Tests of General Educational Development by admissions officers insofar as veterans were concerned. Mumma stated that so many veterans and non-veterans have availed

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[13]Arthur W. Hartung, "The Case of the GED Student," School and Society, LXVII (August, 1948), 138.

[14]Richard A. Mumma, "The College Record of Students Admitted on the Basis of GED Tests," College and University, XXVI (October, 1950), 79-87.

themselves of the opportunity to take the GED tests that it is important for admissions officers to know how accurately the results of these tests predict success in college.

The group considered in this study included a total of fifty-six male veterans who were admitted to Johns Hopkins University on the basis of their scores on the High School Level GED tests. Thirteen entered in February 1946; twenty-nine entered in September 1946; and fourteen entered in September 1947. Forty-four had completed 4 years of high school, three had completed 3½ years, three had completed 3 years, four had completed 2 years, and two had completed 1 year. In all probability few, if any, would have been admitted were it not for the GED tests.

One of the factors used to gauge progress was the number of semester hours of credit earned. The criterion used was "normal progress," defined as thirty semester hours of credit per academic year and six semester hours of credit for summer. Definite evidence was obtained that the GED students received grades below the average of all of the students.

The findings of this study indicated that students admitted to the Johns Hopkins University on the basis of GED tests, even though their test scores placed them in high percentile ranks when considered as a group, were dropped in larger proportions than other students, made lower grade-point

averages than other students, and earned semester hours of credit at a rate that was below normal.

The purpose of the study conducted at the University of Utah by Andrew[15] was to determine whether or not students who drop out of high school before graduation perform as well in college as a matched group of students who are graduated from high school. In order to compare the achievement of non-high school graduates with that of regularly admitted students, matched groups were established using the following factors as the basis for matching: sex, age at time of entrance, college of enrollment, quarter of admission, and scholastic index.

It was found that the group of high school graduates completed more quarters successfully, took more hours, and carried a heavier load per quarter than did the non-high school graduates. The differences between the two groups on these factors were significant at the .05 or .01 level.

The drop-out rate of the matched group was shown according to the number of quarters completed. A larger percentage of high school graduates completed a greater number of quarters than did the non-high school graduates.

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[15]Dean C. Andrew, "A Comparative Study of the Academic Achievement of High School Graduates and Non-Graduates," College and University, XXVII (October, 1951), 50-55.

Six percent of the experimental group were graduated whereas twelve percent of the control were graduated.

From the data presented it was concluded that some or similar factors which caused students to drop out of high school before graduation were still operating when they attended college. Non-high school graduates therefore performed at a significantly lower level than did matched individuals who succeeded in being graduated from high school.

III. PREDICTION OF SCHOLASTIC SUCCESS

Studies have looked at the value of high school rank, high school grades, aptitude and subject matter test scores, personality tests, and data on interests and socio-economic background of students to see if better predictions for college success can be made. More research in this area is needed since the national attrition rate is approximately forty percent in higher education as a whole.[16]

Schneiders, Anastasi, and Mead[17] conducted a large-scale study for the College Entrance Examination Board on predicting

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[16]Robert Iffert, Retention and Withdrawal of College Students, Series 1958, No. 1 (Washington: United States Office of Education, 1957).

[17]A. A. Schneiders, Anna Anastasi, and Martin J. Mead, The Validation of a Biographical Inventory as a Predictor of College Success, College Entrance Examination Board Research and Development Report (New York: Fordham University, 1960).

scholastic success in college. The purpose of this study was to develop and validate a weighted scoring key for use with a biographical inventory as a predictor of college success. The classes of 1958 and 1959 at Fordham College were used to provide the initial and cross-validation samples. Although academic achievement was taken into account, the criterion of college success emphasized non-intellectual factors and was shown to be differentiable from the usual grade-point average criterion. The subjects for the three criteria groups established were selected on the basis of information assembled from nine criteria sources covering the first three years in college. The three groups established were designated as (1) positive, representing essentially the type of person the college wants to develop; (2) average, representing those students who were making a satisfactory adjustment to college, but showed no outstanding characteristics; and (3) negative, representing those students showing concrete evidence of emotional maladjustments or antisocial behavior and judged to be all-around unsatisfactory students.

The correlations obtained from the cross-validations were consistently higher than those obtained with College Board Scholastic Aptitude Test scores--Verbal and Mathematical --against the criterion. Analysis of other aptitude, achievement, personality, and interest tests indicated that the

biographical inventory differentiated more effectively than the other predictors.

McConnell and Heist[18] pointed out that while these general studies were helpful, each institution should make individual studies to find what specific factors are more meaningful for the particular institution. Not only should the student be helped to select a college in which he will succeed, but the college must also select to the best of its ability the student who will succeed at that college. Success in college is measured in most studies by scholastic success because this factor can be measured objectively.

According to Jackson,[19] it would be undesirable for a college to admit a student who is known to have no chance to succeed in that college. This action would be wasteful and basically dishonest, would produce bad public relations, and often would have disastrous psychological effects on the student involved.

Scholastic Success and High School Rank

A commonly used predictor of college success is high school rank. In a study of 1,533 freshman students entering

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[18]T. R. McConnell and Paul Heist, "Do Students Make the College?," College and University, XXXIV (Summer, 1959), 442-452.

[19]Paul J. Jackson, "Selecting Students Differently," College and University, XXXIII (Fall, 1957), 36-43.

Marquette University in the Fall Semesters of 1934, 1935, 1936, and 1937, Butsch[20] found correlations ranging from .47 to .60 between rank in high school class and first semester marks in college. The criteria used were grades earned during the first semester of the freshman year.

The predictive measures used in this study were (1) rank in high school class, (2) knowledge of secondary school subject matter as measured by the Iowa High School Content Examination, and (3) a general measure of college aptitude as determined by the Thurstone Psychological Examination.

Garrett[21] pointed out that the problem of predicting college scholastic success was related closely to the matter of college entrance requirements. He studied the data from educational research, testing the validity of certain college entrance requirements of long standing and the ability of these institutions to select college entrants satisfactorily as they were formally thought to do. Because of the scope of the problem, the study was limited to a consideration of

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[20]R. L. C. Butsch, "Improving the Prediction of Academic Success through Differential Weighting," Journal of Educational Psychology, XXX (September, 1939), 401-420.

[21]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, XVIII (December, 1949), 91-139.

studies covering only colleges of liberal arts and teachers colleges.

At the conclusion of the study Garrett made the following statements:

> 1. High School Average--Among all of the factors contributing to prediction of scholastic success in college, the student's average grade in high school shows the highest correlation (.55) with later college scholarship average.
>
> 2. High School Rank--Influenced by number in class. Average correlation with freshman grades of .26 to .30.
>
> 3. Pattern of High School Courses--The studies reported seem to prove conclusively that there is practically no relationship between the number or pattern of high school subjects and later success in college.
>
> 4. Size of the High School--No apparent relationship to college scholastic success. Average correlation of .09.
>
> 5. Age--Eighteen years was reported as the model college entrance age. Those entering when older do slightly less well at first, then tend to reach the others during the last two years of college work.[22]

Garrett further stated that the five factors which have the greatest predictive value--and their average correlations with average college grades--are (1) high school grades (.56), and high school rank (.55); (2) general achievement test scores (.49); (3) general college aptitude test

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[22] Ibid., p. 137.

scores (.43); (4) intelligence test scores (.47); and (5) special aptitude test scores (.42).[23]

The literature suggests that high school class rank as a method of prediction is one of the most frequently used methods for predicting college success. A statement by Seyler is indicative of the general attitude: "Rank in high school class offers a means of making predictions that is more accurate than a guess would be, and as such has distinctive value."[24]

Data for the study made by Seyler were based on the records of 7,006 freshman students admitted to the University of Illinois in September 1935, September 1936, and September 1937. In summarizing the data presented, Seyler arrived at the following conclusions:

> There is a definite positive relationship between rank in high school graduating class and freshman scholastic record.
>
> That it is possible to predict with considerable accuracy the scholastic success in the freahman year of any group of students whose percentile rank in class falls within certain limits.
>
> That rank in class offers a means of making predictions more accurate than a guess would be, and as such, has a distinctive value.[25]

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[23] Ibid., p. 138.

[24] E. C. Seyler, "The Value of Rank in High School Graduating Class for Predicting Freshman Scholarship," Journal of the American Association of Collegiate Registrars, XV (October, 1939), 5-22.

[25] Ibid., p. 22.

The major purpose of a study made by Dale P. Scannell at the State University of Iowa and Iowa State College was to investigate annually obtained comparable achievement measures as predictors of college success. In addition, the predictive power of measures of school attainment was studied, using these measures separately and in combination with achievement test scores. A base sample was obtained of 3,202 students who had taken the Iowa Tests of Educational Development as high school seniors during the years 1948 to 1952 and who enrolled the following fall in either the State University of Iowa or Iowa State College. The admissions requirements of the two institutions were essentially the same during the 1949-1953 period.

The data that were collected included results of the Iowa Tests of Basic Studies for grades 4, 6, and 8; results of the Iowa Tests of Educational Development for grades 9 through 12; rank in high school graduating class; high school grade average; freshman college grade-point average; four-year college grade-point average for graduates; and cumulative college grade-point averages for students withdrawing from college.

Scannell's major findings included:

> The accuracy with which general college academic success was predicted from achievement test scores increased year by year from grade 4 through high school; the grade 12 Iowa Tests of Educational

Development yielded multiple correlations of .634 with freshman college grade-point average and .535 with four-year college grade-point average.

Combinations of achievement test data obtained at several points in the students' careers were only slightly more predictive than the most recent results.

High school grade average was the best single predictor of college success yielding correlations of .67 and .59 with freshman college grade-point average and four-year grade-point average respectively. Rank in class was not highly predictive for graduates of small high schools.

The Iowa Tests of Educational Development prediction equations derived for one college were only slightly less accurate than "own school" equations when applied to data for the other college. The slight decreases in prediction accuracy suggest that these equations could be used satisfactorily at other four-year institutions with similar admission requirements.

When restriction in range of scores is considered, elementary school test data correlated highly with college success. The estimated correlation between grade 8 Iowa Tests of Basic Studies and freshman grade-point average for a sample representative of eighth-grade students was .85. This finding suggests that predictions of college success from elementary school test scores can be as useful as predictions from high school data.[26]

Scholastic Success and High School Grades

The actual grade average achieved in high school is used as a selective criterion by many colleges. In a review

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[26]Dale P. Scannell, "Prediction of College Success from Elementary and Secondary School Performance," Journal of Educational Psychology, LI (June, 1960), 134.

of more than one hundred studies Garrett[27] found an average correlation of .56 between high school average and college grade average. In those studies where the correlation was made between high school grades and first semester college grades, a high correlation of the total high school grade-point average to the first semester college grade average was found to be around .80.

Schmitz,[28] in a study of the entering freshmen at St. Benedict's College in 1934, 1935, and 1936, found high school grade average the most efficient single instrument for predicting college success. The coefficient of correlation established for high school grade average with college success was .64. His study gave the comparative value of several criteria: American Council on Education Psychological Examination, Purdue Placement Test, and Spelling Test. The study likewise included a comparison of the high school grade average with success in college. Success in college was measured by individual grade-point average.

Scannell[29] found a correlation of .59 between high school grade average and the four-year college grade average

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[27]Garrett, loc. cit.

[28]Sylvester B. Schmitz, "Predicting Success in College: A Study of Various Criteria," Journal of Educational Psychology, XXVIII (September, 1937), 645-675.

[29]Scannell, loc. cit.

of 3,302 students at the State University of Iowa and Iowa State College from 1949 to 1953.

In a study at the University of Arkansas, Kerr[30] found that the higher the grades in high school, the better the chances for good accomplishment in college. He pointed out that his study found no criterion significant enough for selective admission which would not do injustice to a large number of applicants, again showing the need for more than one basis for selecting students.

Douglass,[31] in a study based on the academic success in three quarters of college work of 811 students entering the University of Oregon in 1926 and 1927, and also on the success of 385 students completing five quarters of college work in 1930 at the same institution, found the following correlations with the criterion: high school average .56; science .54; English .49; foreign languages .46; mathematics .44; and vocational .36.

As a result, Douglass stated:

> One of the most interesting outcomes of the study is the higher coefficient between high school marks and college marks as compared to percentile

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[30]Fred L. Kerr, "Studies on the Freshman Class at the University of Arkansas," College and University, XXXIV (Winter, 1959), 186-199.

[31]Harl R. Douglass, "The Relation of High School Preparation and Certain Other Factors to Academic Success at the University of Oregon," University of Oregon Publications, Education Series, III (January, 1931), 9-15.

> rank on the American Council on Education Psychological Test factors. No other coefficient of correlation between any one factor and college marks equaled or exceeded that obtained between average college marks and average high school marks (.56). Coefficients approaching most closely were those arising from the quartile rankings of the high school principal (.48) and that from the percentile rank of the American Council on Education Psychological Test (.45).[32]

Jones and Laslett[33] studied the records of 500 freshmen admitted to Oregon State College in 1933. The authors found that the high school composite mark is the best single predictor of college scholastic success. The coefficient of correlation established for high school composite mark with college success was .65. They also found that the size of the high school from which the students came had little relationship to college scholastic success.

In his study, Gladfelter[34] used the records of Temple University freshmen admitted in 1936. Again it was found that the four-year average of high school grades was a more accurate predictor of success in college than grades in

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[32] Ibid., p. 14.

[33] George A. Jones and H. R. Laslett, "The Prediction of Scholastic Success in College," Journal of Educational Research, XXIX (December, 1935), 266-271.

[34] Millard E. Gladfelter, "The Value of Several Criteria in Predicting College Success," Journal of the American Association of Collegiate Registrars, XI (April, 1936), 187-195.

particular subjects or groups of subjects. The coefficient of correlation established for four-year high school average with freshman-year average was .68.

Carlson and Milstein,[35] in a study at the University of Oregon in 1958, employed a method involving a combination of college aptitude rating based on either the Ohio State University Psychological Examination or the College Entrance Examination Board Scholastic Aptitude Test, and a "Prep" rating which consisted of the ratio of units of "A" in all high school courses to the total number of high school units accepted.

The study indicated, in general, that course averages of "A"'s and "B"'s combined had a higher relationship to first semester grade-point average than either "A"'s or "B"'s alone. The same relationships held for the three broad areas of the high school curriculum (academic, vocational, activity). Most of the variance was accounted for by courses in the academic area, with English course grades contributing most to academic scores.

Schmitz[36] expressed the belief that the grades made by the student in high school appear to have the highest

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[35]J. Spencer Carlson and Victor Milstein, "The Relation of Certain Aspects of High School Performance to Academic Success in College," College and University, XXXIII (Winter, 1958), 185-192.

[36]Schmitz, loc. cit.

predictive value of success in college. This conclusion was based on a study conducted at St. Benedict's College, using the 1934, 1935, and 1936 classes of entering freshmen. The coefficient of correlation established for high school grade average with college success was .64.

At George Peabody College for Teachers 193 freshmen who completed one to three semesters of work were measured by Cochran and Davis[37] on the basis of several variables. They found a coefficient of correlation of .63 between high school average and freshman grades, a relationship that was higher than any other relationship using tests as the predictive measures. Both authors concluded that high school grades were the best predictor currently available.

A study by Scannell was designed to investigate annually obtained comparable achievement measures as predictors of college success for Iowa State College or the State University of Iowa. The author concluded, "High school grade-point average was the best single predictor of college success."[38] The coefficients of correlation found for the relationship of high school grade-point average with college success ranged from .63 to .69 with a median of .65.

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[37]Samuel W. Cochran and Frederic B. Davis, "Predicting Freshman Grades," Peabody Journal of Education, XXVII (May, 1950), 352-356.

[38]Scannell, op. cit., p. 134.

Harris[39] in his survey of 328 investigations of prediction of college success conducted from 1930 to 1938 found that among all the factors contributing to the prediction of college success, high school grades showed higher correlations with college success than any other measure. Most of the coefficients of correlations for the relationship of high school grades and college success ranged from .60 to .70, with a high of .78.

Cosand[40] in 1953 summarized in tabular form the findings of thirty-five studies which investigated single predictors of college success. The median coefficient of correlation for seventeen studies investigating the relationship between high school grades and college success was found to be .53, with fifty percent of the cases between .48 and .60. Of all of the various measures investigated, high school grades commanded first place, with high school rank in class second.

Scholastic Success and High School Units

As can be seen from the studies previously reviewed in this chapter, there seems to be very little predictive

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[39]Daniel Harris, "Factors Affecting College Grades: A Survey of the Literature, 1930-1937," Psychological Bulletin, XXXVII (March, 1940), 125-166.

[40]Joseph P. Cosand, "Admissions Criteria," College and University, XXVIII (April, 1953), 338-364.

value in the number or pattern of high school units a student has in high school. Livengood[41] in a Master's thesis at Auburn University found that at Columbus College in Columbus, Georgia (a two-year junior college for girls), it made no difference whether the students had fewer than 12 academic units, 12 to 13½ academic units, or 14 or more academic units upon entry.

In 1961 Melton[42] studied the records of 1,075 freshmen who enrolled for the first time in The University of Georgia the fall of 1958 without previous college experience and who completed the first quarter. The subjects in the validating section were 906 students in the 1959 freshman class who completed the entire year.

In general, less relationship was found between the criteria of the University grade-point average and course grades and the patterns of high school courses than between these criteria and the College Entrance Examination Board Scholastic Aptitude Test scores and high school grade average. The high school average was found to be significant in every

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[41]Mary Livengood, "The Relationship Between the Selection of High School Subjects and Success at Columbus College," (unpublished Master's thesis, Auburn University, Auburn, Alabama, 1962).

[42]C. Y. Melton, "The Academic Achievement of University of Georgia Students as Related to High School Course Patterns," (unpublished Ph.D. dissertation, University of Georgia, Athens, Georgia, 1961).

analysis. In most of the analyses, at least one of the Scholastic Aptitude Test scores was also significant. Melton's study concerned the pattern of high school units rather than their sheer number.

Scholastic Success and High School Size

According to Ferriss, Gaumnitz, and Brammell,[43] studies which have been made on the subject of school efficiency have usually evaluated schools on two bases: (1) in terms of the desirable characteristics of a school, and (2) in terms of achievement of pupils. Using the first basis as a criterion, they compared small secondary schools and found a distinct improvement in conditions in both selected and unselected schools as the enrollment increased.

Dawson[44] studied characteristics of large and small secondary schools and concluded that efficiency is considerably affected by the size of the school.

Seyfert[45] found that size of the student body affects considerably the curriculum offered and that the

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[43]E. N. Ferriss, W. H. Gaumnitz, and P. R. Brammell, The Smaller Secondary Schools, United States Office of Education, Bulletin No. 17, National Survey of Secondary Education, Monograph No. 6 (Washington: Government Printing Office, 1932), 236 pp.

[44]H. A. Dawson, "Satisfactory Local School Units," (unpublished Ph.D. dissertation, George Peabody College for Teachers, Nashville, Tennessee, 1934).

[45]W. C. Seyfert, School Size and School Efficiency (Boston: Harvard University Press, 1927), 315 pp.

small school is seriously handicapped in the number of activities subjects it may undertake satisfactorily at one time.

Scholastic Success and Use of Tests

Use of intelligence tests for predicting academic success is not new. Elementary and secondary schools have been using I. Q. tests for many years for placement of students in graded classes or in programs of study. Use of aptitude tests for predicting college success has increased with the wide use of the tests developed by the College Entrance Examination Board and the American College Testing Program, Inc. While the value of aptitude tests for college selection has been found to vary, results of such tests along with other information can be helpful in making decisions.

In studying the extent to which tests alone correlated with college success, Noel Keys examined the records of 1,112 students who left the Oakland, California, High School from mid-winter 1928-1929 to mid-winter 1933-1934. This study was made to ascertain the significance of group test I. Q.'s obtained in the junior high school years for the prediction of academic success beyond the high school. The study was concerned with (1) the distribution of I. Q.'s for those who proceed from high school to various types of institutions,

(2) the correlation between these I. Q.'s and scholarship in the two institutions found to have received the greatest number, and (3) the probability of particular sorts of advanced schooling and of academic success therein for pupils of given I. Q. levels.

The findings as reported by Keys included these:

> For children of 70 to 84 I. Q., the chances are 68 in 100 that schooling will not continue beyond the high school, while the probability of entering a degree-granting institution appears to be nil.
>
> For those of I. Q.'s around 100, the chances are still 40 in 100 that schooling will cease with high school, while less than 1 in 4 is likely to gain admission to any degree-granting institution.
>
> Even for boys and girls of the I. Q. group from 105 to 119, which includes the average college entrant, the prospects are still that 3 of 10 will not proceed beyond the high school, and 1 of 3 entered the University of California.
>
> Among pupils of 120 to 139 I. Q., only about 1 in 5 stops short with high school, and nearly half of the group actually enrolled at the University of California.
>
> The gifted group above 140 I. Q. showed 100 percent applying for admission to some degree-granting institution, and 44 percent graduating from the University of California with honors.
>
> From among the 4 or 5 percent of junior high school pupils with I. Q.'s of 85 to 94 who later entered the University of California, only 1 in 3 succeeded in graduating.
>
> The individuals with I. Q.'s in the 120's or 130's have roughly 3½ times as good a chance of entering the University of California, and 7 times the likelihood of graduating therefrom as has a youth of 100 I. Q.
>
> For students of I. Q. of 140 or higher, the prospects of graduating from the University of California with

> honors are 100 times as great as for the person of around 100 I. Q., and 11 times as good as for even the 120 to 130 I. Q. group.[46]

Garrett[47] found the average correlation of college achievement with standardized tests of ability to be between .41 and .49.

Williamson and Darley[48] pointed out that test results have greater significance in predicting college academic success when they are combined with other factors such as high school grades or high school class rank.

IV. RELATIONSHIPS TO THIS STUDY

Literature was reviewed to determine the extent to which college admission of non-high school graduates and their scholastic success have been covered and to ascertain the research procedures employed. Scholastic success prediction studies were also reviewed. It is necessary for the admissions officer to be able to predict within reasonable limits the potential scholastic abilities of non-high school graduates seeking admission to avoid unfair and inaccurate

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[46]Noel Keys, "The Value of Group Test I. Q.'s for Prediction of Progress Beyond High School," Journal of Educational Psychology, XXXI (February, 1940), 92-93.

[47]Garrett, op. cit., p. 139.

[48]E. G. Williamson and John G. Darley, Student Personnel Work (New York: McGraw-Hill, 1937), pp. 133-134.

judgments in their selection. Most of the attention has been given to correlation studies because they are important in providing information about the relationships between predictor variables and scholastic success. Greater predictive efficiency, however, does not automatically result from using the variable or variables that correlate highest with the criterion in the case where decisions to accept or to reject students are based upon a particular cutting score.

The need to evaluate the effectiveness of entrance requirements, whatever they happen to be, can easily be recognized. Until some kind of assessment is made, considerable doubt remains about their predictive efficiency. Many of those charged with the responsibility of making decisions regarding admission continue to trust to prior judgments. Such an approach to prediction and selection can lead to unfair and inaccurate judgments.

Reported studies support the superiority of statistical predictions of scholastic success over predictions made by individuals on some subjective basis. Most of these studies were based upon correlation procedures and compared predictors on the basis of their accuracy of predicting grades for cross-validation groups of successful and unsuccessful students.

This study has described the non-high school graduates who attended Texas Technological College from 1954 to 1964 in

relation to their scholastic success by means of several variables. These variables include sex, age at time of admission, number of high school units presented, size of the high school which the student attended, scores on recognized selective measures, number of semesters attended at Texas Technological College, grade-point average, school of enrollment within the college, college major, and degree attainment. The data were analyzed using, first, an analysis of variance technique, and second, a correlational factor analysis.

V. SUMMARY

The literature and research significant to the topic of this study have been summarized in three broad areas: studies on the scholastic success of non-high school graduates who were admitted to and attended various institutions, prediction of scholastic success, and relationships to this study. For the most part, the practice of admitting carefully selected younger students who were not graduated from high school has been highly successful in terms of scholastic performance of these students. The results of admitting older students, however, have not been so clear.

There are some institutions which allow anyone with a high school diploma to enter the freshman class. At these institutions the selection merely takes place after admission.

Those who reject the idea of selective admissions at the college level argue that everyone should have the opportunity to attend college. Some limit this by arguing only that every high school graduate should be admitted to the tax-supported college of his choice.

While accreditation may once have indicated something about the quality of a high school, clearly the failure rate of graduates of accredited high schools in our colleges reveals that it is not true at present that graduation from an accredited high school signifies that a student is able to do college-level academic work. High school graduation, therefore, is not necessarily essential to successful scholastic success in college. A properly motivated student of average aptitude who was not graduated from high school can, after three years of high school, compete successfully in college with high school graduates, though performance for the freshman year may be at a lower level.

The prediction studies show that of the several criteria that have been used to predict scholastic success, the high school grade average seems to be the most efficient single instrument. Most of the coefficients of correlation for the relationship of high school grade average and college success ranged from .60 to .70.

Attention was given in this study to a method of research appropriate to the analysis of the relationship of

certain factors to the scholastic success of the non-high school graduates who attended Texas Technological College from 1954 to 1964. The method used in this study has not been used previously in any of the literature and research reviewed.

CHAPTER III

PROCEDURES AND METHODOLOGY OF THIS STUDY

This study was an analysis of the relationship of certain selective factors to the scholastic success of non-high school graduates who attended Texas Technological College from 1954 to 1964.

This study was further limited to those non-high school graduates who had been graduated or had withdrawn from Texas Technological College as of June 1964.

With these limitations indicated, this chapter will present in developmental sequence the research, analytical and interpretative procedures employed in this study.

I. SELECTING THE STUDENTS

A total of 158 students who had not been graduated from high school were enrolled in Texas Technological College from the Fall Semester 1954 through the Spring Semester 1964. Seven of these students were excluded from the study because adequate statistical data were not available for them. The remaining 151 students were used in this study.

II. DETERMINING THE DATA

The data on the non-high school graduates were used to discover possible scholastic-success relationships between

these students according to definite variables. All of the data used in this study were those which were available on the student's permanent record card and from the files in the Testing and Counseling Center at Texas Technological College. The following data were available from the student's permanent record and utilized in this study: sex, age at time of admission, total number of high school units presented upon admission, number of semesters attended, total number of semester hours attempted, grade-point average by specific semester, total grade-point average, school in which enrolled within Texas Technological College, college major, degree earned, and size of high school attended.

From the files in the Testing and Counseling Center at Texas Technological College scores on the following tests were obtained and utilized in this study:

1. American Council on Education Psychological Examination: Quantitative, Linguistic, Total;
2. Co-Operative English Examination, Provisional Form OM: Usage, Spelling, Vocabulary, Total;
3. California Multiple Aptitude Test: Arithmetic Reasoning, Arithmetic Computation;
4. Otis-Gamma Mental Ability Test.

As indicated in Chapter I the data utilized in this study were obtained from the following sources at Texas Technological College:

1. Office of Admissions. The list of students comprising this study was obtained from the master audit volumes listing the students who enrolled at Texas Technological College from 1954 to 1964.

2. Office of the Registrar. The list of students obtained from the Office of Admissions was used to locate the permanent records of each student comprising this study from which the data were recorded.

3. Testing and Counseling Center. The list of students obtained from the Office of Admissions was then used to secure the scores each student comprising this study made on the test battery required by the Committee on Admissions at Texas Technological College for each non-high school graduate admitted to the college.

4. Directory of Secondary Day Schools[1] supplied the size of the high school attended by the students comprising this study.

III. RECORDING THE DATA

To facilitate the recording of the data a master work sheet was designed to contain all desired information on one

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[1]United States Department of Health, Education and Welfare, Directory of Secondary Day Schools, 1958-1959 (Washington: Office of Education, 1961).

side of a single sheet of paper 8½" x 11" in size. A copy of this master work sheet may be seen in Appendix A.

The data comprising this study were recorded on a separate master work sheet for each student. The following data were recorded for each student:

1. Sex
2. Age at time of admission
3. Total number of high school units presented upon admission
4. Number of semesters attended at Texas Technological College
5. Total number of semester hours attempted
6. Grade-point average by specific semester
7. Total grade-point average
8. School in which enrolled within Texas Technological College
9. College major
10. Degree earned
11. Size of high school attended
12. Scores on recognized selective tests:
    a. American Council on Education Psychological Examination: Quantitative, Linguistic, Total
    b. Co-Operative English Examination, Provisional Form OM: English Usage, Spelling, Vocabulary, Total
    c. California Multiple Aptitude Test: Arithmetic Reasoning, Arithmetic Computation

d. Otis-Gamma Mental Ability Test.

IV. PROCESSING THE DATA

The data were first analyzed in a factoral analysis of variance design using the general analysis of variance program written by Allan L. Heath[2] for use in the IBM 1620 computer. Table I gives a general experimental design for a six-factor mixed analysis of variance design. These variables include:

1. Sex
2. Age at time of admission
3. Total number of high school units presented upon admission
4. Size of high school attended
5. Scores on recognized selective tests:
   a. American Council on Education Psychological Examination: Quantitative, Linguistic, Total
   b. Co-Operative English Examination, Provisional Form OM: English Usage, Spelling, Vocabulary, Total
   c. California Multiple Aptitude Test: Arithmetic Reasoning, Arithmetic Computation
   d. Otis-Gamma Mental Ability Test

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[2]Allan L. Heath, Biometrical Services, ARS, IBM Library #6.0.090 (Beltsville, Maryland: Agricultural Research Center).

6. Replications.

The Factor column lists all of the factors analyzed in the experiment.

The column headed Level lists the divisions or levels of each factor.

The Code column refers to the manner in which the computer is shown which level of a factor is being considered. A numerical code of one through the total number of levels of each factor was used.

The I. D. column shows a meaningful identifying letter for each factor.

The Type column classifies the factors into either between or within subject factors.

The column headed Sort Order is coding for communication with the computer. It tells the computer the order in which to analyze the factors. Each factor was coded alphabetically.

The dependent variables are presented in Table II. In the first column the variables are identified, and in the second column the levels of the variables are shown.

A number of experiments were run using the general design shown in Table I with the various dependent variables in Table II used at various times as a score factor in the general design.

TABLE I

EXPERIMENTAL DESIGN

Factor	Level	Code	I.D.	Type	Sort Order
Sex	Male	1	X	B	A
	Female	2			
Age	20-29	1	A	B	B
	30-39	2			
	40+	3			
High School Units	0- 4	1	U	B	C
	5- 8	2			
	9-12	3			
	13-16	4			
High School Size	0- 99	1	S	B	D
	100-499	2			
	500+	3			
Test Scores	A.C.E.-Q	1	Z	W	E
	A.C.E.-L	2			
	A.C.E.-T	3			
	Coop. Eng.-U	4			
	Coop. Eng.-S	5			
	Coop. Eng.-V	6			
	Coop. Eng.-T	7			
	C.M.A.-R	8			
	C.M.A.-C	9			
	Otis-Gamma	10			
Replications	1	1	R	B	F
	2	2			
	3	3			
	4	4			

TABLE II

DEPENDENT VARIABLES

Variable	Level
Grade-Point Average	.00- .99 1.00-1.99 2.00-2.99 3.00-3.99 4.00
Number of Semesters Completed	Less than one One Two Three - to sixteen
Major Subject	Mathematics English History *
School	Agriculture Arts and Sciences Business Administration Engineering Home Economics
Degree Earned	B. S. B. A. B. B. A. M. S. M. A.

*See page 55 for complete listing of major subjects.

Preparing the Data for Analysis on the IBM 1620 Computer

A tally sheet was designed on a single sheet of paper 8½" x 11" in size on which the data were tallied in cells according to sex, age, high school units, and high school size. These tally sheets may be seen in Appendix B.

Block diagrams were then drawn for each of the four main effects which include sex, age at time of admission, high school units presented upon admission, and size of high school attended, and the interactions between these main effects.

From the data in the block diagrams graphs were drawn to depict the main effects and the interactions between the main effects.

Analysis of the Data

The data were analyzed using five programs for the IBM 1620 computer in succession as follows:

1. The independent variable fields were punched on cards using a Level Puncher Program developed by Charles Burdsal, Jr., a student at Texas Technological College.

2. The data, or dependent variables, were punched on the data cards on the second step using Burdsal's Data Converter Program.

3. The sums of the squares were then obtained in the third step using Heath's Analysis of Variance Program. This

pass gave the degrees of freedom, sums of squares, and mean squares for each independent variable individually, and for all combinations of the independent variables.

4. The means for each function separately and for all combinations for the factors were obtained in the fourth step using again Heath's Analysis of Variance Program.

5. In the fifth and final step Burdsal's F-Ratio Program was used to calculate the appropriate error terms, all F-Ratios, and to set up the analysis of variance tables showing the complete summary of the statistical results.

Factor Analysis

The data available on the non-high school graduates who attended Texas Technological College from 1954 through 1964 produced an unbalanced analysis of variance design. It was not possible to consider all independent or dependent variables simultaneously. A correlational factor analysis was made, therefore, in order to establish better the relationship between the variables.

All data collected were placed on IBM cards and programmed for a factor analysis. Only one pass through the IBM 1620 computer was made, using a Factor Analysis Program (MVAF) written by Dr. Don Veldman, Associate Professor of Educational Psychology at The University of Texas. This pass calculated the means, standard deviations, and

intercorrelations, and extracted the variance which produced the Principal Axis solution and the Varimax Rotation solution.

A complete list of variables with definitions follows:

1. Sex. Reference to male or female.
2. Age. The age of the non-high school graduate when admitted to Texas Technological College.
3. High school units. The total number of high school units the student presented upon admission to Texas Technological College.
4. Number of semesters. The number of semesters the student completed at Texas Technological College.
5. Total semester hours. The total number of semester hours completed by the student.
6. Total grade points. The total number of grade points accumulated by the student while attending Texas Technological College.
7. Grade-point average. The over-all grade-point average made by the student while attending Texas Technological College.
8. Major. The student's major field of study.
9. Degree. The completion of a prescribed course of study leading to the baccalaureate or Master's degree.
10. High school size. The size of the high school attended by the student.

11. American Council on Education Psychological Examination:

Quantitative. Measurement of the non-verbal reasoning ability of the student.

Linguistic. Measurement of the verbal reasoning ability of the student.

Total. Combination of the Quantitative and Linguistic scores as measurement of general reasoning ability.

12. Co-Operative English Examination:

Usage. Measurement of ability to use English grammar correctly.

Spelling. Measurement of ability to spell correctly.

Vocabulary. Measurement of ability to recognize and to use words correctly.

Total. Combination of the Usage, Spelling, and Vocabulary scores as measurement of general ability to use the English language.

13. California Multiple Aptitude Test:

Arithmetic Reasoning. Measurement of non-verbal ability to reason with numbers.

Arithmetic Computation. Measurement of ability to manipulate numbers.

14. Otis-Gamma Test of Mental Ability. Measurement of intelligence.

15. Semester entered. Fall or Spring Semester or Summer Session of admission.

16. Year entered. The year the student first entered Texas Technological College.

17. Major subjects. Major subjects ranked by three members of the Texas Technological College faculty according to importance of mathematics to each major. Combined results of the rankings are:

Mathematics	Pre-Nursing
Physics	Geology
Electrical Engineering	Advertising Art and Design
Mechanical Engineering	Elementary Education
Civil Engineering	Secondary Education
Petroleum Engineering	Business Education
Chemistry	Agriculture Education
Industrial Engineering	Agronomy
Accounting	Advertising
Finance	Applied Arts
Architecture	Pre-Law
Psychology	Government
Management	History
Industrial Management	English
Liberal Arts	Spanish
Marketing	Speech
Entomology	Home Economics Education
Retailing	Journalism
Animal Husbandry	Secretarial Administration
Economics	Non-Major
International Trade	Music
Pre-Medical	

V. PRESENTATION OF THE DATA

Chapter IV contains the complete results of the analysis of variance and the factor analysis.

CHAPTER IV

FINDINGS ON THE NON-HIGH SCHOOL GRADUATES

I. INTRODUCTION

This chapter presents data relating to the 151 non-high school graduates who attended Texas Technological College from 1954 to 1964. Four major areas are presented: a description of the characteristics of the subjects included in this study, the results of the tests of experimental hypothesis by the use of analysis of variance technique, a correlational factor analysis of the variables shown in Tables I and II (pages 49 and 50), and a descriptive summary of the distribution of degrees according to the school of enrollment.

II. STUDENT CHARACTERISTICS

The purpose of this section was to describe the characteristics of the 151 students included in this study. As was stated in Chapter III, block diagrams were drawn for each of the four main effects, which included sex, age, high school units, and high school size, and the interaction between these main effects. From the data in the block diagrams graphs were drawn depicting the main effects and the interactions between the main effects.

Hypothesis. There is a relationship between the variables and the academic success measures.

In order to test this hypothesis the Chi-Square test was administered to each of the main effects and the interactions. The four main effects tested separately, the first-order main effects interaction between sex and age, and age and high school size, and all third-order main effects interactions were significant. All other first-order main effects interactions and all second-order main effects interactions were not significant, but were included in this section in order that the complete picture may be seen. They were not commented upon. The block diagrams of the main effects and their interactions may be seen in Appendix A.

Sex main effect. Figure 1 shows that there were 117 male students and 34 female students included in this study. This effect was significant at the .001 level.

Age main effect. In Figure 2 it may be seen that 124 of the students were in their twenties, 17 were in their thirties, whereas only 10 were in their forties when they were admitted to Texas Technological College. The significance level was .001.

High school units main effect. In Figure 3 it is noted that about an equal number of the non-high school

FIGURE 1

SEX MAIN EFFECT

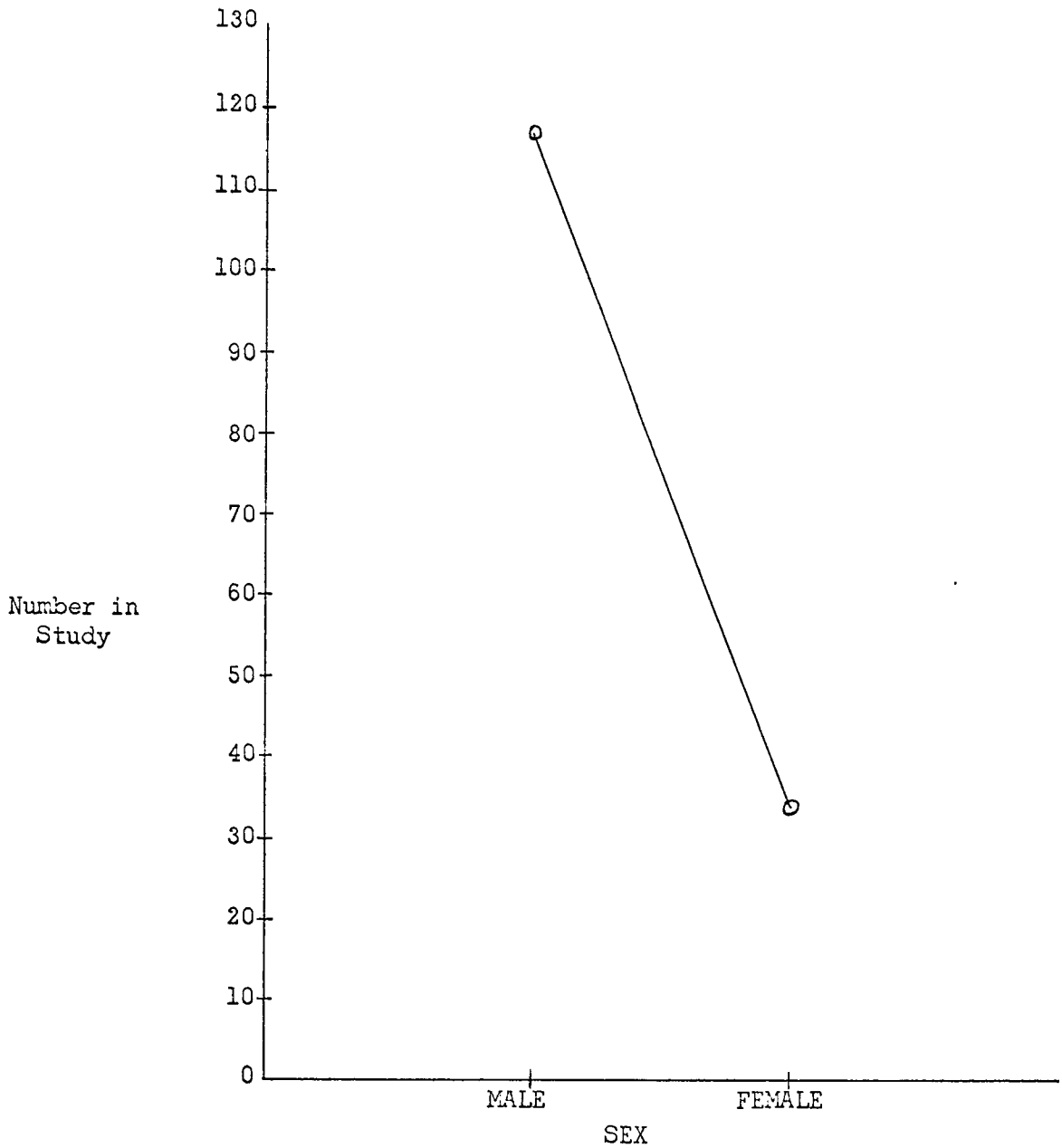


FIGURE 2

AGE MAIN EFFECT

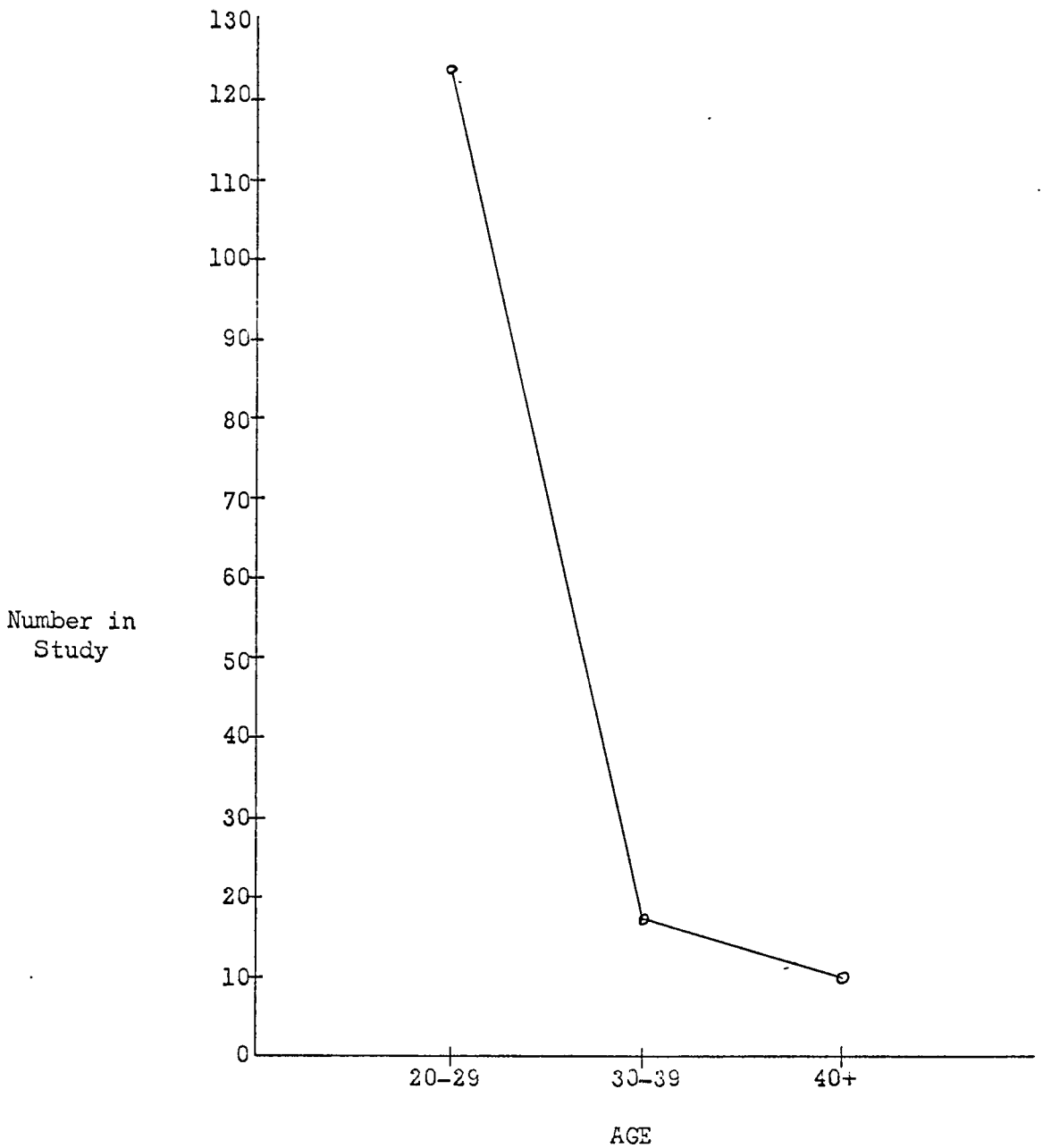
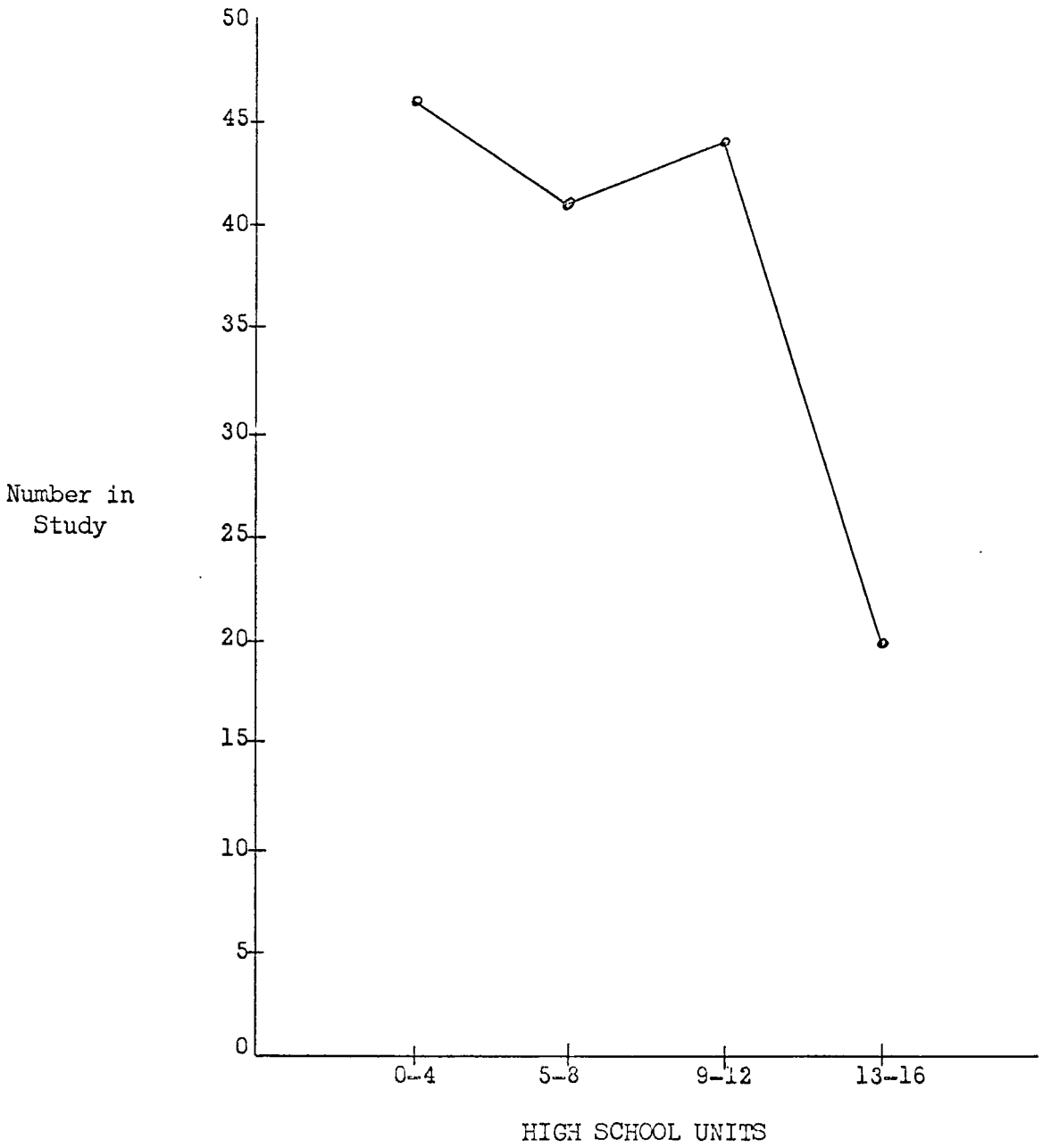


FIGURE 3

HIGH SCHOOL UNITS MAIN EFFECT



graduates included in this study had dropped out of high school while in the ninth, tenth, and eleventh grades. A disproportionate number dropped out during their senior year in high school. This was significant at the .001 level.

High school size main effect. Figure 4 indicates that the probability is that the non-high school graduates admitted to Texas Technological College will be from high schools of over 500 enrollment. The significance level was .01.

First-order main effects interaction between sex and age. Figure 5 indicates that the age effect, Figure 2, must be modified when sex is taken into account. A disproportionate number of the twenty-year-old non-high school graduates who were admitted to Texas Technological College were males rather than females. This was significant at the .01 level.

First-order main effects interaction between sex and high school units. This interaction as shown in Figure 6 was not significant.

First-order main effects interaction between sex and high school size. This interaction as shown in Figure 7 was not significant.

FIGURE 4

HIGH SCHOOL SIZE MAIN EFFECT

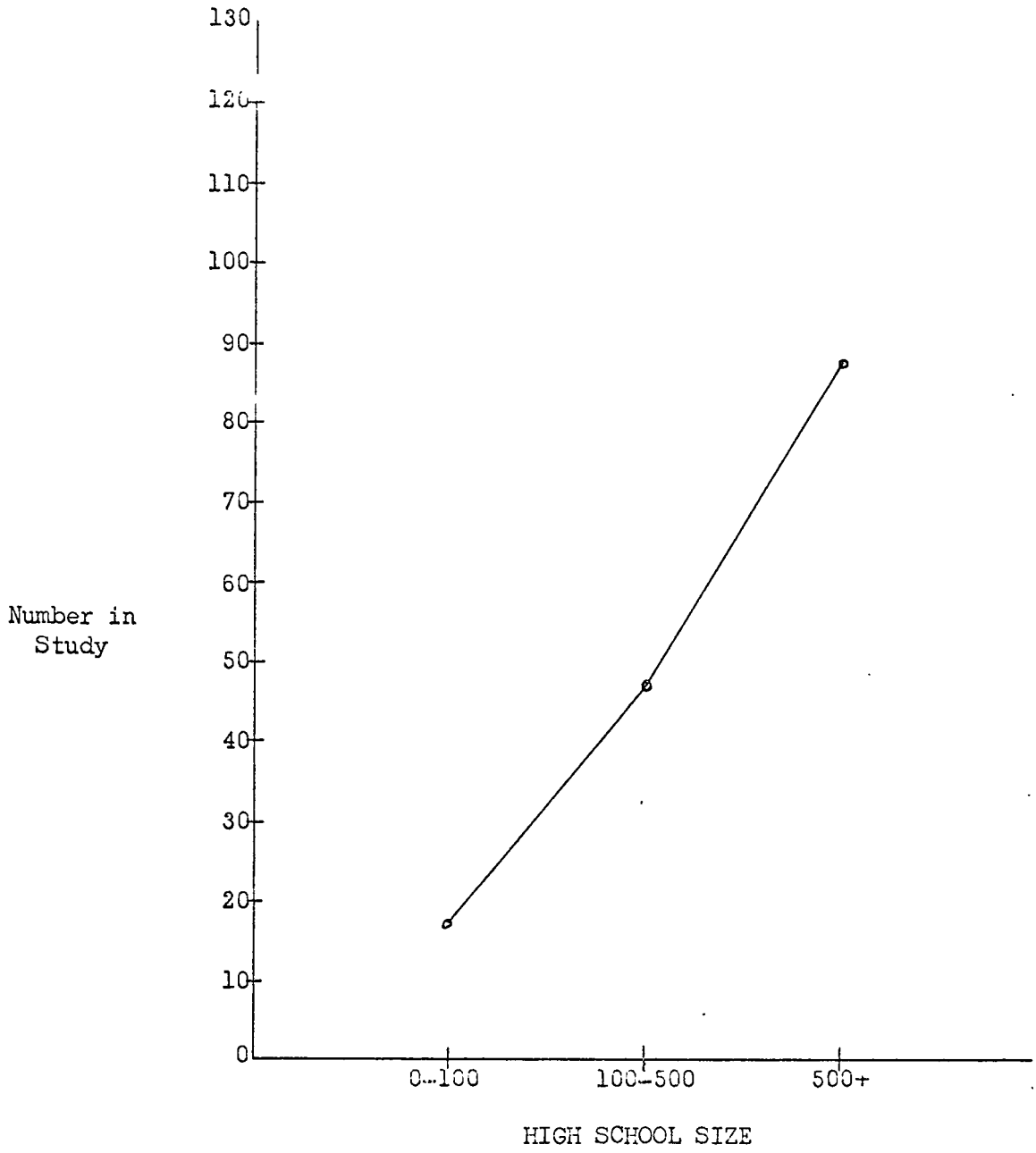


FIGURE 5

FIRST ORDER MAIN EFFECTS INTERACTION

SEX - AGE

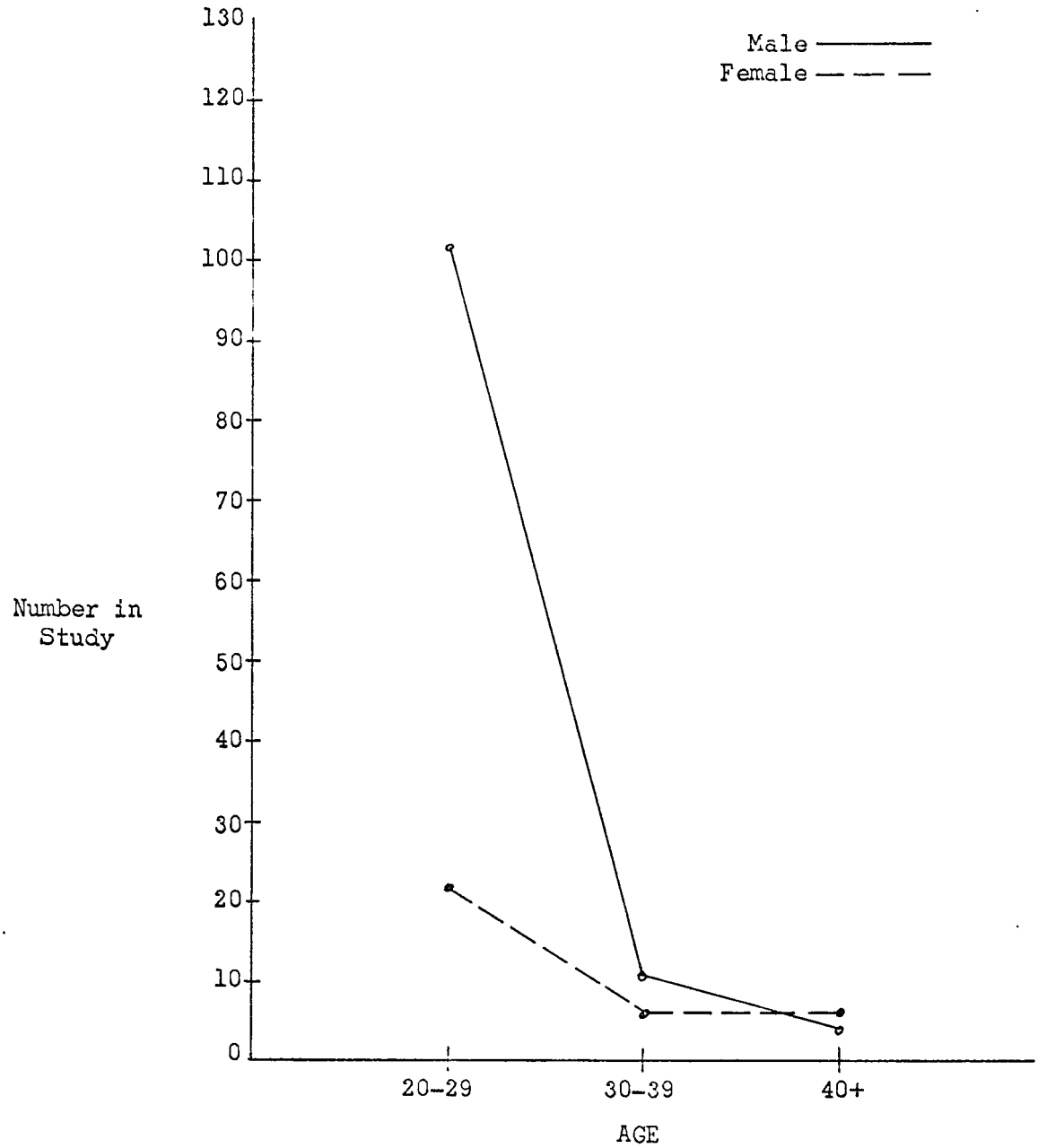


FIGURE 6

FIRST ORDER MAIN EFFECTS INTERACTION

SEX - HIGH SCHOOL UNITS

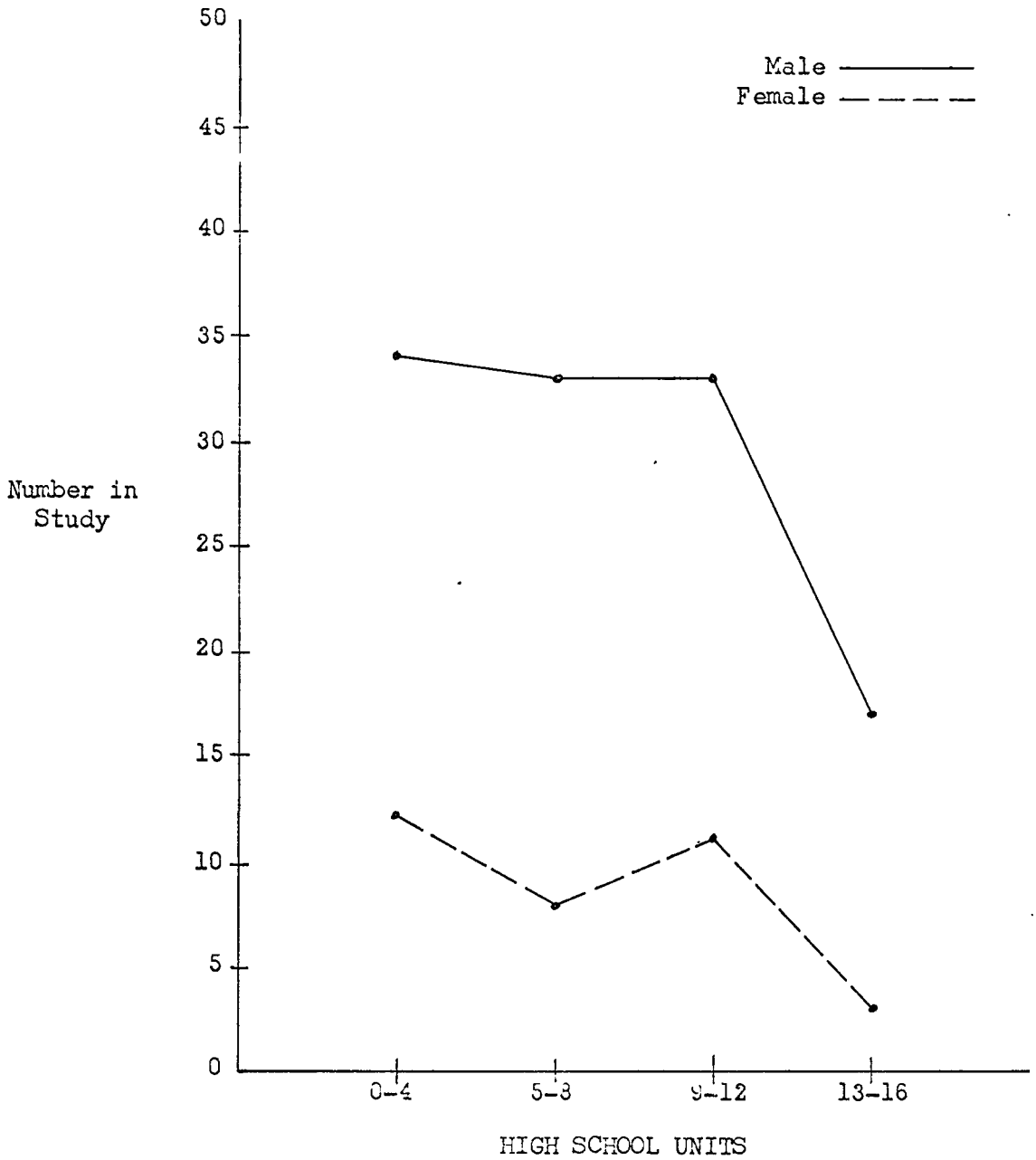
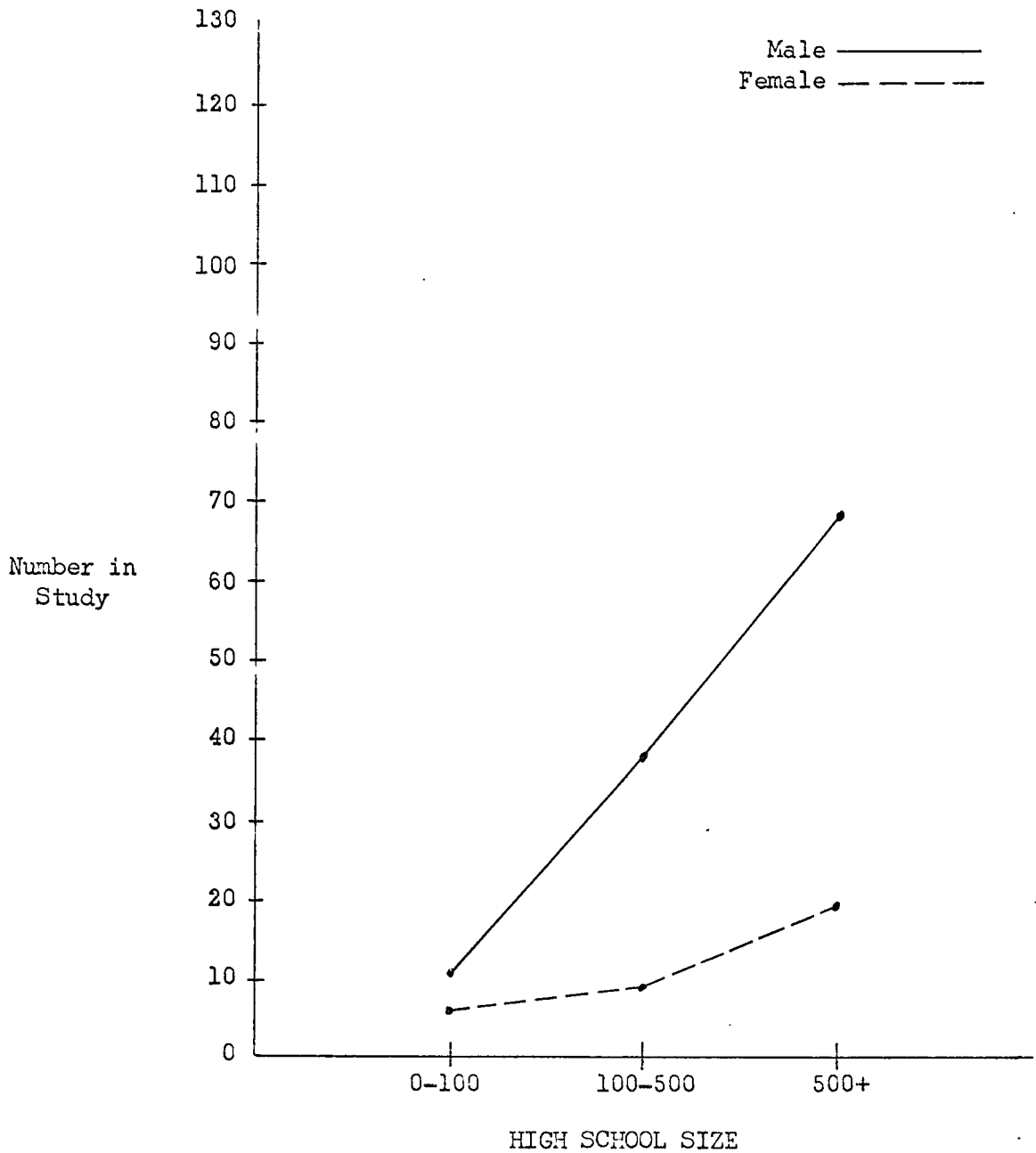


FIGURE 7

FIRST ORDER MAIN EFFECTS INTERACTION

SEX - HIGH SCHOOL SIZE



First-order main effects interaction between age and high school units. This interaction as shown in Figure 8 was not significant.

First-order main effects interaction between age and high school size. Figure 9, as does Figure 5, indicates that the age effect, Figure 2, must also be modified when the high school size is taken into account. The age effect is not equal for all high school sizes. The larger the high school, the more twenty-year-old males who are not graduated from high school apply for admission and are accepted at Texas Technological College. This was significant at the .05 level.

First-order main effects interaction between high school units and high school size. This interaction, shown in Figure 10, was not significant.

Second-order main effects interaction between sex, age, and high school units. This interaction as shown in Figure 11-A and Figure 11-B was not significant.

Second-order main effects interaction between sex, age, and high school size. This interaction as shown in Figures 12-A and 12-B was not significant.

Second-order main effects interaction between sex, high school units, and high school size. This interaction as shown in Figure 13-A and Figure 13-B was not significant.

FIGURE 8

FIRST ORDER MAIN EFFECTS INTERACTION

AGE - HIGH SCHOOL UNITS

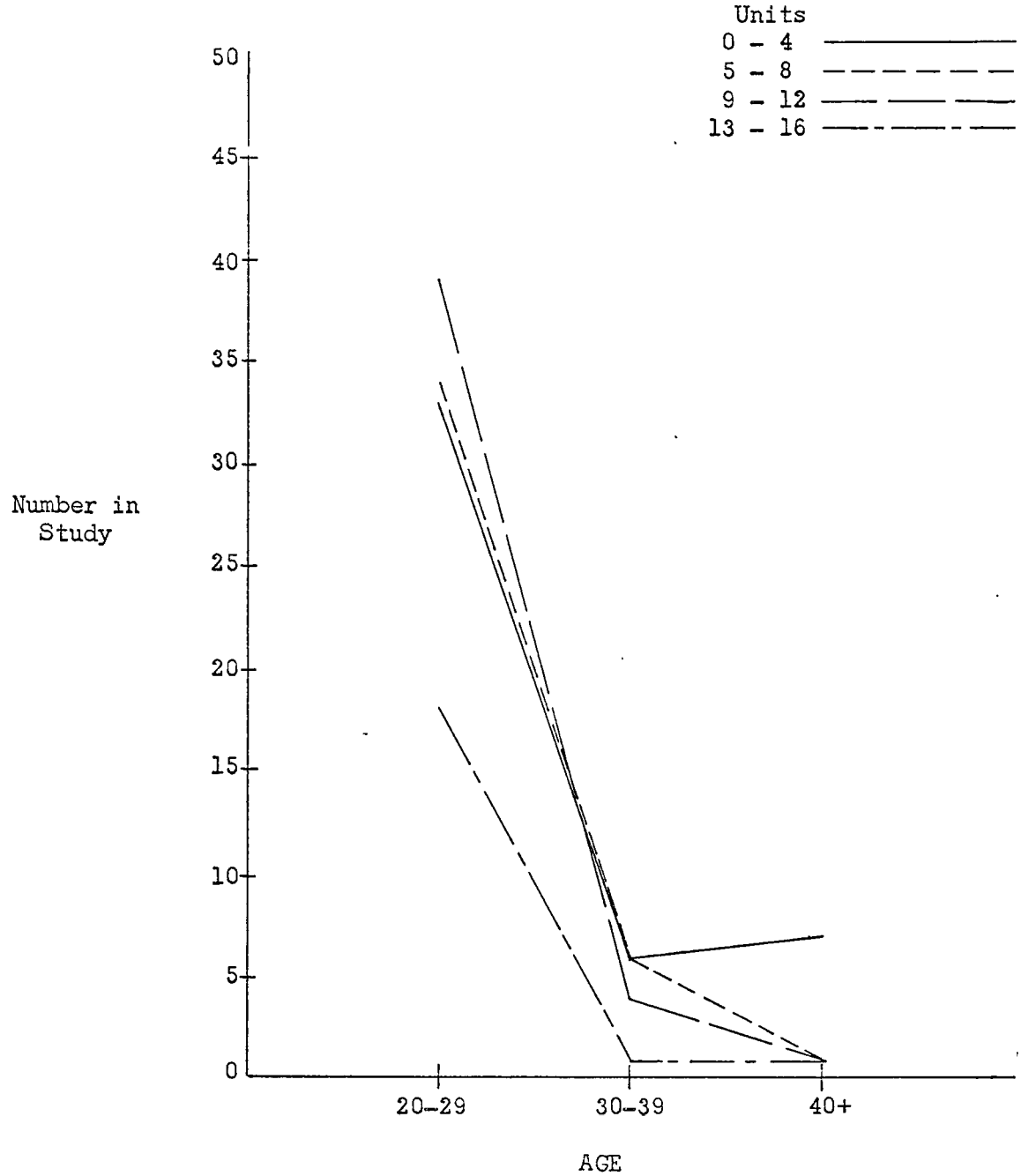


FIGURE 9

FIRST ORDER MAIN EFFECTS INTERACTION

AGE - HIGH SCHOOL SIZE

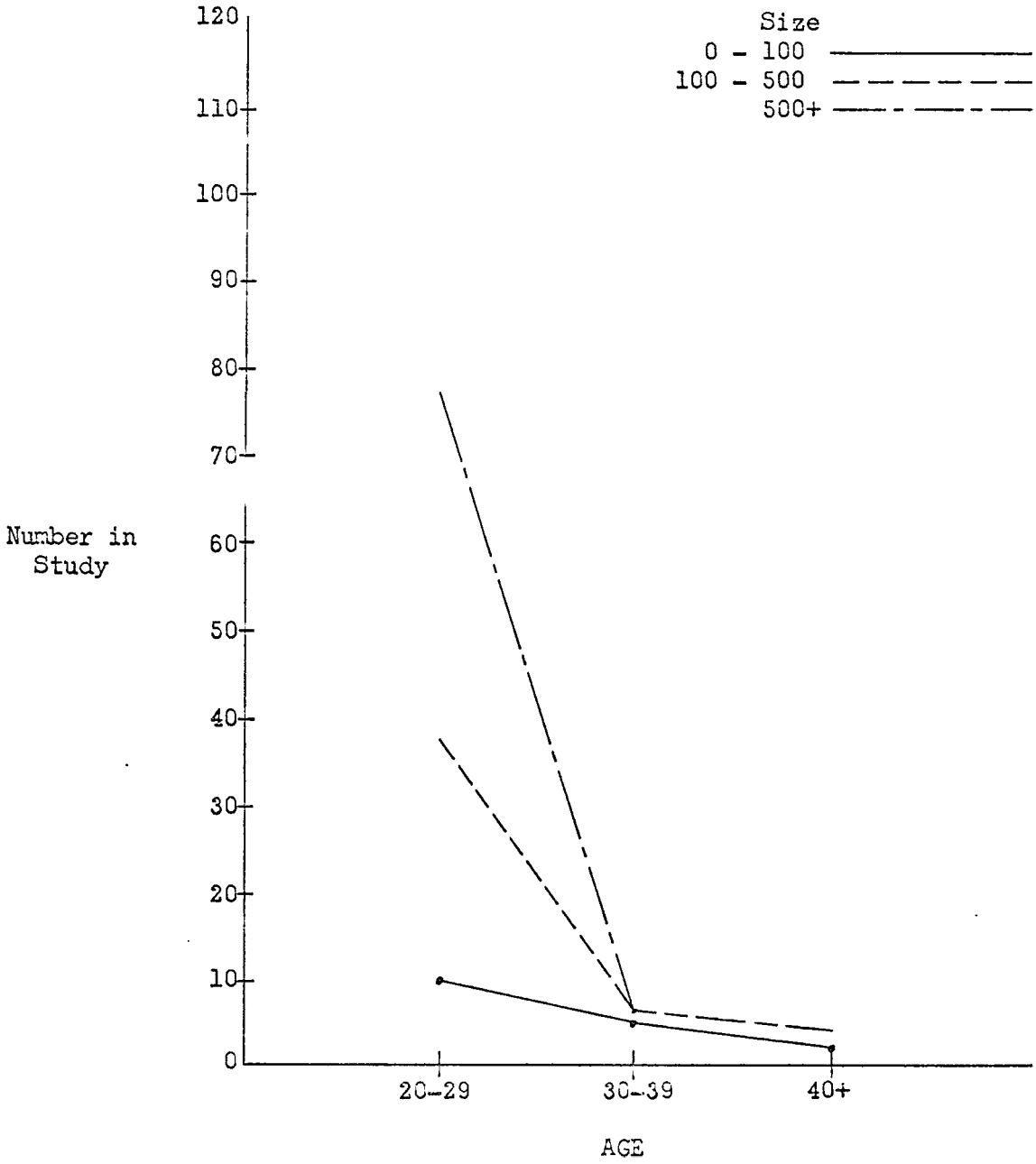


FIGURE 10

FIRST ORDER MAIN EFFECTS INTERACTION

HIGH SCHOOL UNITS - HIGH SCHOOL SIZE

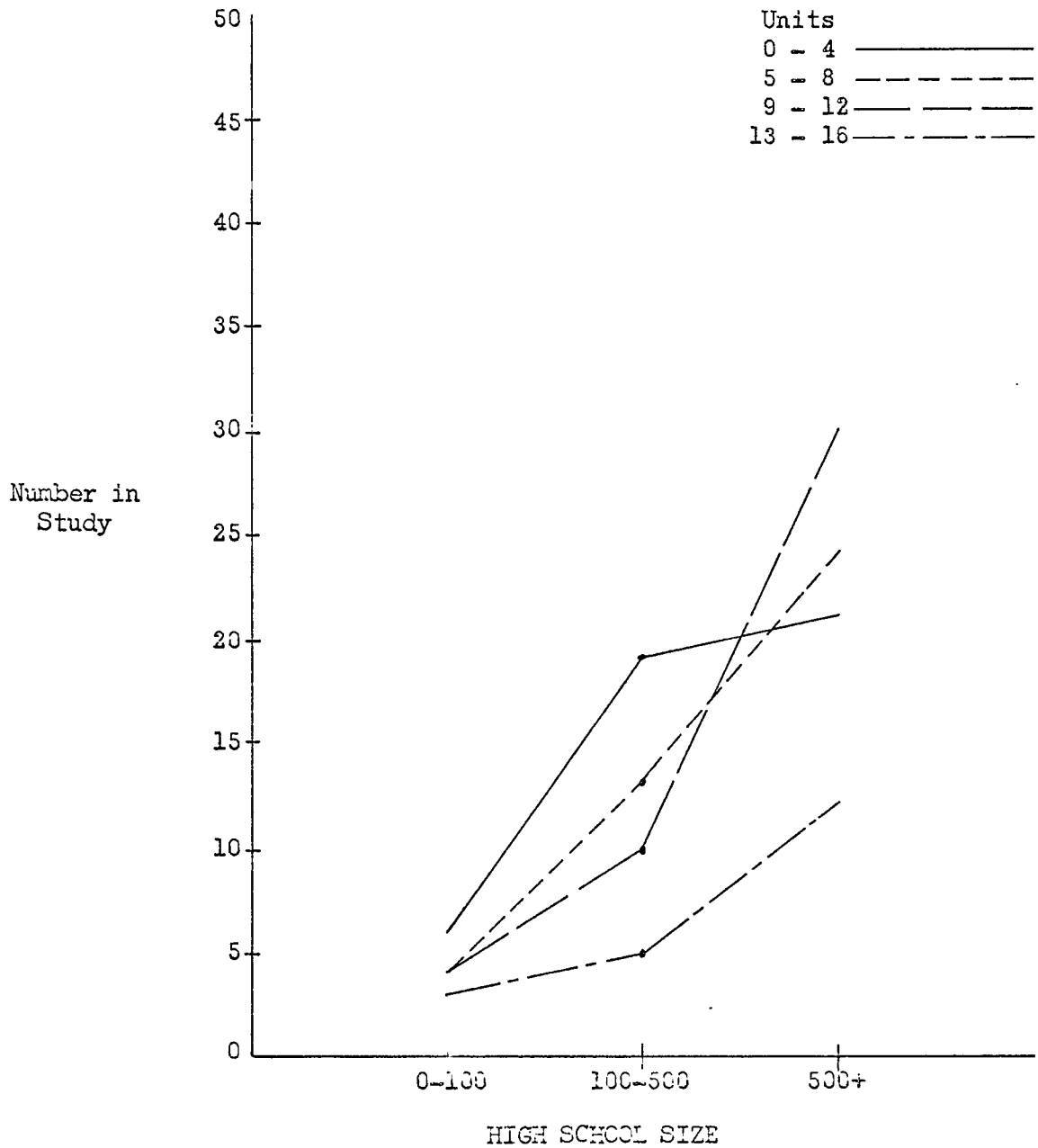


FIGURE 11-A

SECOND ORDER MAIN EFFECTS INTERACTION

SEX - AGE - HIGH SCHOOL UNITS

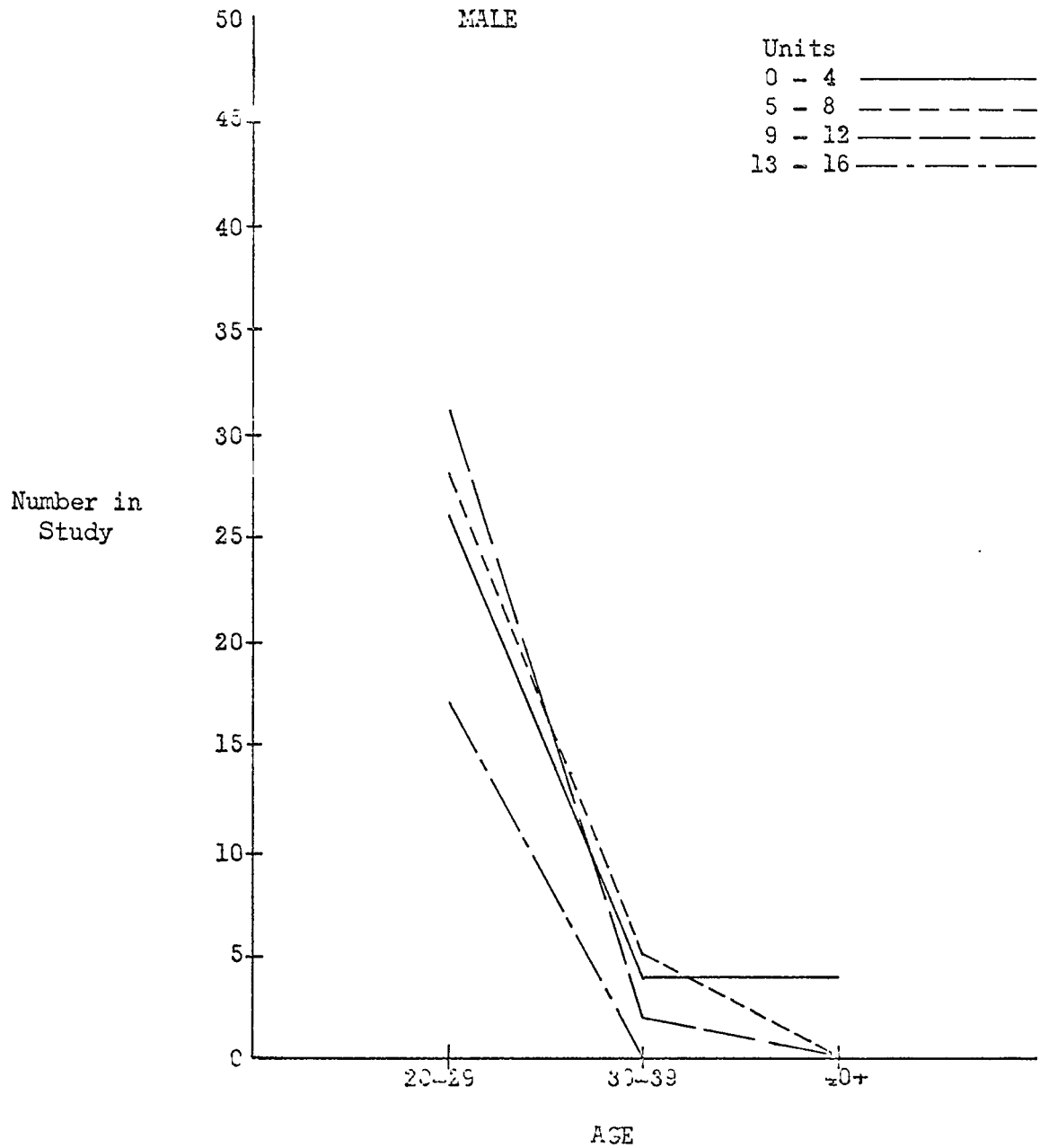


FIGURE 11-3

SECOND ORDER MAIN EFFECTS INTERACTION

SEX - AGE - HIGH SCHOOL UNITS

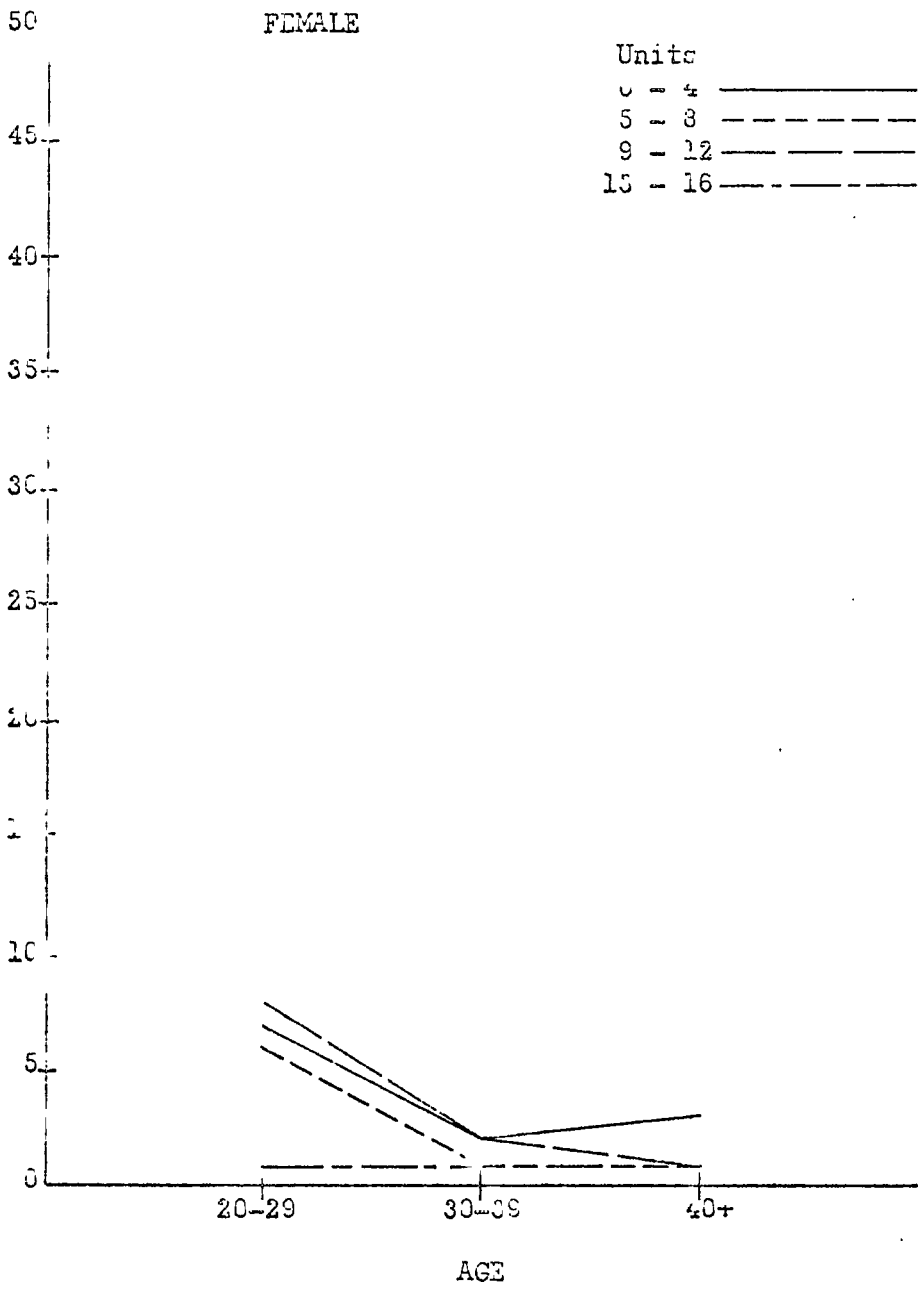


FIGURE 12-A

SECOND ORDER MAIN EFFECTS INTERACTION

SEX - AGE - HIGH SCHOOL SIZE

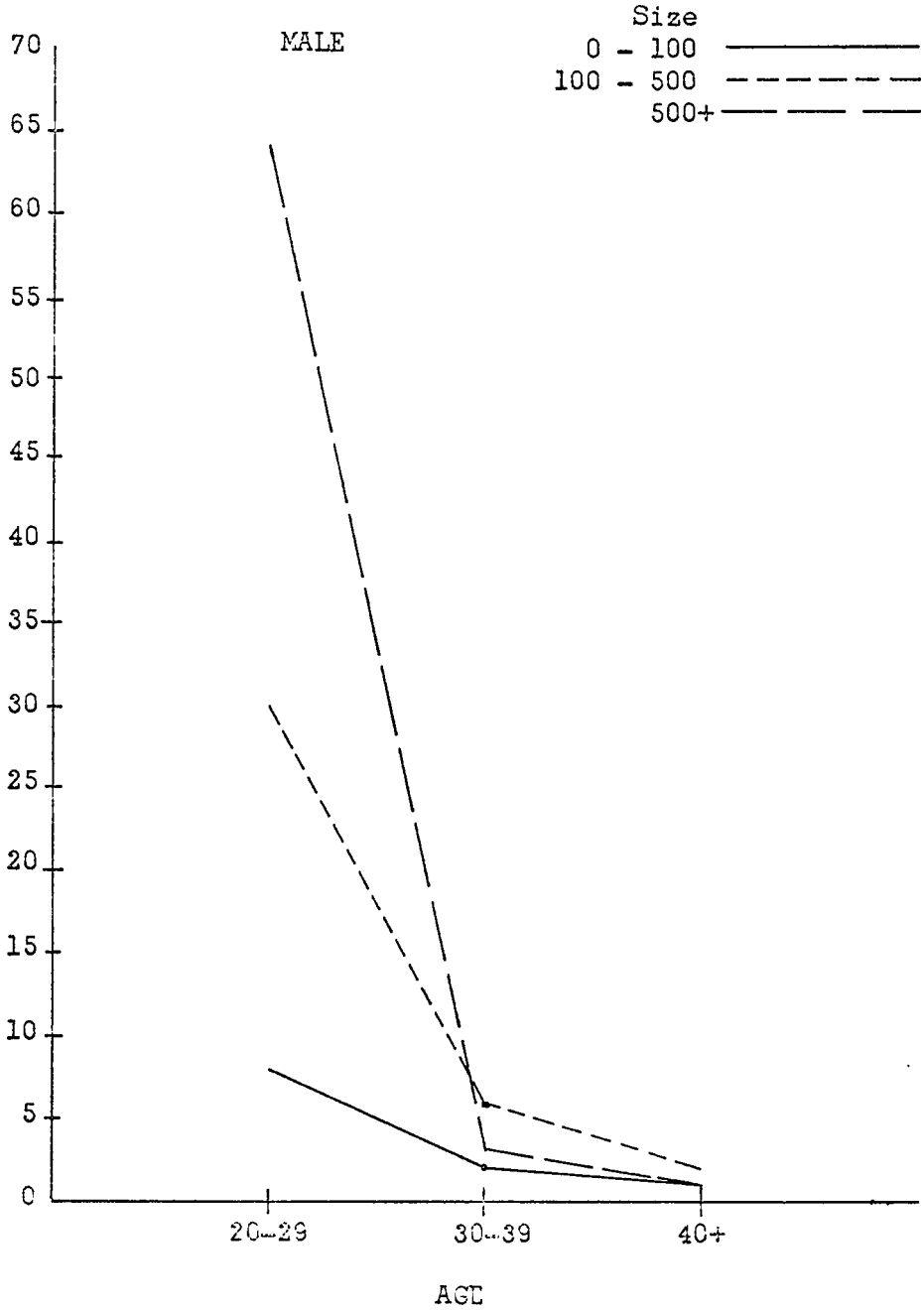


FIGURE 12-B

SECOND ORDER MAIN EFFECTS INTERACTION

SEX - AGE - HIGH SCHOOL SIZE

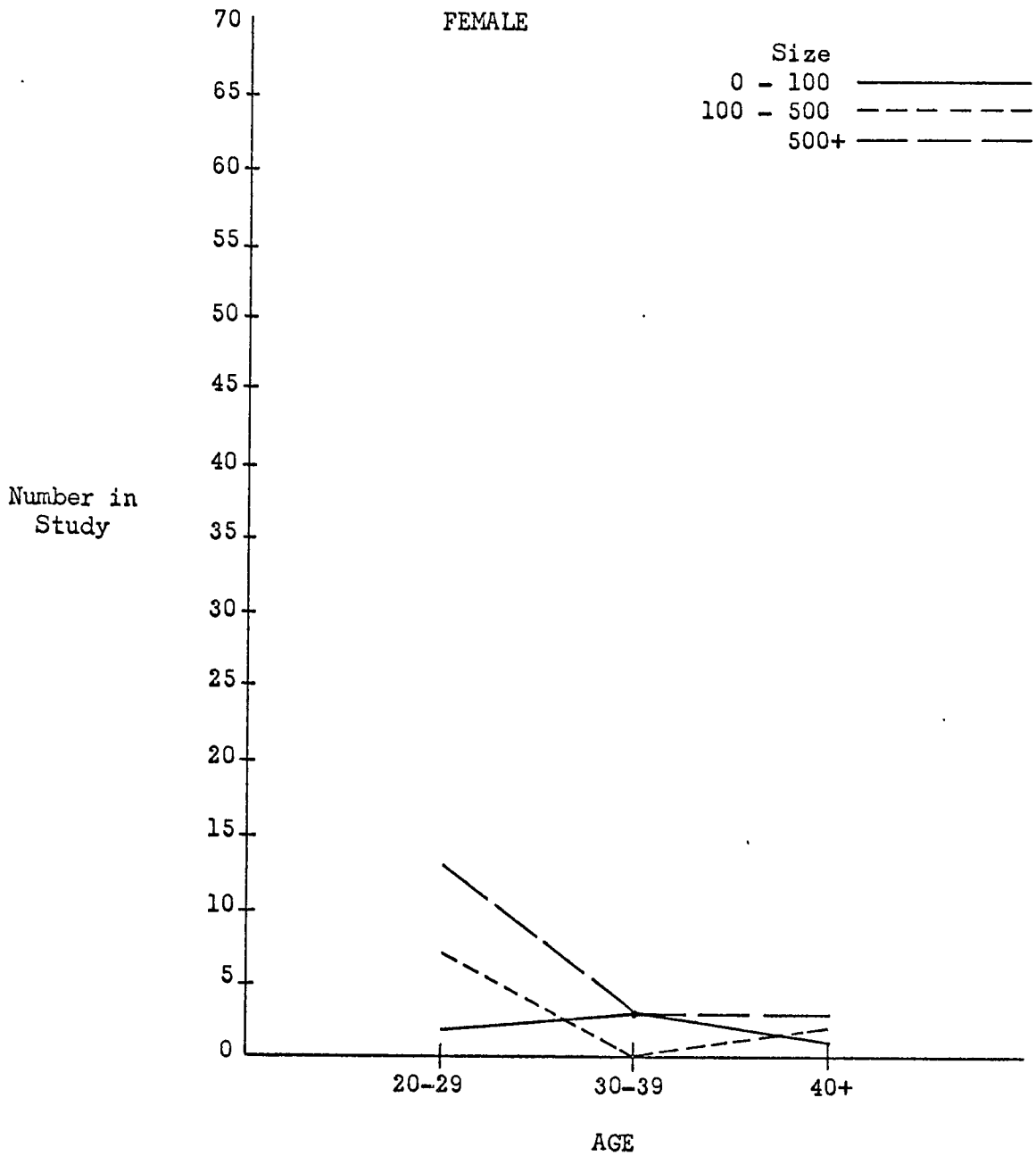


FIGURE 13-A

SECOND ORDER MAIN EFFECTS INTERACTION

SEX - HIGH SCHOOL UNITS - HIGH SCHOOL SIZE

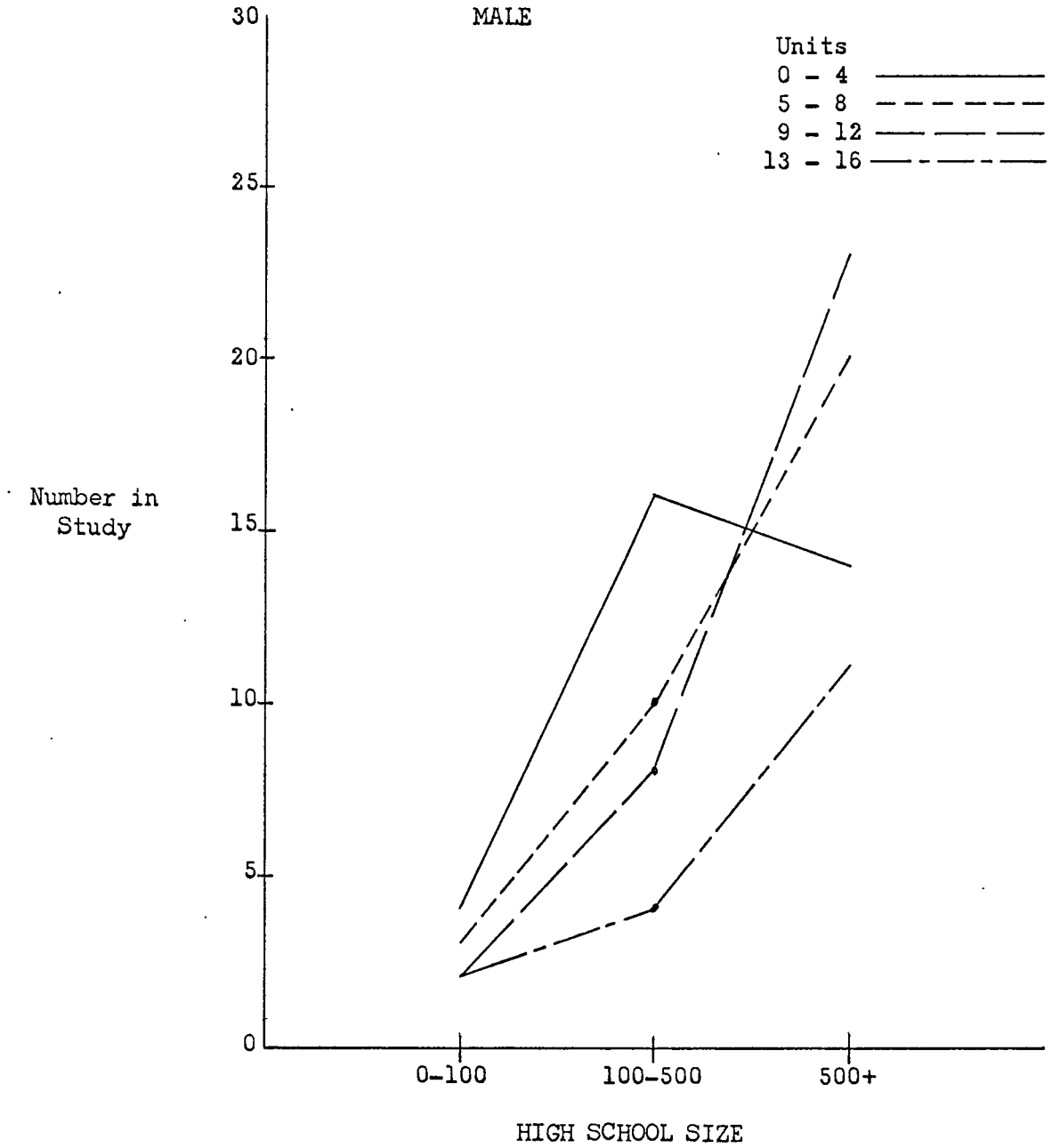
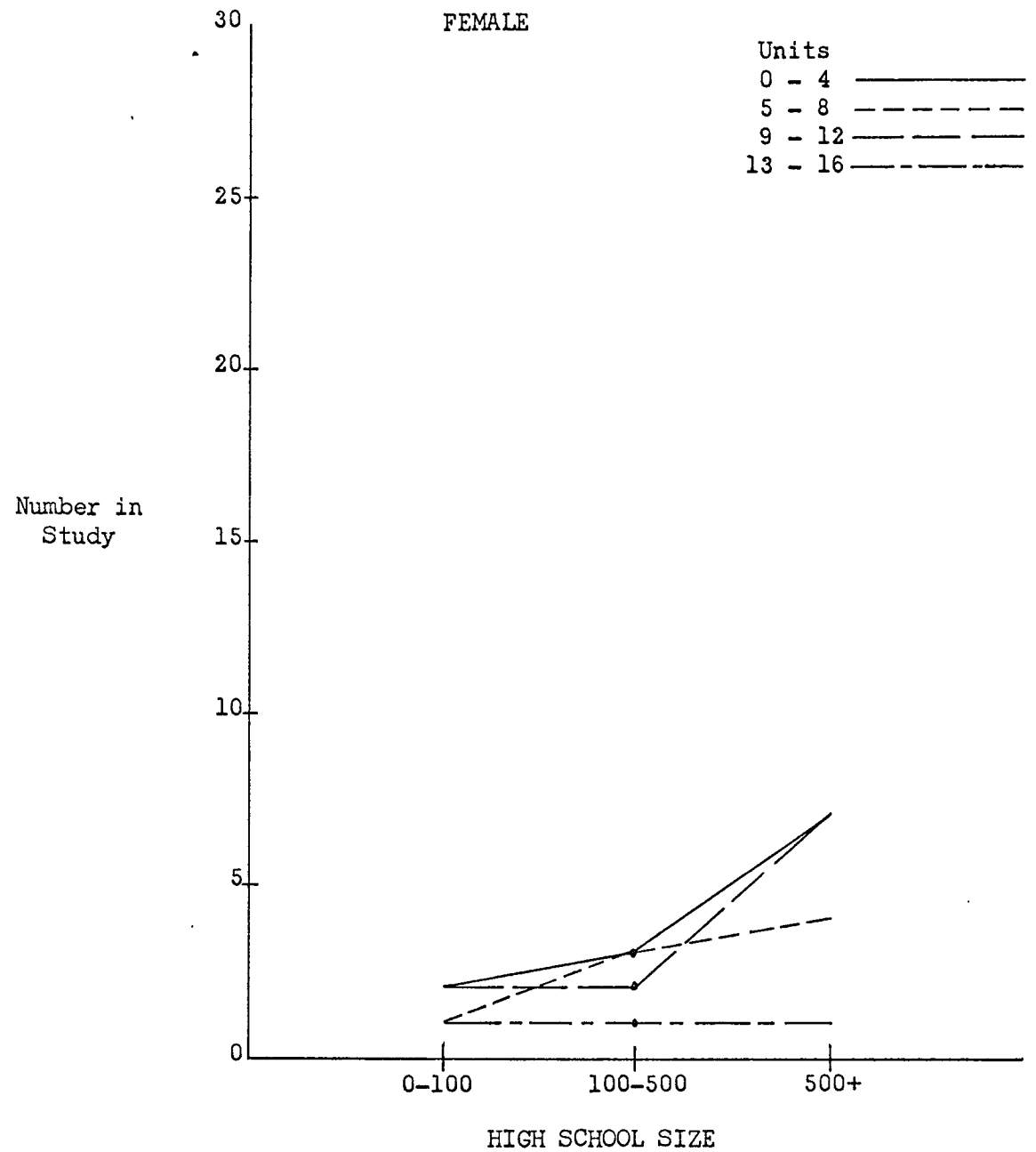


FIGURE 13-B

SECOND ORDER MAIN EFFECTS INTERACTION

SEX - HIGH SCHOOL UNITS - HIGH SCHOOL SIZE



Second-order main effects interaction between age, high school units, and high school size. This interaction as shown in Figure 14-A, Figure 14-B, and Figure 14-C was not significant.

Third-order main effects interaction between sex, age, high school units, and high school size. Figure 15-A, Figure 15-B, Figure 15-C, Figure 15-D, Figure 15-E, and Figure 15-F make it clear that the effects described and shown in the preceding figures must be carefully limited primarily to the twenty-year-old group and especially to the twenty-year-old males. This was significant at the .01 level.

III. ANALYSIS OF VARIANCE

This section shows the results of the tests of the experimental hypothesis that there would be a relationship between certain of the variables and the academic-success measures. The total number of subjects available for this study was relatively small and unevenly divided as to sex, age, size of the high school from which they came, and the number of high school units presented when admitted to Texas Technological College. A total of 151 non-high school graduates who attended Texas Technological College from 1954 to 1964 were included in this study. It was not possible to consider all of the variables simultaneously. Only limited

FIGURE 14-A

SECOND ORDER MAIN EFFECTS INTERACTION

AGE - HIGH SCHOOL UNITS - HIGH SCHOOL SIZE

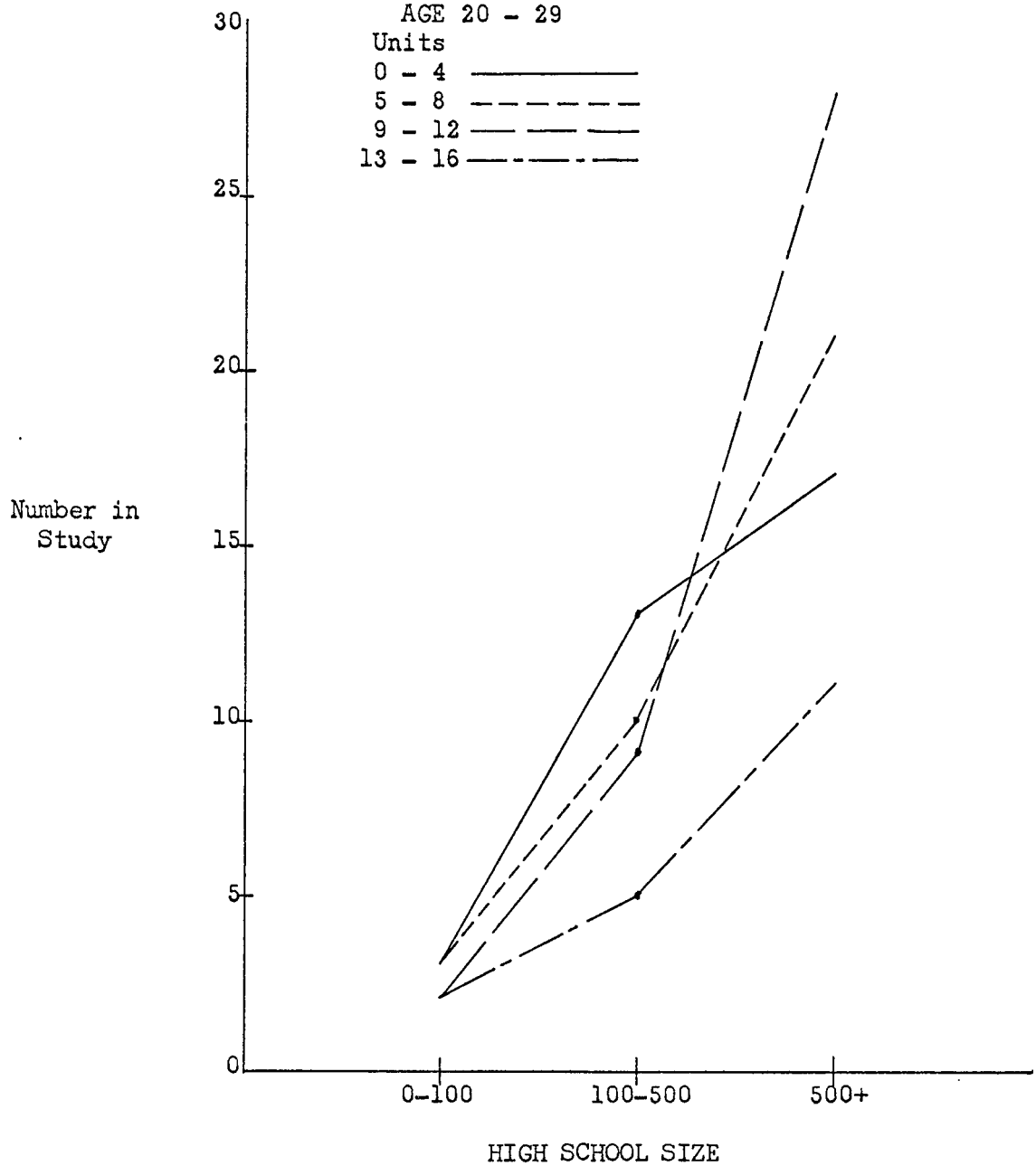


FIGURE 14-B

SECOND ORDER MAIN EFFECTS INTERACTION

AGE - HIGH SCHOOL UNITS - HIGH SCHOOL SIZE

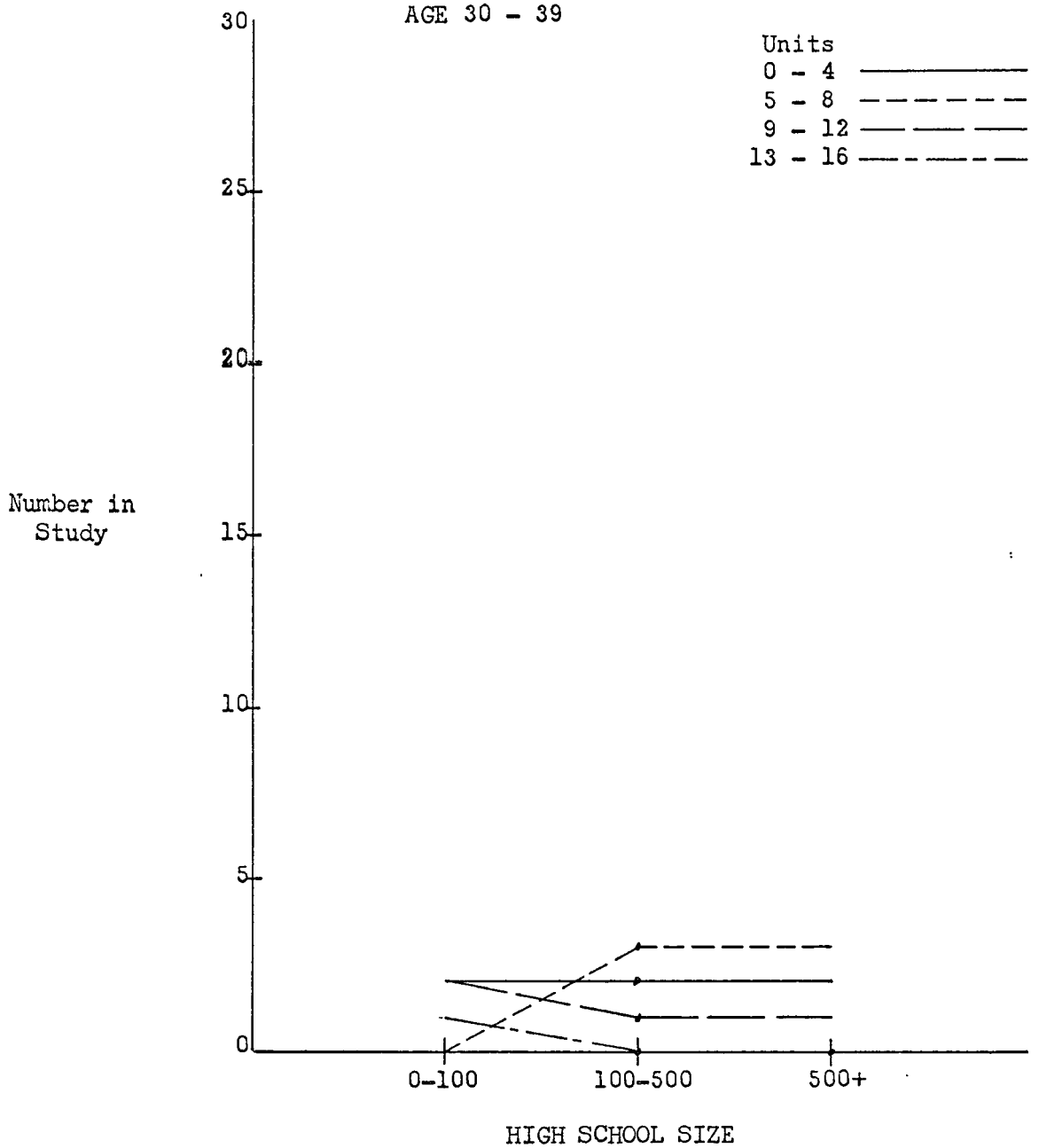


FIGURE 14-C

SECOND ORDER MAIN EFFECTS INTERACTION

AGE - HIGH SCHOOL UNITS - HIGH SCHOOL SIZE

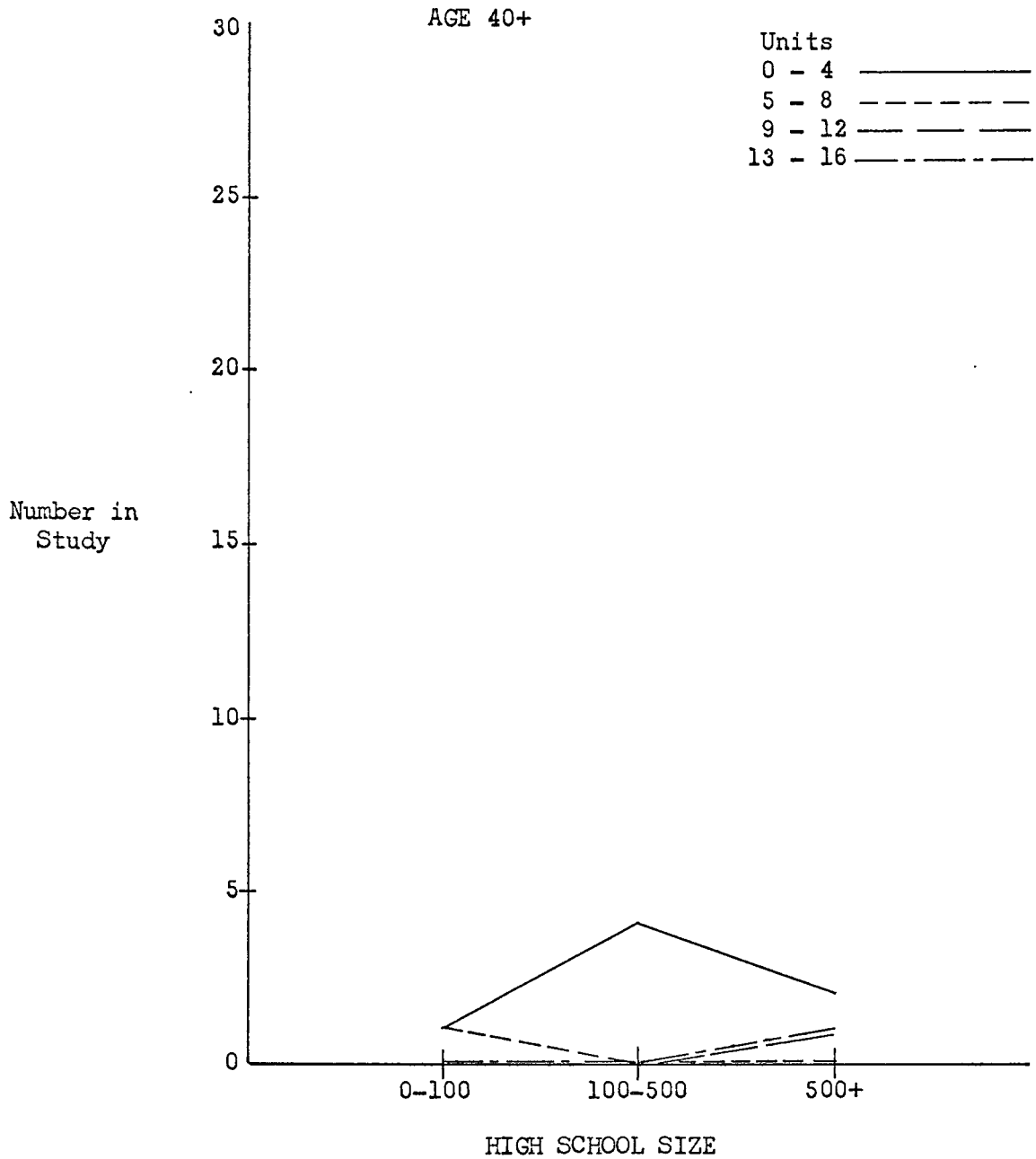


FIGURE 15-A

THIRD ORDER MAIN EFFECTS INTERACTION

SEX - AGE - HIGH SCHOOL UNITS - HIGH SCHOOL SIZE

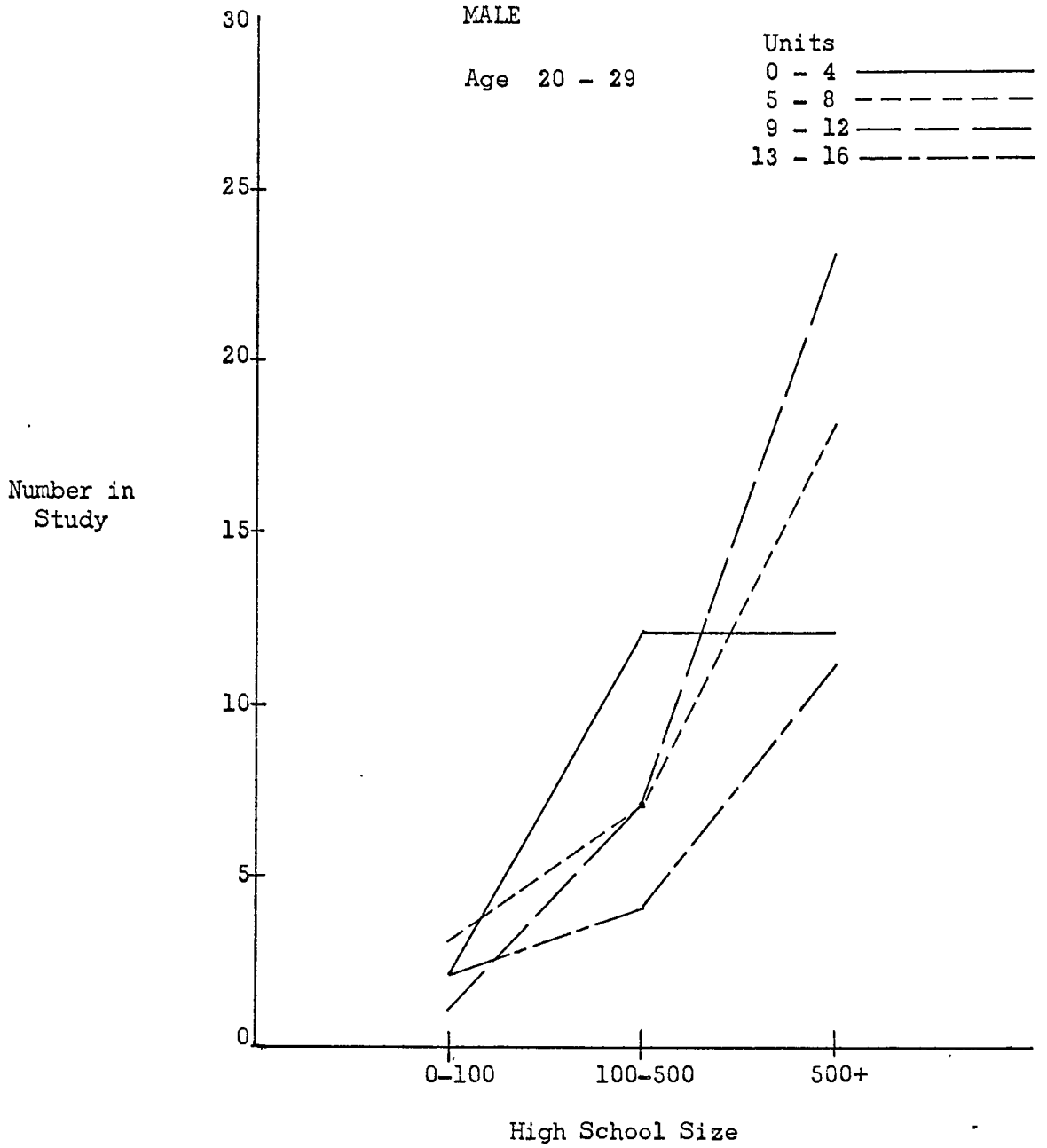


FIGURE 15-B

THIRD ORDER MAIN EFFECTS INTERACTION

SEX - AGE - HIGH SCHOOL UNITS - HIGH SCHOOL SIZE

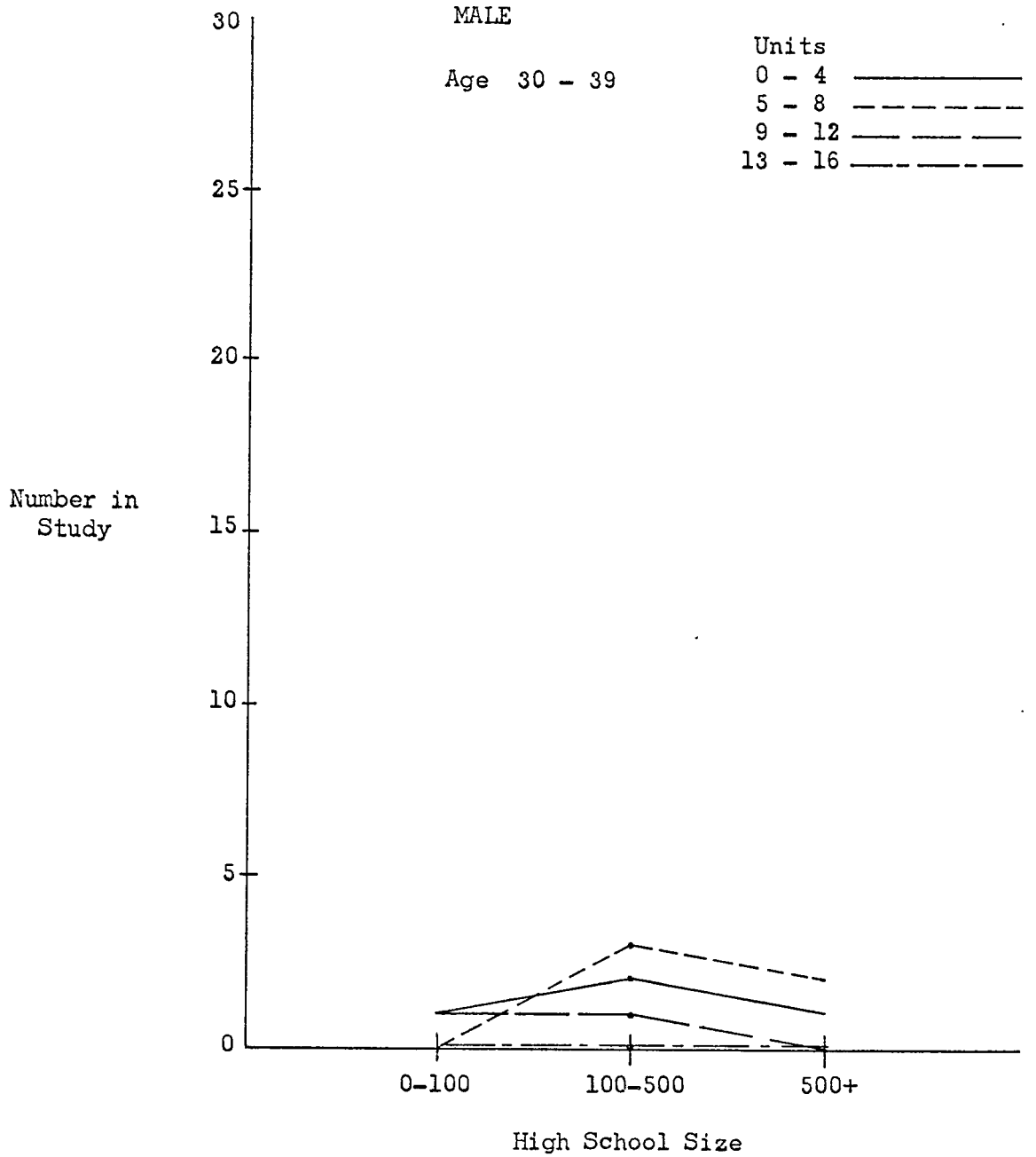


FIGURE 15-C

THIRD ORDER MAIN EFFECTS INTERACTION

SEX - AGE - HIGH SCHOOL UNITS - HIGH SCHOOL SIZE

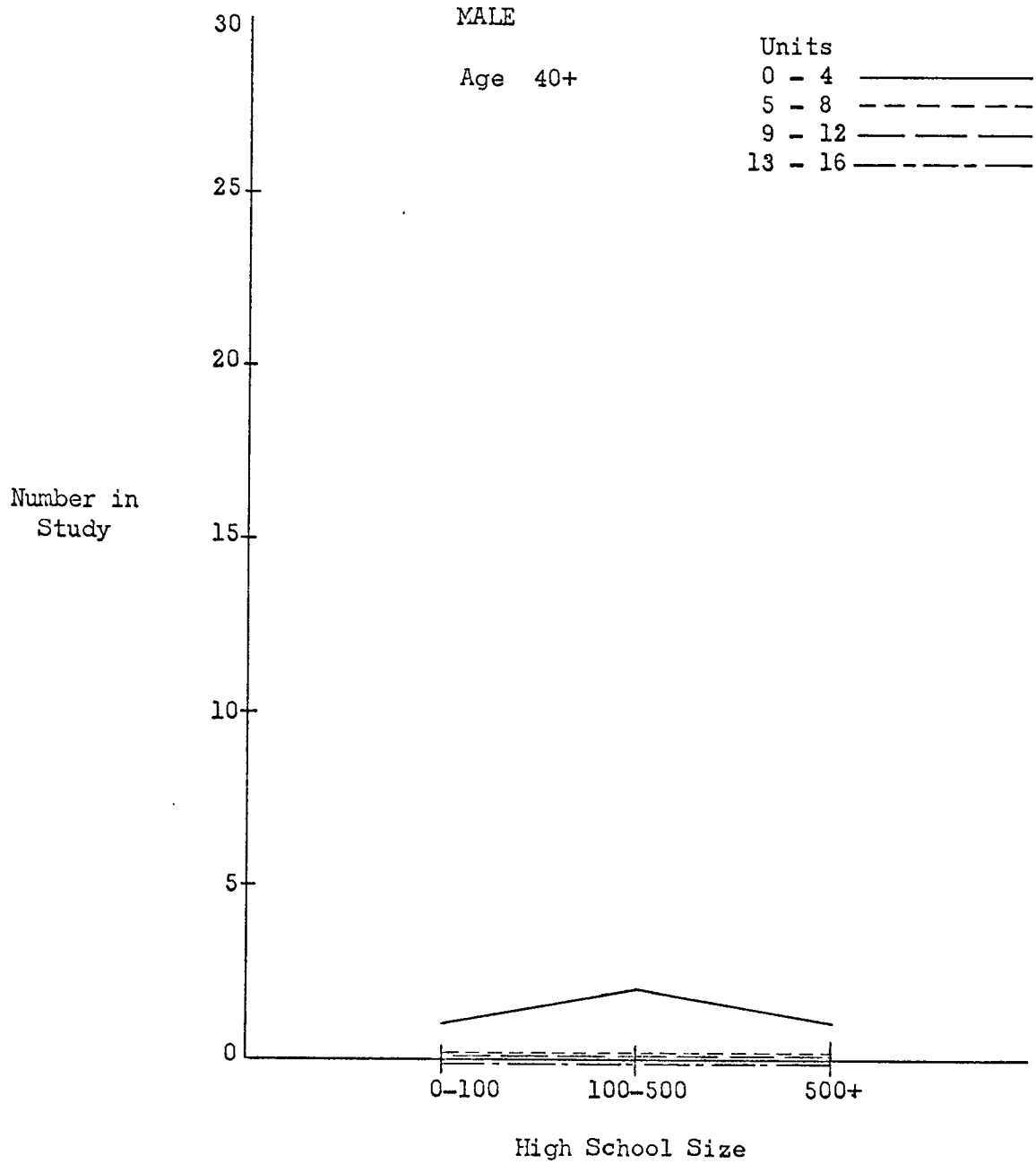


FIGURE 15-D

THIRD ORDER MAIN EFFECTS INTERACTION

SEX - AGE - HIGH SCHOOL UNITS - HIGH SCHOOL SIZE

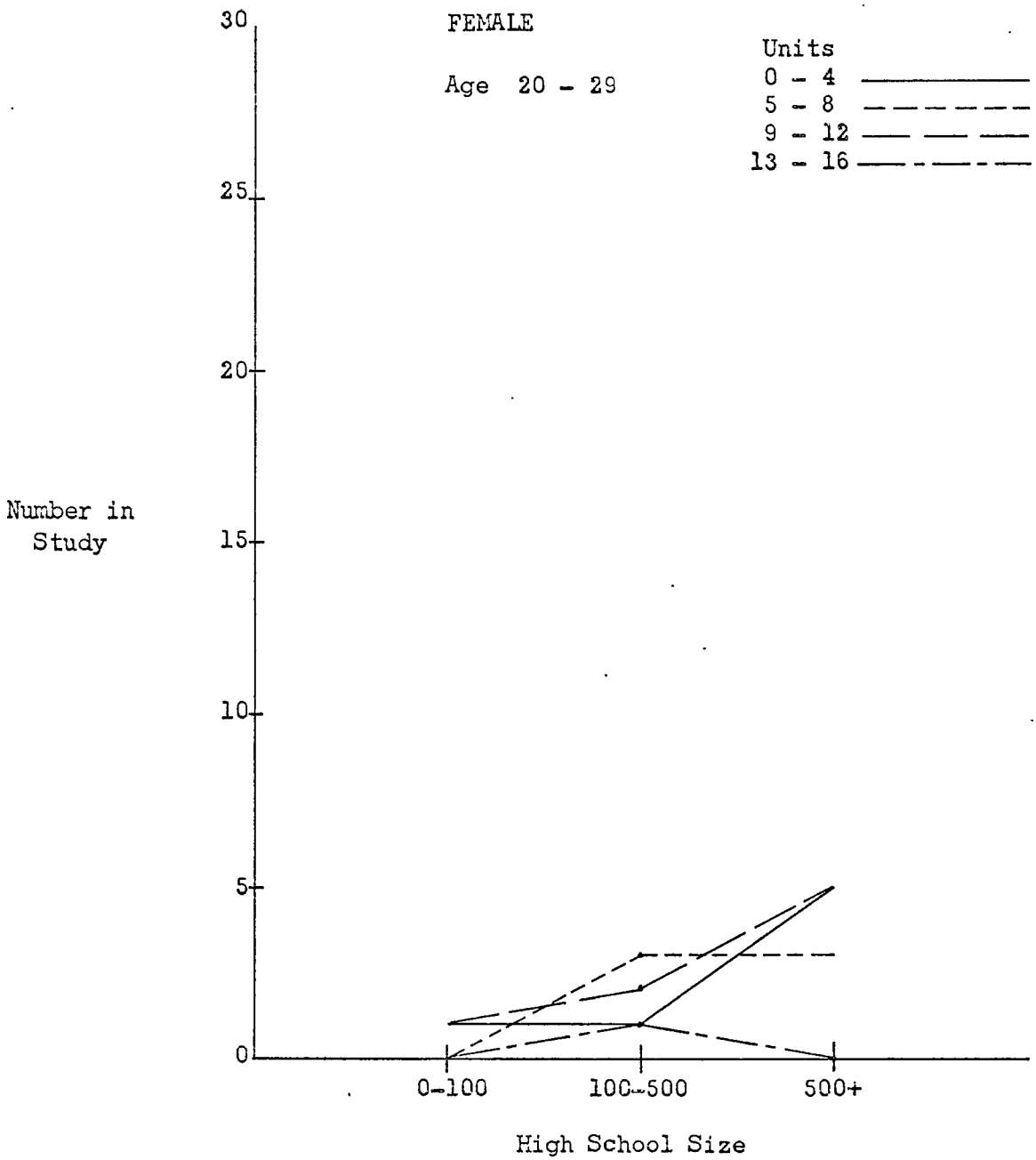


FIGURE 15-E

THIRD ORDER MAIN EFFECTS INTERACTION

SEX - AGE - HIGH SCHOOL UNITS - HIGH SCHOOL SIZE

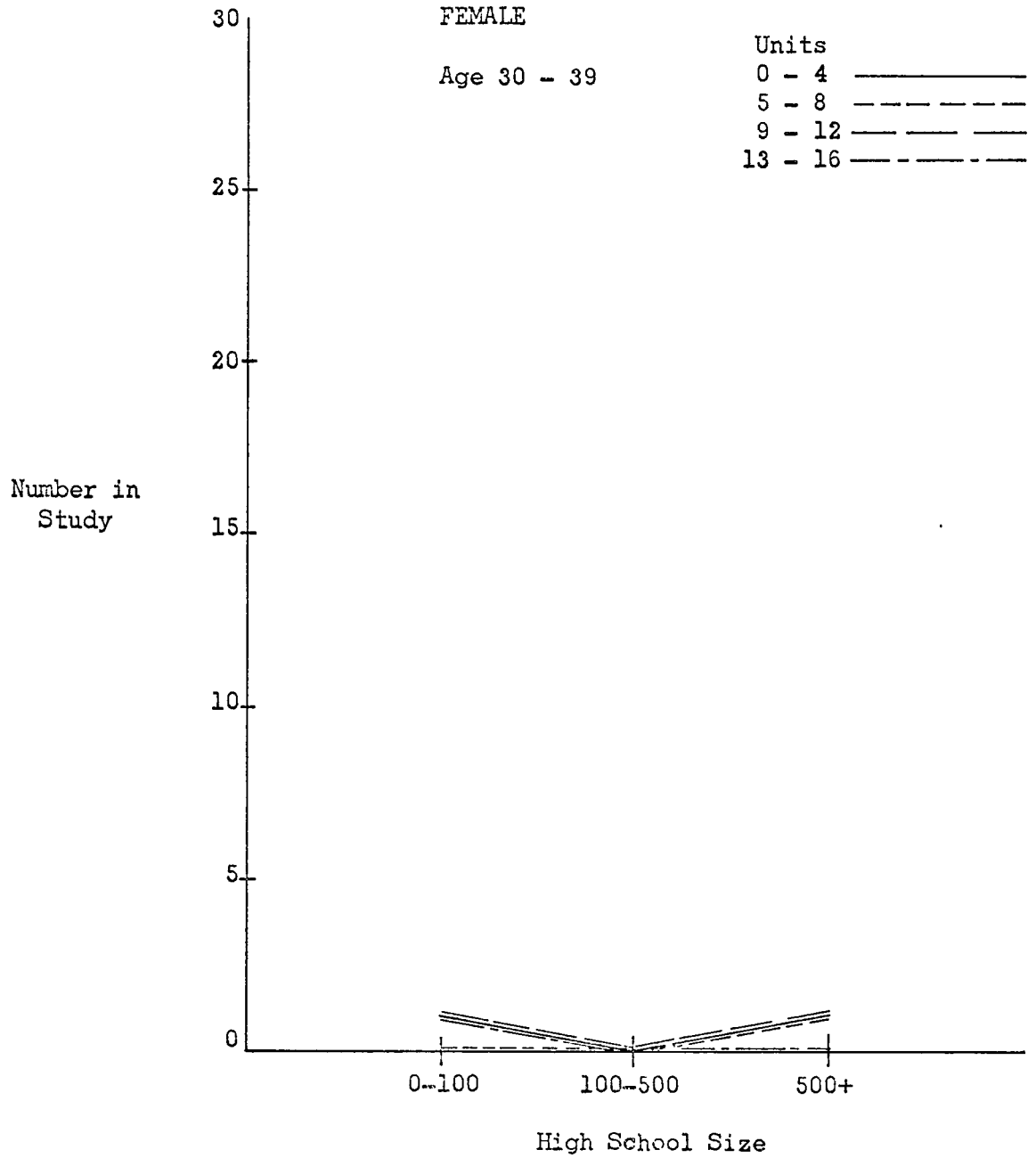
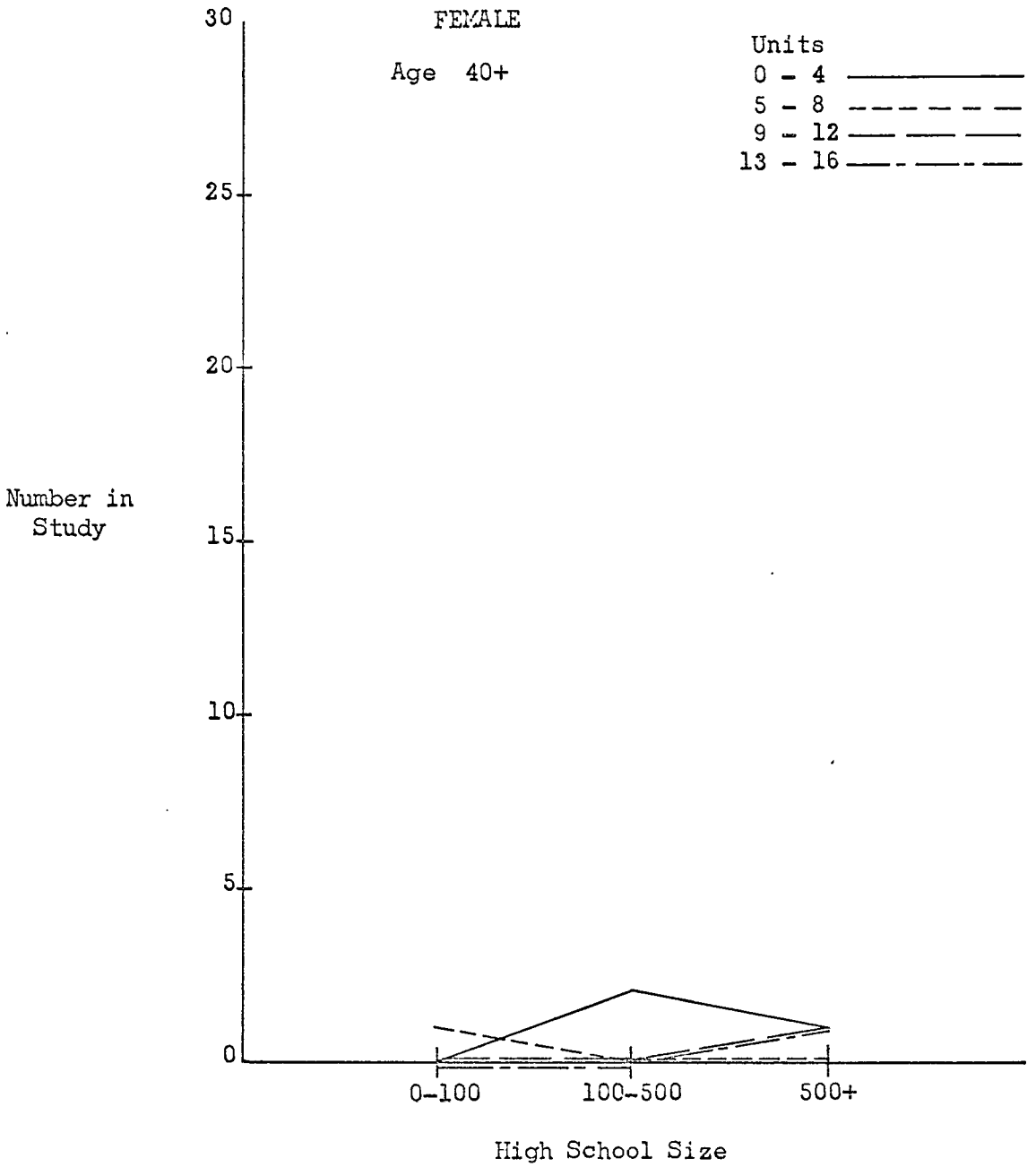


FIGURE 15-F

THIRD ORDER MAIN EFFECTS INTERACTION

SEX - AGE - HIGH SCHOOL UNITS - HIGH SCHOOL SIZE



tests of the hypothesis were possible therefore. In this section those limited tests of the hypothesis were made selectively in those cells where sufficient subjects existed to satisfy a balanced analysis of variance design. Four analyses were made.

Analysis I. Table III shows the data used in this analysis. This design was made possible only by pooling the high school sizes into two classes--below and above 500 enrollment. With this division there were enough male students in the twenty-year-old range distributed equally over the high school unit levels to make possible four replications, or four independent subjects per cell.

In Table III column one gives the subject's number in the whole study. Column two gives his replication number for this particular analysis. Columns three, four, five, and six are some of the data available for these subjects.

Three different runs through the computer were made. On the first run a multivariate analysis was made using the data in columns three and six. On the second run a univariate analysis was made using the data in column three. A univariate analysis was again made on the third run using the data from column six.

Table IV shows the design used in Analysis I. The Factor column lists all of the factors analyzed in this experiment. The column headed Level lists the divisions,

TABLE III

ANALYSIS I--DEPENDENT VARIABLES--MALES, 20 TO 29, HIGH SCHOOL SIZE OF 100+

Study No.	Rep. No.	G.P.A.	School	Major	No. Sem.	H. S. Units	Study No.	Rep. No.	G.P.A.	School	Major	No. Sem.
24	1	0.00	A & S	Chem.	1		27	1	.50	B. A.	Acct.	2
32	2	0.00	A & S	N/M	1		75	6	1.27	Eng.	M. E.	3
106	7	0.00	Agri.	Ento.	1	0- 4	89	7	0.00	B. A.	Acct.	1
127	9	2.10	H. Ec.	P-Nur.	3		141	11	0.00	B. A.	I. Mgt.	1
18	1	0.00	B. A.	Eco.	1		30	4	0.00	A & S	N/M	1
51	2	0.00	B. A.	Mkt.	1		55	8	1.88	A & S	Math.	4
94	4	.63	B. A.	Mgt.	2	5- 8	116	13	1.07	A & S	Math.	4
154	7	0.00	B. A.	Acct.	1		151	17	.63	A & S	N/M	2
36	3	0.00	A & S	N/M	1		41	7	2.59	B. A.	Acct.	3
101	5	0.00	A & S	Chem.	1		91	13	2.17	A & S	Geol.	4
113	6	1.72	B. A.	Int. Tr.	12	9-12	118	17	2.08	A & S	Fl.	7
114	7	0.00	Eng.	Pet. E.	1		140	21	1.62	B. A.	Acct.	10
14		1.78	Eng.	Pet. E.	14		8	1	0.00	Eng.	C. E.	1
28	2	2.00	A & S	N/M	4		38	3	.48	A & S	Geol.	5
52	3	0.00	A & S	N/M	1	13-16	39	4	2.65	Eng.	Arch.	16
69	4	2.50	Eng.	E. E.	1		179	10	.80	B. A.	Eco.	1

High School Size: 100 to 499

High School Size: 500+

or levels, of each factor. The Code column refers to the manner in which the computer was shown which level of a factor is being considered. The I. D. column shows a meaningful identifying letter for each factor. The Type column classified each factor into either between or within subjects. The column headed Sort Order was coded for communication with the computer. It told the computer the order in which to analyze the factors. Each factor was coded alphabetically.

Table V shows the results of the analysis of the data by the analysis of variance technique. The information in the table was the output of the computer.

In Table V column one identified the source, or factor, used. Column two gives the degree of freedom. Column three shows the sums of squares. Column four gives the mean squares. The F-Ratio is given in column five. Column six, labeled P, shows the significance level of the factors. This table furnished the data for the first run through the computer. Tables VI and VII furnished the data for the second and third runs respectively.

In Analysis I only the main effect for the score factor was significant. This was a trivial effect. In any multivariate analysis it would be surprising only if the differences between the scores were not significant. Differences between the scores can be eliminated if the scores

TABLE IV

ANALYSIS I--DESIGN

Factor	Level	Code	I.D.	Type	Sort Order
Score	G.P.A.	1	P	W	A
	No. Com.	2			
High School Units	0- 4	1	U	B	B A A
	5- 8	2			
	9-12	3			
	13-16	4			
High School Size	100-499	1	S	B	C B B
	500+	2			
Replications	One	1	R	B	D C C
	Two	2			
	Three	3			
	Four	4			

TABLE V

ANALYSIS I--ANALYSIS OF VARIANCE--MULTIVARIATE GRADE-POINT AVERAGE AND NUMBER OF SEMESTERS

Source	D.F.	S.S.	M.S.	F-Ratio	P
Within Sub.	32	297.3917			
P	1	106.4251	106.4251	15.8073	.01
PU	3	26.5835	8.8612	1.3161	N.S.
PS	1	2.2461	2.2461	.3336	N.S.
PUS	3	.5540	.1847	.0274	N.S.
(W)	24	161.5830	6.7326		
Between Sub.	31	342.0562			
U	3	67.5030	22.5010	2.1260	N.S.
S	1	10.5707	10.5707	.9987	N.S.
US	3	9.9744	3.3248	.3141	N.S.
(B)	24	254.0081	10.5836		
Total	63	639.4479			

TABLE VI

ANALYSIS I--ANALYSIS OF VARIANCE--UNIVARIATE
GRADE-POINT AVERAGE ONLY

Source	D.F.	S.S.	M.S.	F-Ratio	P
U	3	4.7428	1.5809	2.2529	N.S.
S	1	1.5356	1.5356	2.1883	N.S.
US	3	5.9346	1.9782	2.8191	N.S.
(B)	24	16.8411	.7017		
Total	31	29.0541			

TABLE VII

ANALYSIS I--ANALYSIS OF VARIANCE--UNIVARIATE
NUMBER OF SEMESTERS ONLY

Source	D.F.	S.S.	M.S.	F-Ratio	P
U	3	89.3437	29.7812	1.7924	N.S.
S	1	11.2812	11.2812	.6789	N.S.
US	3	4.5938	1.5313	.0921	N.S.
(B)	24	398.7500	16.6145		
Total	31	503.9687			

have been previously converted to standard scores. This analysis was made on raw data. The conversion to standard scores was not made since the same effect is accomplished by analysis of variance directly. Hence, the significant difference between the scores referred to above was present.

Figure 16 shows that the average number of semesters completed by all of the subjects included in this particular analysis was 3.48 semesters. The mean grade-point average was .90. Texas Technological College uses a 4.00 system. The subjects in this particular analysis, therefore, had slightly less than a "D" average.

Because only four replications were possible in this analysis using high school sizes above 100 enrollment, an additional analysis was made using only the data for the males in the twenty-year-old range from high school sizes of 500 enrollment and above. The number of subjects in these particular cells was sufficient to furnish eleven different subjects each for the four levels of the high school background, or a total of forty-four subjects. In none of the analyses, however, was any significant relationship observed between the independent variable and the various dependent variables measuring academic success or ability. Caution was exercised here since these tests were not very powerful due to the few subjects available for the test.

FIGURE 16

ANALYSIS I

DEPENDENT VARIABLES - Males - 20 to 29 - High School Size of 100+

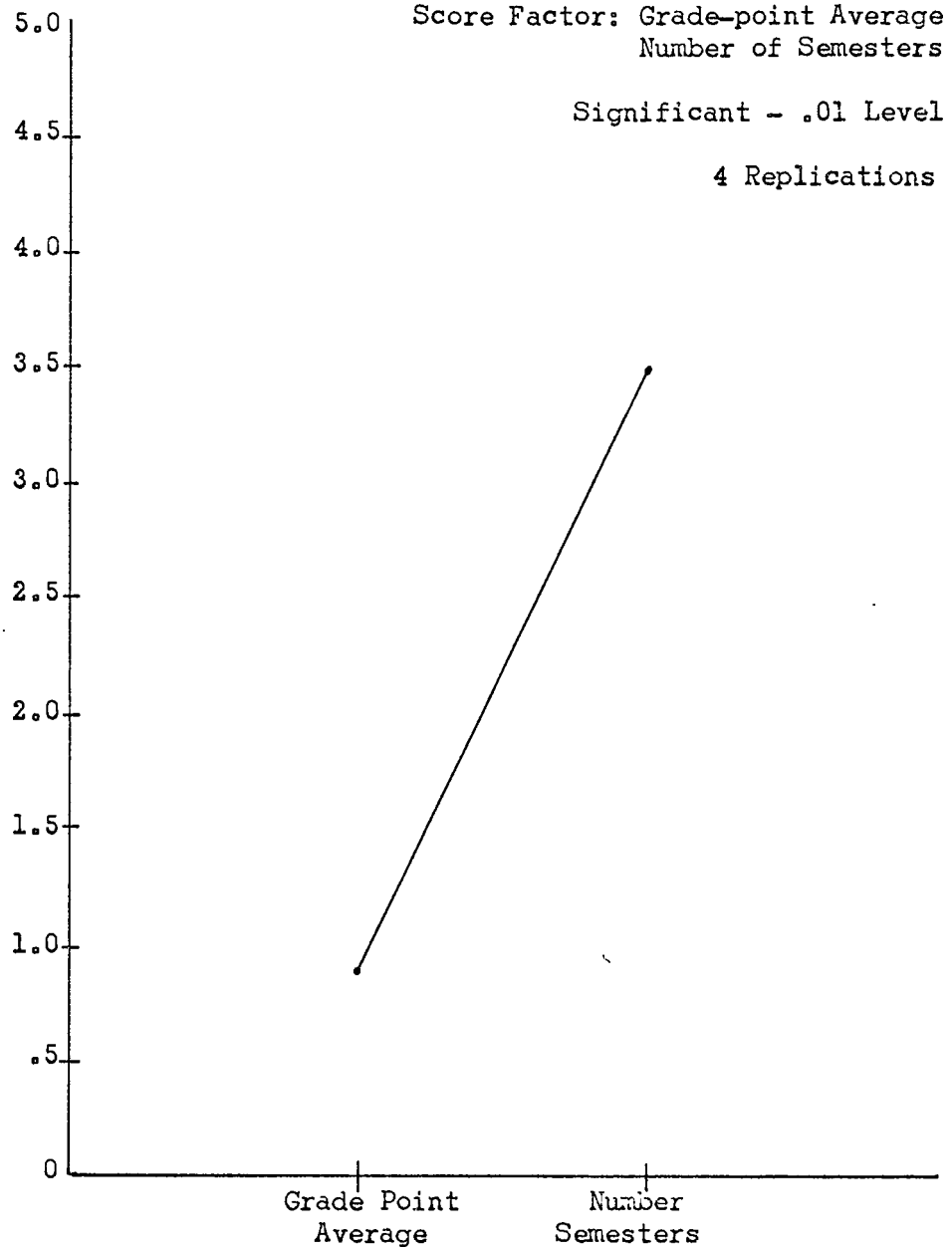


Table VIII shows the data used in this analysis. Table IX shows the design used. Tables X, XI, and XII furnished the data for the three separate runs through the computer.

Analysis II. In this analysis only subjects from the high schools of over 500 enrollment were used. Both sexes were included, but only the subjects in their twenties were selected. Tables XIII, XIV, XV, XVI, and XVII provided the data for the three runs through the computer.

Figure 17 made it unmistakably clear that the young females included in this study who attended large high schools had greater success in Texas Technological College than did the young males included in this study who attended large high schools. The mean grade-point average was .93 for the males and 2.48 for the females. This effect was the result of the univariate analysis.

Figure 18 shows the results of the univariate analysis on the grade-point average scores. It indicates that those students who presented between nine and twelve high school units upon entering Texas Technological College tended to achieve better than those who presented fewer high school units.

Figure 19 shows the result of the univariate analysis. Here again, as in the multivariate analysis, Figure 17, the young females from the larger schools far exceeded the males in

TABLE VIII

ANALYSIS IA--DEPENDENT VARIABLES--MALES, 20 TO 29, HIGH SCHOOL SIZE OF 500+

H. S. Units	Study No.	Rep. No.	G.P.A.	School	Major	No. Sem.
0- 4	27	1	.50	B. A.	Acct.	2
	35	2	0.00	Eng.	E. E.	1
	48	3	0.00	A & S	N/M	1
	67	4	1.87	B. A.	Mgt.	2
	70	5	0.00	A & S	N/M	1
	75	6	1.27	Eng.	M. E.	3
	89	7	0.00	B. A.	Acct.	1
	95	8	4.00	A & S	Psy.	1
	117	9	1.56	Eng.	E. E.	9
	122	10	1.20	A & S	Hist.	3
	141	11	0.00	B. A.	I. Mgt.	1
5- 8	5	2	0.00	A & S	N/M	1
	19	3	1.00	Eng.	C. E.	1
	30	4	0.00	A & S	N/M	1
	42	6	.20	A & S	Speech	1
	55	8	1.88	A & S	Math.	4
	65	10	1.20	Eng.	Pet. E.	9
	84	11	2.00	B. A.	Acct.	1
	138	15	1.37	A & S	Spanish	3
	145	16	1.00	B. A.	Mkt.	1
	151	17	.63	A & S	N/M	2
	158	18	3.21	Eng.	Ad. Art	3
9-12	6	1	0.00	Eng.	M. E.	1
	15	2	3.60	A & S	Hist.	1
	22	5	2.13	A & S	Chem.	2
	61	9	1.62	A & S	N/M	4
	85	12	1.85	A & S	Chem.	8
	97	14	1.08	B. A.	Acct.	2
	99	15	1.09	Eng.	C. E.	2
	120	18	1.15	A & S	P-Law	1
	140	21	1.62	B. A.	Acct.	10
	150	22	1.61	A & S	Math.	10
	157	23	2.91	Eng.	Arch.	2

TABLE VIII (continued)

H. S. Units	Study No.	Rep. No.	G.P.A.	School	Major	No. Sem.
	8	1	0.00	Eng.	C. E.	1
	29	2	.96	Eng.	I. E.	7
	38	3	.48	A & S	Geol.	5
	39	4	2.65	Eng.	Arch.	16
	71	5	1.77	B. A.	Acct.	5
13-16	73	6	1.47	B. A.	Mkt.	12
	83	7	.44	A & S	P-Law	2
	128	8	.20	B. A.	Acct.	1
	130	9	1.67	B. A.	N/M	1
	149	10	.80	B. A.	Eco.	1
	156	11	1.36	A & S	N/M	2

TABLE IX

ANALYSIS IA--DESIGN

Factor	Level	Code	I.D.	Type	Sort Order
Score	G.P.A. No. Sem.	1 2	P	W	A
High School Units	0- 4 5- 8 9-12 13-16	1 2 3 4	U	B	B A A
Replications	1 to 11	1 to 11	R	B	C B B

TABLE X

ANALYSIS IA--ANALYSIS OF VARIANCE--MULTIVARIATE GRADE-POINT AVERAGE AND NUMBER OF SEMESTERS

Source	D.F.	S.S.	M.S.	F-Ratio	P
Within Sub.	44	352.3035			
P	1	101.1796	101.1796	17.5921	N.S.
PU	3	21.0673	7.0224	1.2209	N.S.
(W)	40	230.0566	5.7514		
Between Sub.	43	342.7129			
U	3	31.2127	10.4042	1.3360	
(B)	40	311.5002	7.7875		
Total	87	695.0164			

TABLE XI

ANALYSIS IA--ANALYSIS OF VARIANCE--UNIVARIATE
GRADE-POINT AVERAGE ONLY

Source	D.F.	S.S.	M.S.	F-Ratio	P
U	3	3.5528	1.1843	1.1812	N.S.

TABLE XII

ANALYSIS IA--ANALYSIS OF VARIANCE--UNIVARIATE
NUMBER OF SEMESTERS ONLY

Source	D.F.	S.S.	M.S.	F-Ratio	P
U	3	48.7273	16.2424	1.2956	N.S.

TABLE XIII

ANALYSIS II--DEPENDENT VARIABLES--MALES, FEMALES, 20 TO 29, HIGH SCHOOL SIZE OF 500+

Study No.	Rep. No.	G.P.A.	School	Major	No. Sem.	H. S. Units	Study No.	Rep. No.	G.P.A.	School	Major	No. Sem.
70	5	0.00	A & S	N/M	1		46	2	2.46	A & S	El. Ed.	1
89	7	0.00	B. A.	Acct.	1	0- 4	98	4	2.00	B. A.	Acct.	1
141	11	0.00	B. A.	I. Mgt.	1		143	5	3.00	H. Ec.	Ap. Art	1
42	6	.20	A & S	Speech	1		62	1	1.83	A & S	Ed.	3
64	9	0.00	Agri.	Ag. Ed.	1	5- 8	109	2	.96	A & S	Spanish	11
138	15	1.37	A & S	Spanish	3		125	3	2.00	A & S	N/M	2
45	8	.60	Eng.	E. E.	1		72	1	2.35	A & S	N/M	2
97	14	1.08	B. A.	Acct.	2	9-12	131	3	2.86	A & S	Ed.	2
135	20	1.25	A & S	N/M	1		137	4	3.00	A & S	El. Ed.	1
			MALE							FEMALE		

TABLE XIV

ANALYSIS II--DESIGN

Factor	Level	Code	I.D.	Type	Sort Order
Score	G.P.A.	1	P	W	A
	No. Sem.	2			
High School Units	0- 4	1	U	B	B A A
	5- 8	2			
	9-12	3			
	13-16	4			
Sex	Male	1	X	B	C B B
	Female	2			
Replications	One	1	R	B	D C C
	Two	2			
	Three	3			

TABLE XV

ANALYSIS II--ANALYSIS OF VARIANCE--MULTIVARIATE GRADE-POINT AVERAGE AND NUMBER OF SEMESTERS

Source	D.F.	S.S.	M.S.	F-Ratio	P
Within Sub.	18	61.2650			
P	1	3.3856	3.3856	1.2841	N.S.
PU	2	15.0344	7.5172	2.8513	N.S.
PX	1	.4356	.4356	.1652	N.S.
PUX	2	10.7727	5.3864	2.0430	N.S.
(W)	12	31.6367	2.6363		
Between Sub.	17	56.5394			
U	2	8.0545	4.0273	2.0382	N.S.
X	1	21.7156	21.7156	10.9905	.01
UX	2	3.0592	1.5296	.7741	N.S.
(B)	12	23.7101	1.9758		
Total	35	117.8044			

TABLE XVI

ANALYSIS II--ANALYSIS OF VARIANCE--UNIVARIATE
GRADE-POINT AVERAGE ONLY

Source	D.F.	S.S.	M.S.	F-Ratio	P
U	2	2.0889	1.0445	4.6766	.05
X	1	14.1512	14.1512	63.3612	.01
UX	2	1.4986	.7493	3.3549	.05
(B)	12	2.6801	.2233		
Total	17	20.4188			

TABLE XVII

ANALYSIS II--ANALYSIS OF VARIANCE--UNIVARIATE
NUMBER OF SEMESTERS ONLY

Source	D.F.	S.S.	M.S.	F-Ratio	P
U	2	21.0000	10.5000	2.3924	N.S.
X	1	8.0000	8.0000	1.8227	N.S.
UX	2	12.3333	6.1667	1.4050	N.S.
(B)	12	52.6667	4.3888		
Total	17	94.0000			

FIGURE 17

ANALYSIS II

DEPENDENT VARIABLES - Males - Females - 20 to 29 - High School Size of 500+.

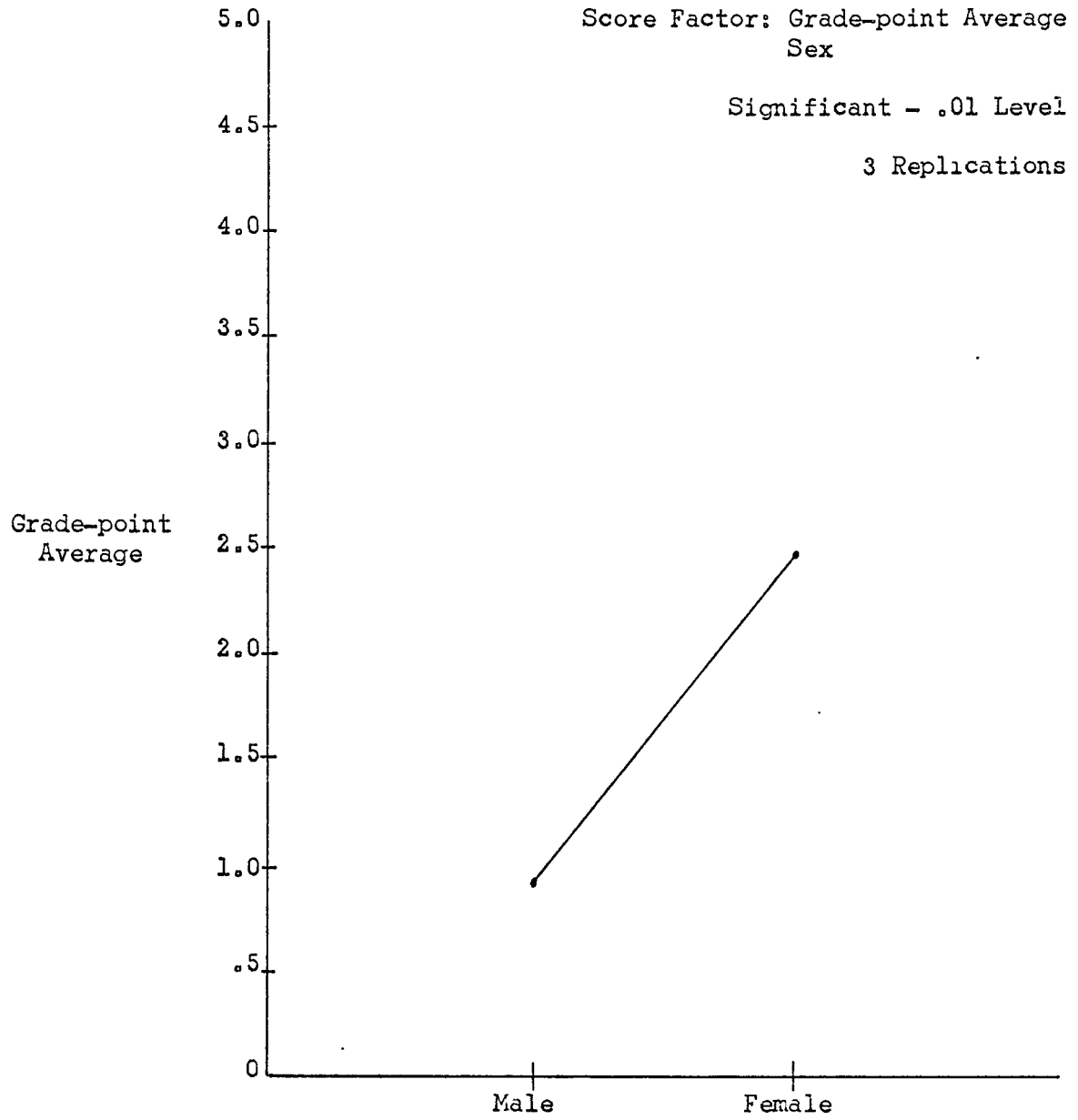
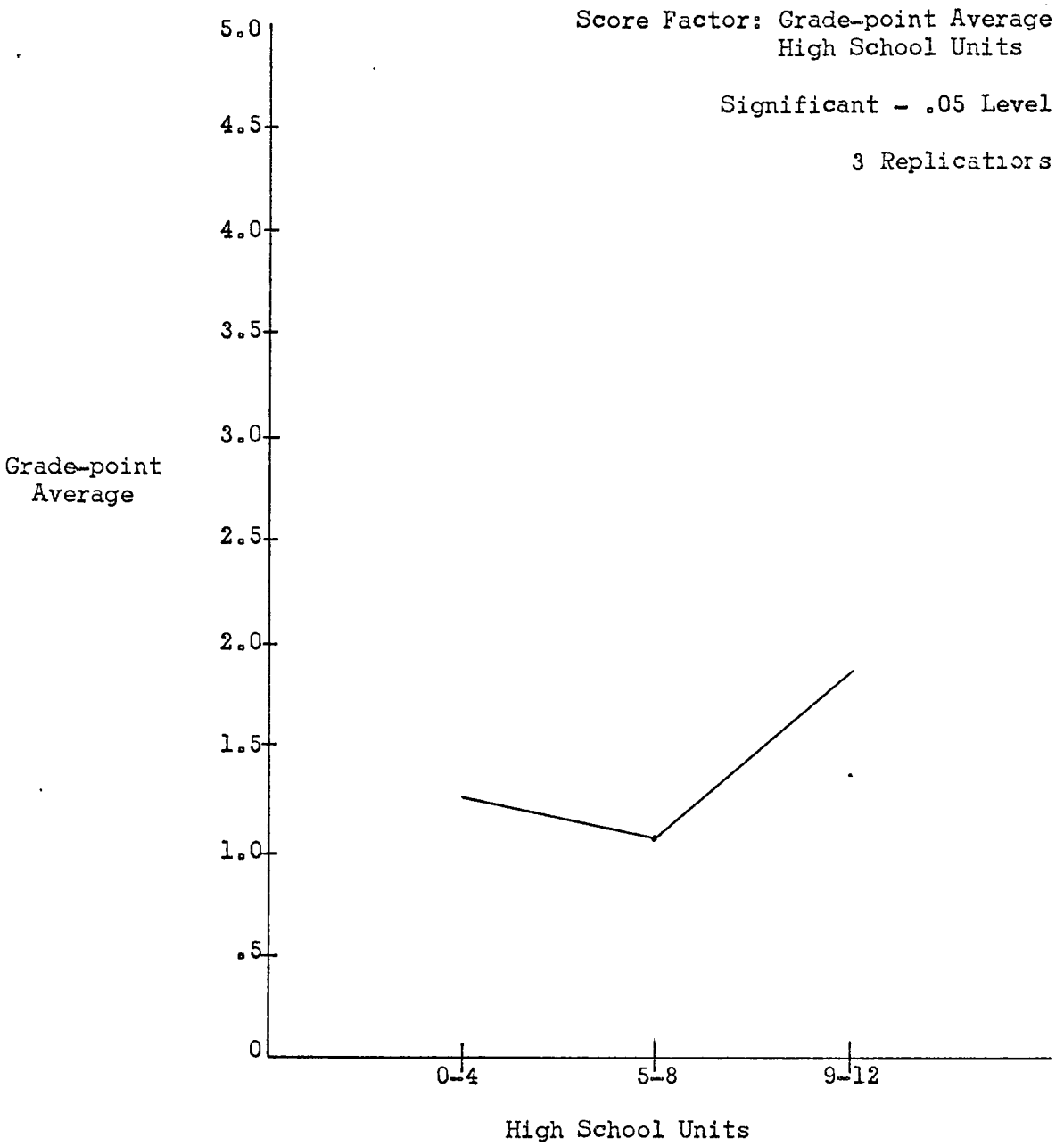


FIGURE 18

ANALYSIS II

DEPENDENT VARIABLES - Males - Females - 20 to 29 - High School Size of 500+



grade-point average. The males had a .51 average compared with the females' 2.28 grade-point average.

Figure 20 indicates that the superiority of the female students exceeded the males no matter how many high school units the females had upon entering Texas Technological College. The success of the males, however, increased with the greater number of high school units presented upon entering Texas Technological College.

Analysis III. In Analysis III the same subjects were used as in Analyses I and II. Here, however, a different set of dependent variables was used. In this analysis the entrance test scores required by the Committee on Admissions at Texas Technological College for those students who have not been graduated from high school were examined to find if the differences observed in academic success were associated with differences in the original entrance test scores.

The data were organized for analysis by the computer in the same manner as in the preceding analyses. Table XVIII shows that the same subjects were used in this analysis as in Analyses I and II. Column one gives the subject's number in the whole study. Column two gives his replication number for this particular analysis. Columns three, four, and five give the standard scores each subject made on the sub-tests of the American Council on Education Psychological Examination. The three sub-tests are Quantitative,

FIGURE 19

ANALYSIS II

DEPENDENT VARIABLES - Males - Females - 20 to 29 - High School Size of 500+

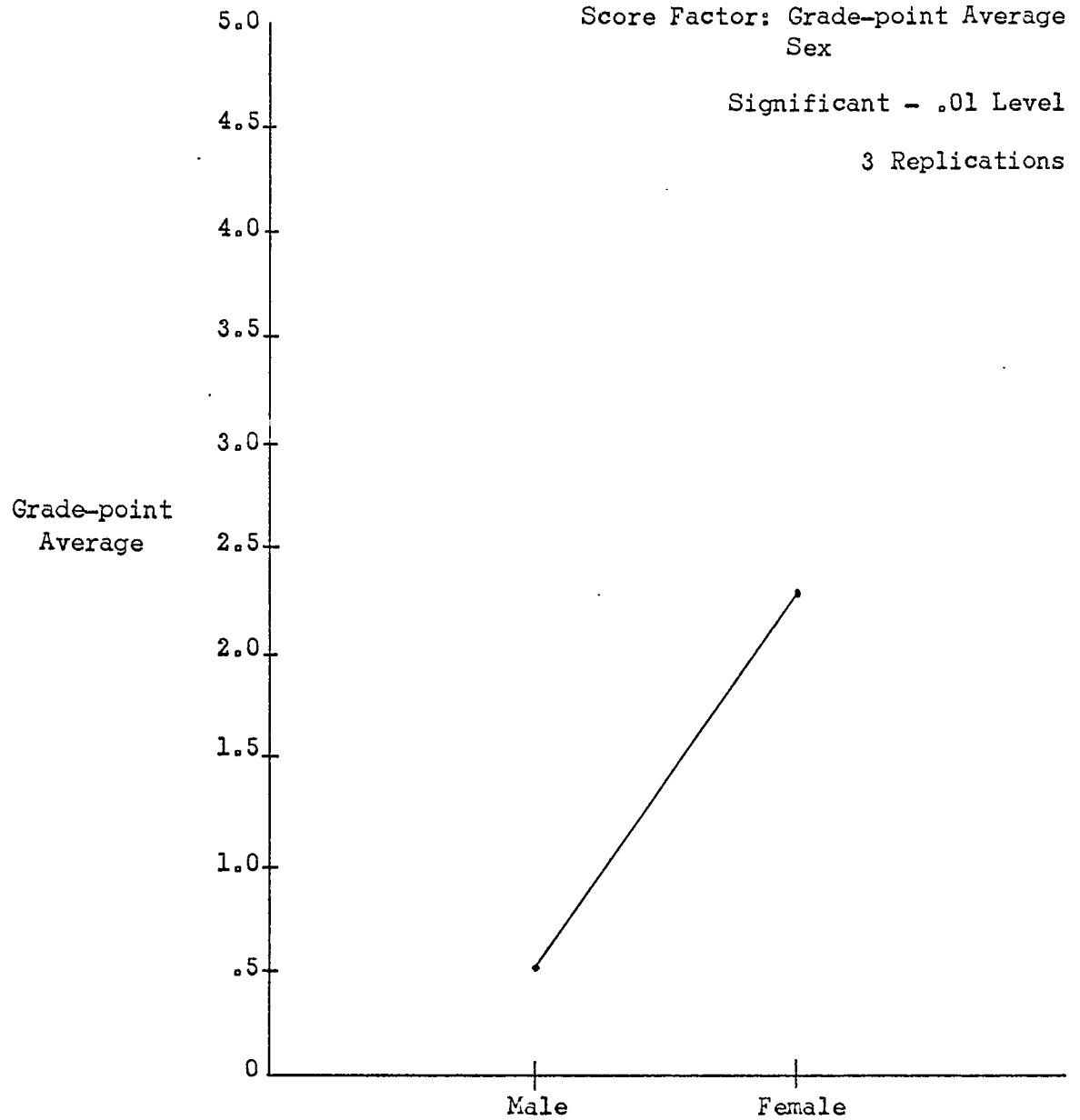


FIGURE 20

ANALYSIS II

DEPENDENT VARIABLES - Males - Females - 20 to 29 - High School Size of 500+

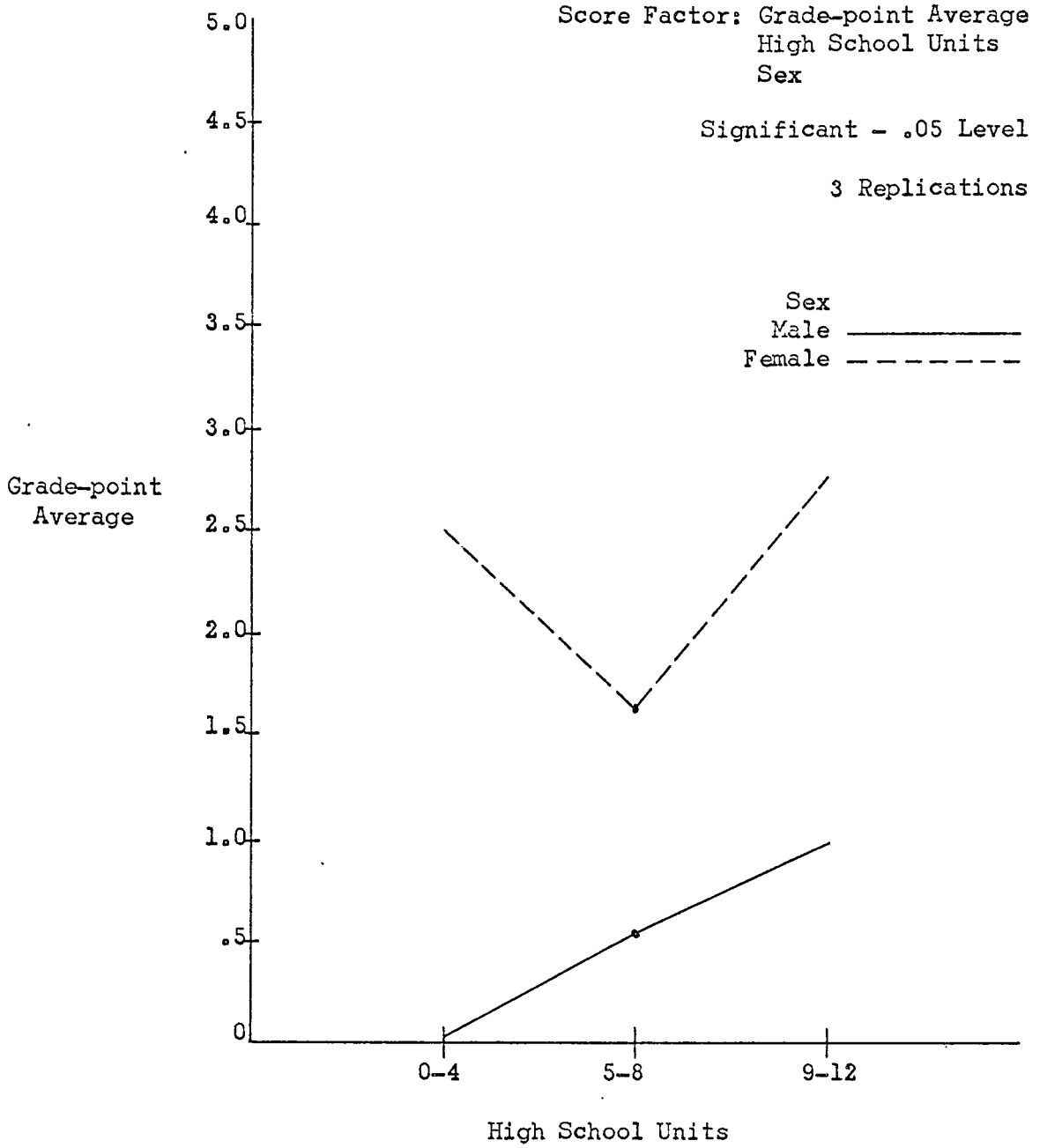


TABLE XVIII

ANALYSIS III--DEPENDENT VARIABLES--MALES, 20 TO 29

HIGH SCHOOL SIZE OF 100 TO 499

High School Units	Study Number	Replication Number	A.C.E. Q	A.C.E. L	A.C.E. T	Coop. Eng. U	Coop. Eng. S	Coop. Eng. V	Coop. Eng. T	C.M.A. R	C.M.A. C	Otis I.Q.
0-4	24	1	33	48	81	43	28	45	38	17	20	101
	32	2	21	28	49	34	32	36	34	9	16	86
	106	7	47	72	119	48	39	58	48	23	22	124
	127	9	42	56	98	54	48	66	56	16	22	127
5-8	18	1	33	48	81	40	24	42	36	13	18	98
	51	2	39	69	108	50	12	36	46	11	17	109
	94	4	13	37	50	36	48	21	34	4	6	91
	154	7	47	58	105	51	53	61	55	17	26	118
9-12	36	3	23	58	81	34	34	53	36	17	8	95
	101	5	37	67	104	49	43	55	49	18	31	126
	113	6	30	57	87	52	51	51	51	14	23	117
	114	7	49	46	95	37	42	44	40	20	27	122
13-16	14	1	46	71	117	62	60	67	63	24	34	123
	28	2	29	43	72	42	37	41	39	3	16	98
	52	3	21	41	62	39	23	45	35	18	13	99
	69	4	34	59	93	49	55	51	52	16	24	117

TABLE XVIII (continued)

HIGH SCHOOL SIZE OF 500+

High School Units	Study Number	Replication Number	A.C.E. Q	A.C.E. L	A.C.E. T	Coop. Eng. U	Coop. Eng. S	Coop. Eng. V	Coop. Eng. T	C.E.A. R	C.E.A. C	Otis I.Q.
0-4	27	1	26	41	67	38	37	39	38	12	13	91
	75	6	32	60	92	36	36	58	42	9	23	107
	89	7	41	71	112	43	46	47	45	15	30	111
	141	11	27	67	94	38	30	56	41	9	21	101
5-8	30	4	36	51	87	41	28	48	39	15	23	108
	55	8	51	51	102	43	32	44	36	15	30	118
	116	13	36	72	108	55	50	68	58	15	30	122
	151	17	37	45	82	52	28	53	44	13	16	102
9-12	41	7	38	63	101	68	14	44	41	17	34	111
	91	13	31	90	121	104	27	73	68	17	32	133
	118	17	44	73	117	98	13	41	52	19	28	117
	140	21	44	65	109	46	49	52	49	15	28	113
13-16	8	1	25	69	85	41	30	54	41	10	19	99
	38	3	29	56	85	44	48	53	48	9	23	114
	39	4	18	63	81	43	48	38	42	9	11	108
	149	10	29	41	70	41	40	36	38	6	9	101

Linguistic, and Total. The Quantitative (Q) score is shown in column three, the Linguistic (L) score in column four, and the Total (T) score in column five. Columns six through nine show the standard scores made by each subject on the various sub-tests of the Co-Operative English Examination, Provisional Form OM. Column six gives the scores made on the English Usage (U) test. Column seven shows the scores made on the Spelling (S) test. The scores made on the Vocabulary (V) test are shown in column eight and the Total (T) score in column nine.

Columns ten and eleven show the standard scores made by each of the subjects on the two arithmetic sub-tests of the California Multiple Aptitude Test. Column ten shows the scores for the Arithmetic Reasoning (R) while the scores on the Arithmetic Computation (C) are shown in column eleven.

In column twelve the I. Q. as measured by the Otis-Gamma Mental Ability Test is shown for each of the subjects included in this particular analysis.

Table XIX gives the design for Analysis III. Table XX shows the output of the computer.

Figure 21 shows that those students who attended high schools with enrollments above 500 were significantly more successful in Texas Technological College than those who attended smaller high schools.

TABLE XIX

ANALYSIS III--DESIGN

Factor	Level	Code	I.D.	Type	Sort Order
High School Size	100-499	1	S	B	A
	500+	2			
High School Units	0- 4	1	U	B	B
	5- 8	2			
	9-12	3			
	13-16	4			
Replications	One	1	R	B	C
	Two	2			
	Three	3			
	Four	4			
Score	ACE-Q	1	P	W	D
	ACE-L	2			
	ACE-T	3			
	Coop-U	4			
	Coop-S	5			
	Coop-V	6			
	Coop-T	7			
	CMA-R	8			
	CMA-C	9			
	Otis	10			

TABLE XX

ANALYSIS III--ANALYSIS OF VARIANCE--MULTIVARIATE
HIGH SCHOOL SIZE--HIGH SCHOOL UNITS--TEST SCORES

Source	D.F.	S.S.	M.S.	F-Ratio	P
Within Sub.	288	273087.7000			
P	9	251065.4000	27896.1600	408.4390	.001
SP	9	1146.8500	127.4300	1.8657	.05
UP	27	2893.8100	107.1800	1.5692	.01
SUP	27	3229.1000	119.6000	1.7511	.01
(W)	216	14752.6800	68.2994		
Between Sub.	31	23330.4700			
S	1	318.0000	318.0000	.4241	N.S.
U	3	2924.4800	974.8300	1.3003	N.S.
SU	3	2095.9200	698.6400	.9319	N.S.
(B)	24	17992.0700	749.6695		
Total	319	296418.1000			

FIGURE 21

ANALYSIS III

DEPENDENT VARIABLES - Males - 20 to 29 - High School Size of 100+

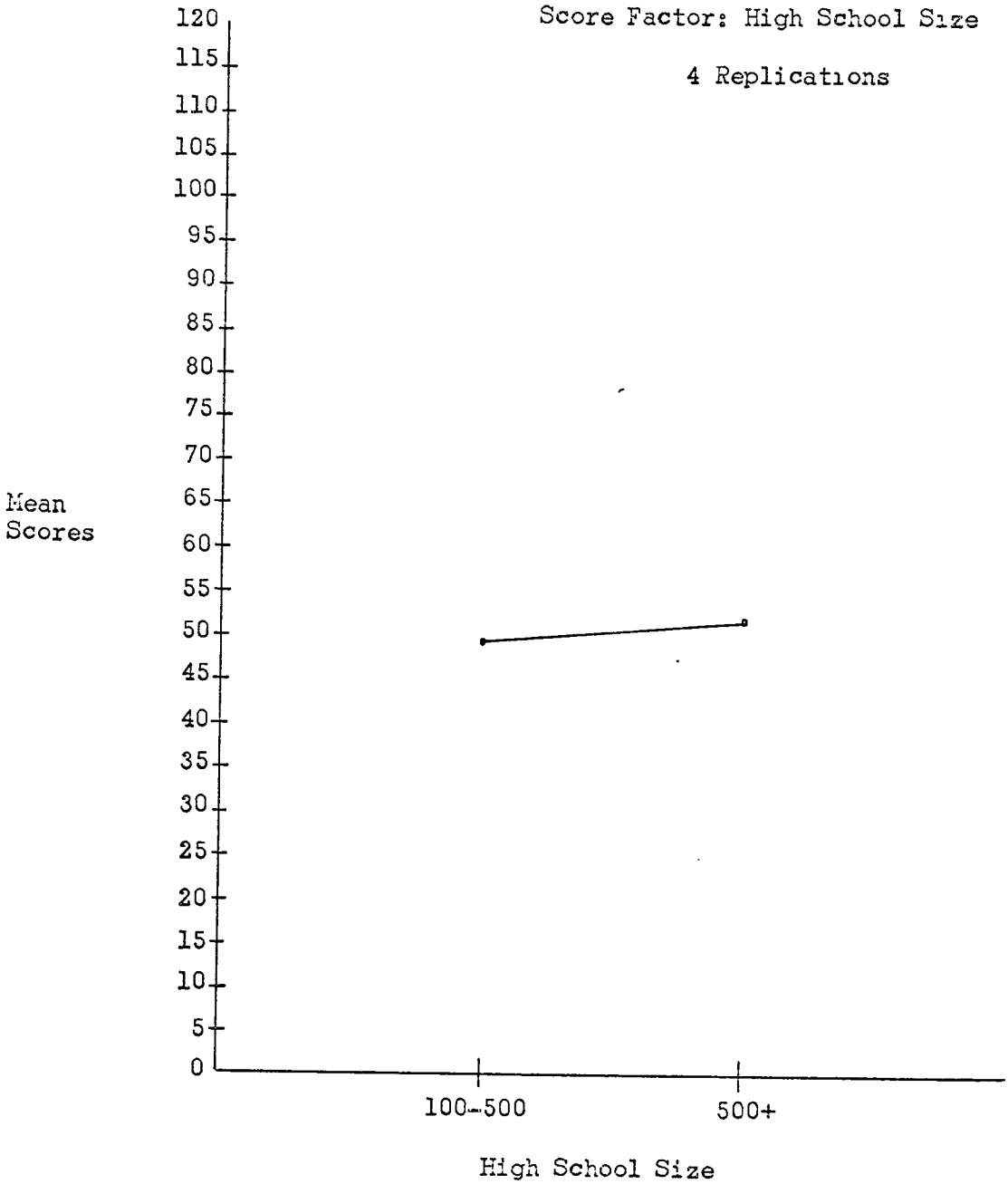


Figure 22 shows that the students who dropped out of high school during their junior year (eleventh grade) were more successful academically than were those who dropped out at any other time.

In Figure 23 it was noted that the composite test score which may be taken to indicate a greater academic potential was seen in those students from schools with an enrollment of 500 or larger, and more especially from juniors in the larger schools. This began to offer at least a partial explanation for the differences noted in the earlier results.

Figure 24 shows the relationship between the various scores for all of the subjects in this particular analysis combined.

Figure 25 compares the profile for the students from the smaller and the larger high schools. It was noted that the students from the high schools with an enrollment in excess of 500 students scored higher on all of the tests except the Spelling Test of the Co-Operative English Examination and the Arithmetic Reasoning Test of the California Multiple Aptitude Test.

Figure 26 shows that these profiles differ depending upon how many high school units the student presented when admitted to Texas Technological College. It was noted that the juniors, those who presented between nine and twelve

FIGURE 22

ANALYSIS III

DEPENDENT VARIABLES - Males - 20 to 29 - High School Size of 100+

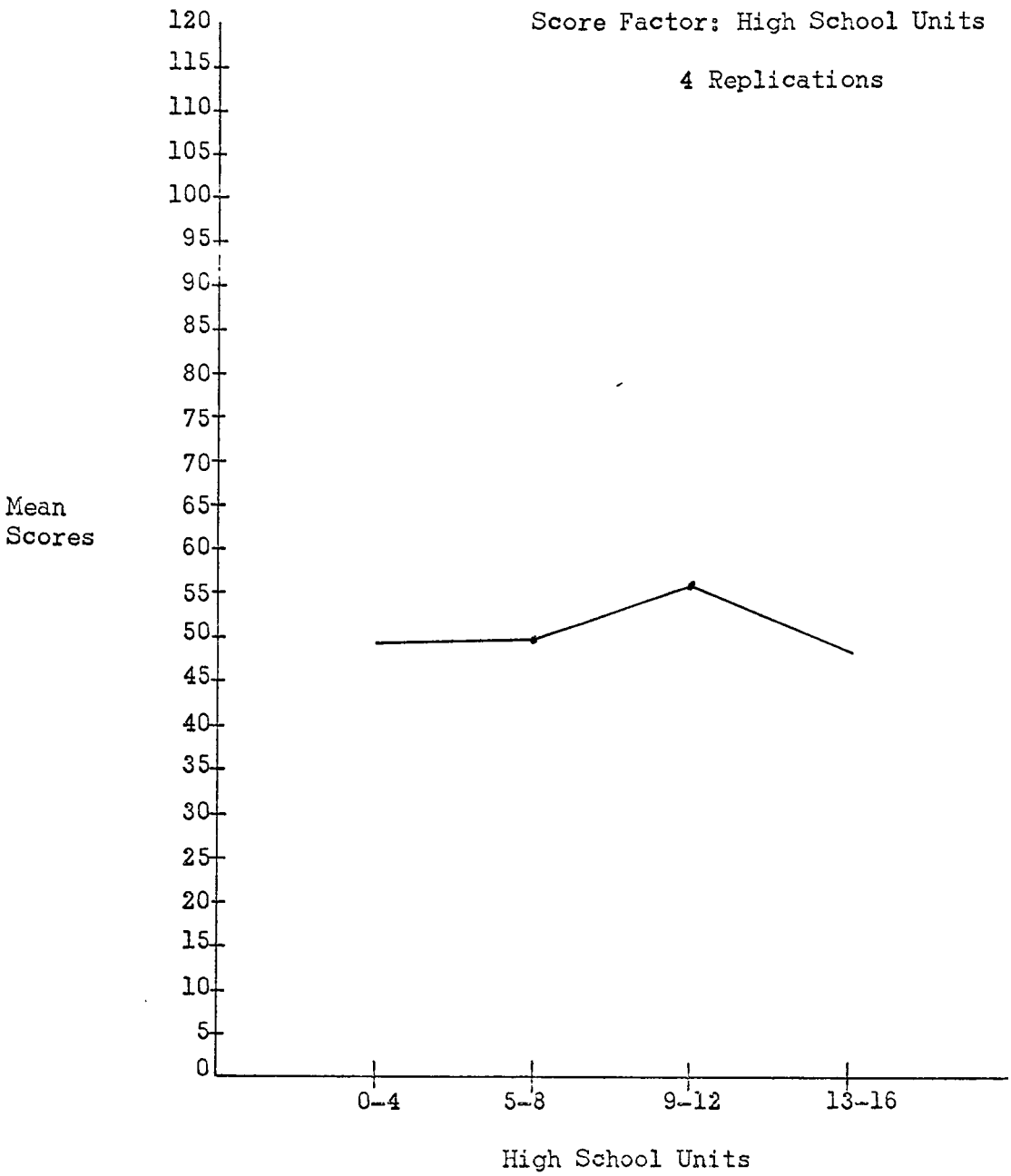


FIGURE 23

ANALYSIS III

DEPENDENT VARIABLES - Males - 20 to 29 - High School Size of 100+

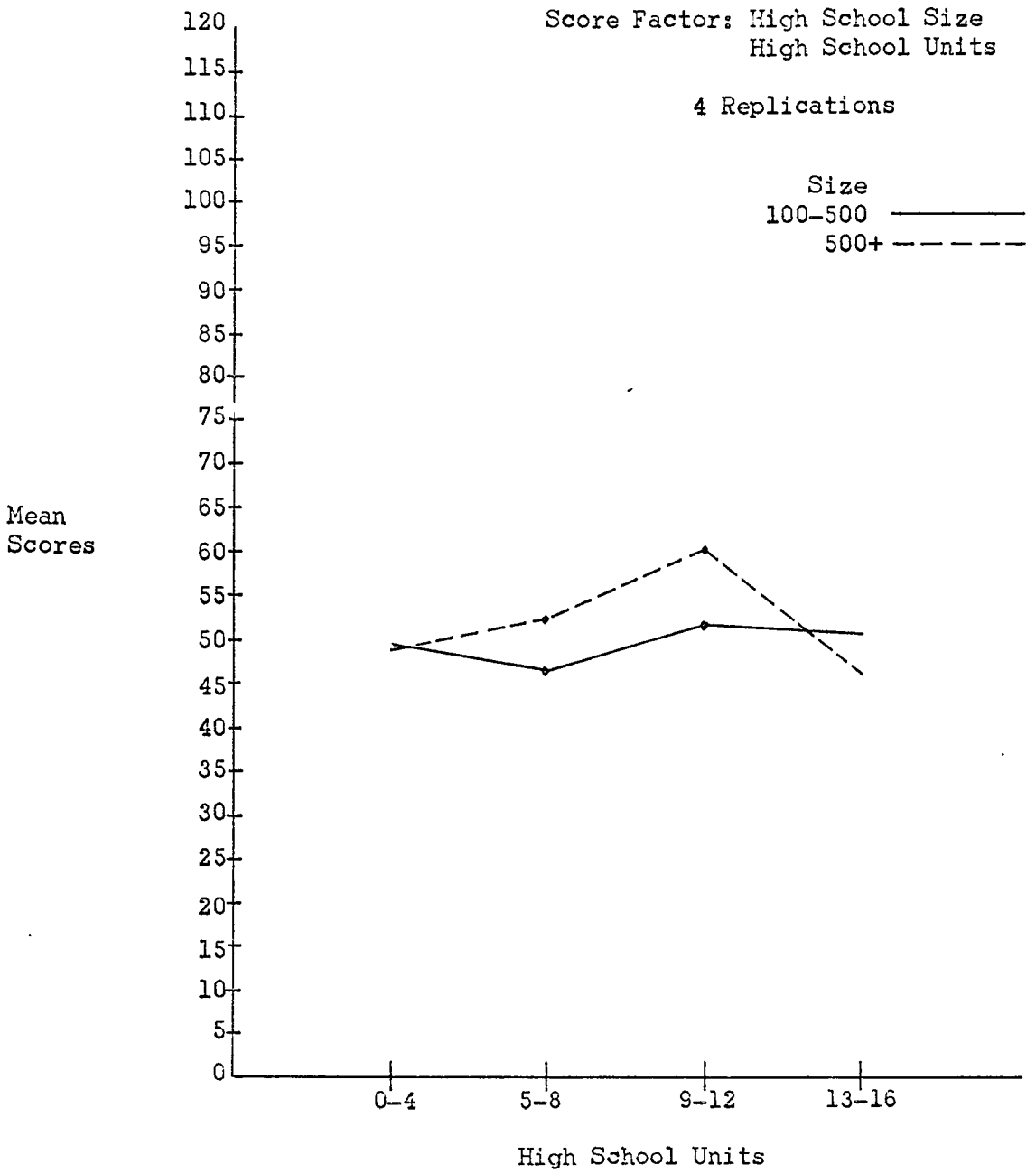


FIGURE 24

ANALYSIS III

DEPENDENT VARIABLES - Males - 20 to 29 - High School Size of 100+

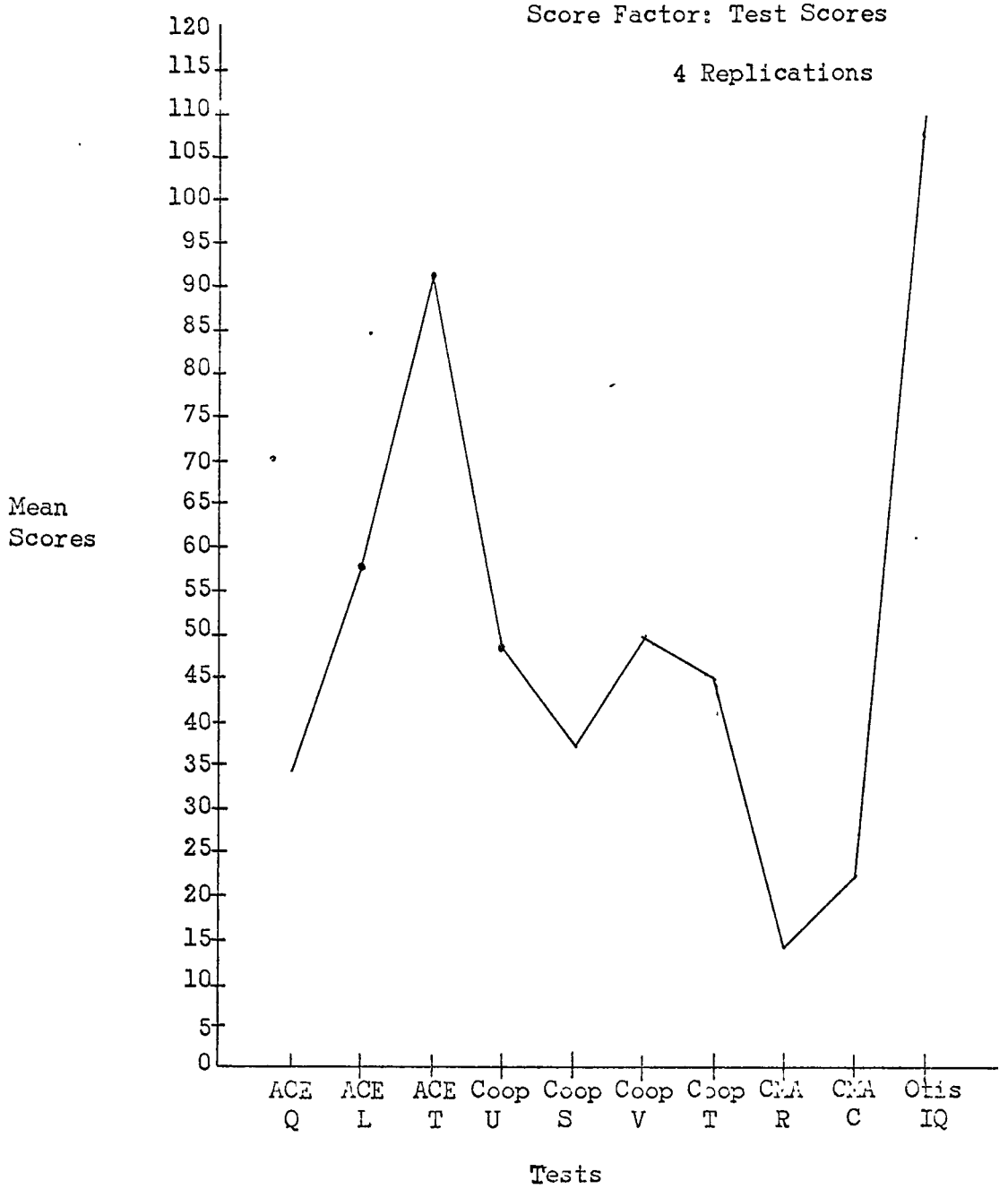
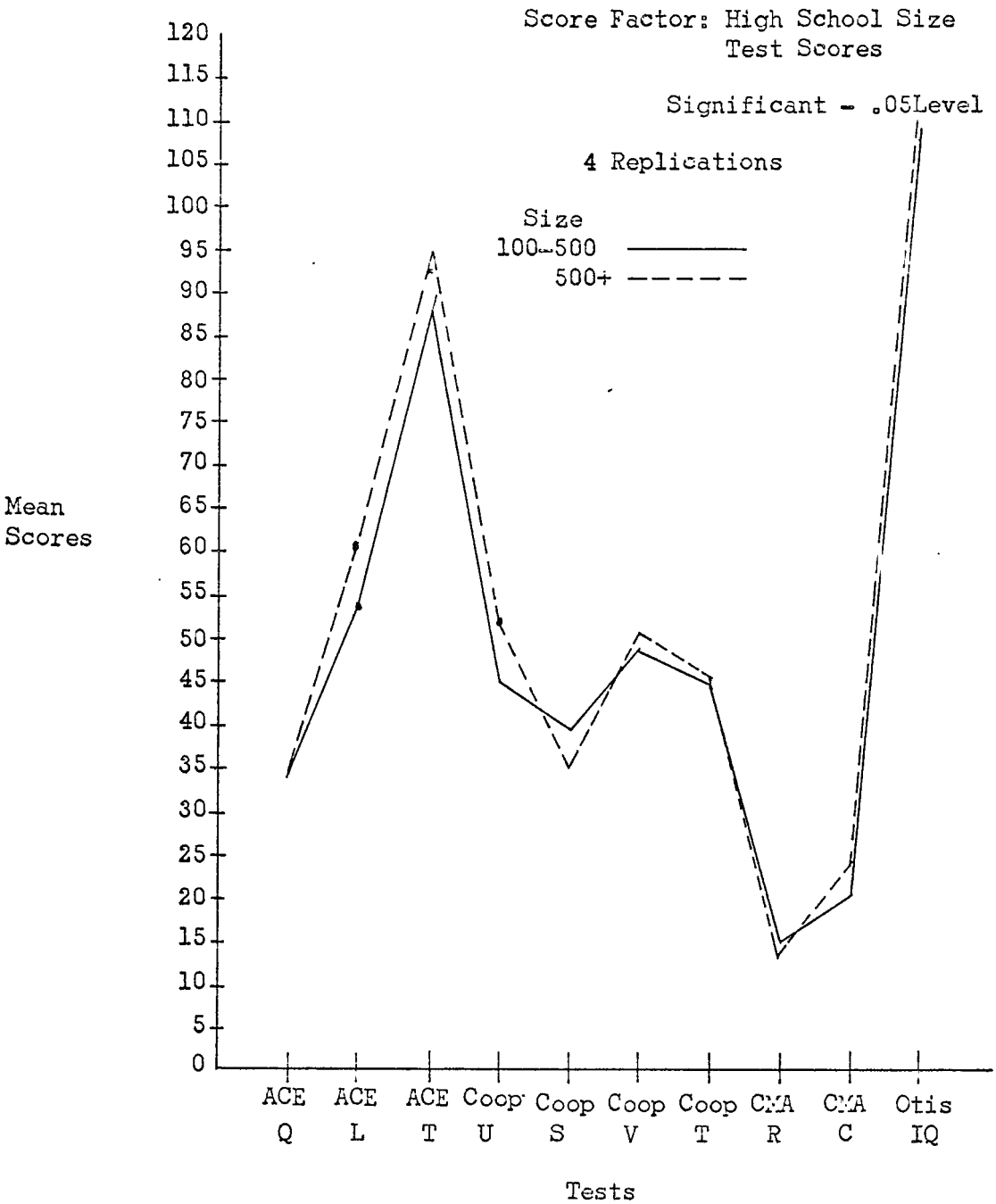


FIGURE 25

ANALYSIS III

DEPENDENT VARIABLES - Males - 20 to 29 - High School Size of 100+



high school units, and as was noted earlier had the greatest academic success in Texas Technological College, had a better score on every test except the Spelling Test of the Co-Operative English Examination.

Figure 27 indicates that those students who presented between nine and twelve high school units upon admission to Texas Technological College tended to show more academic potential.

Figure 28 shows that the superiority of the junior (eleventh grade) profile seen in Figure 27 was greater in the larger than in the smaller schools.

Here again, as in Analysis I, only four replications were possible using high school sizes above 100 enrollment. An additional analysis was made using only the data for the males in the twenty-year-old range from high school sizes of 500 enrollment and above. The same subjects were used as in the additional analysis in Analysis I. In none of the analyses, however, was any significant relationship observed between the independent variable and the various dependent variables measuring academic success or ability.

Table XXI shows the data used in this additional analysis. Table XXII shows the design used. Table XXIII shows the output of the computer.

Analysis IV. In this analysis only subjects from the high schools with an enrollment of 500 and over were used.

FIGURE 26

ANALYSIS III

DEPENDENT VARIABLES - Males - 20 to 29 - High School Size of 100+

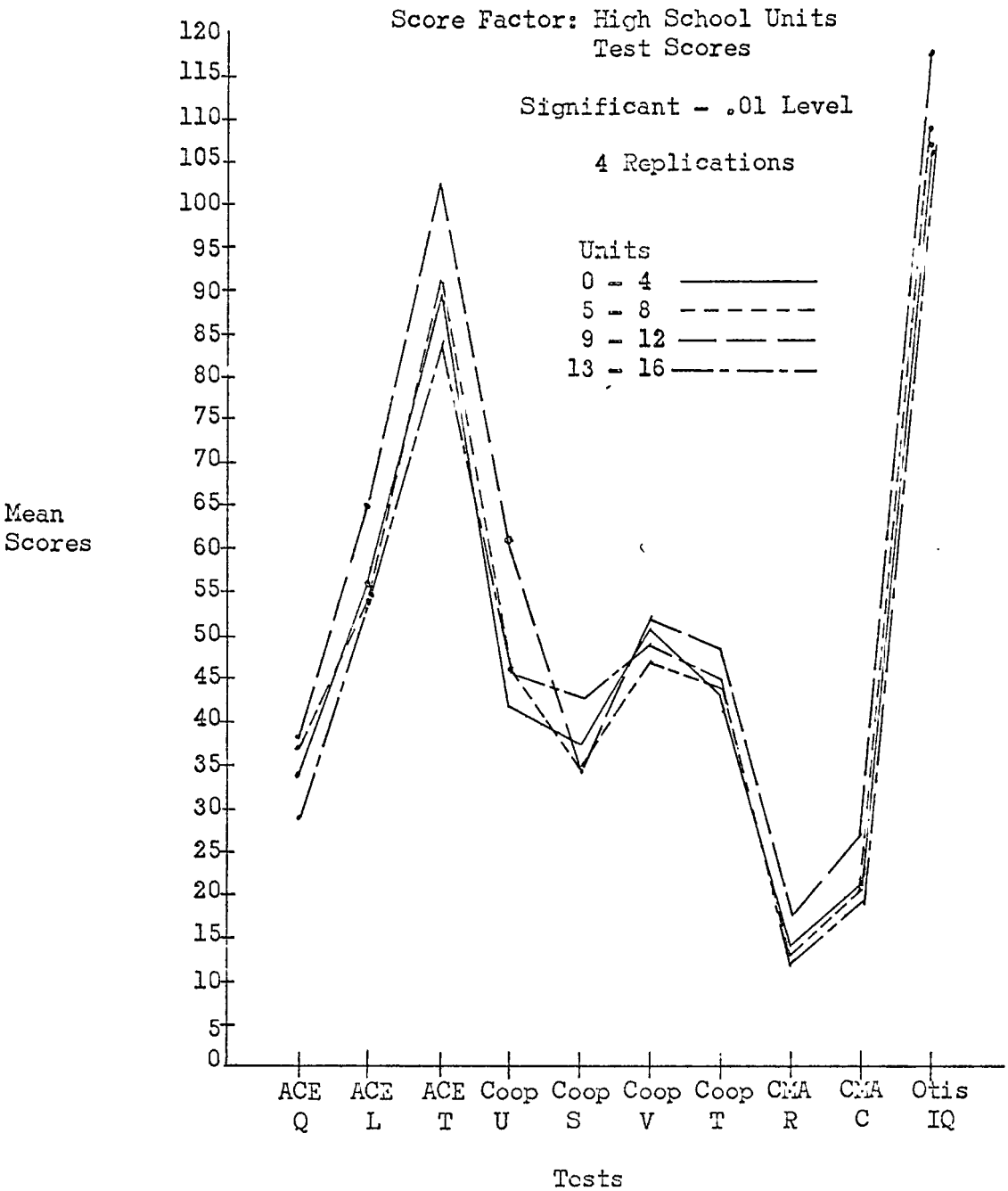


FIGURE 27

ANALYSIS III

DEPENDENT VARIABLES - Males - 20 to 29 - High School Size of 100+

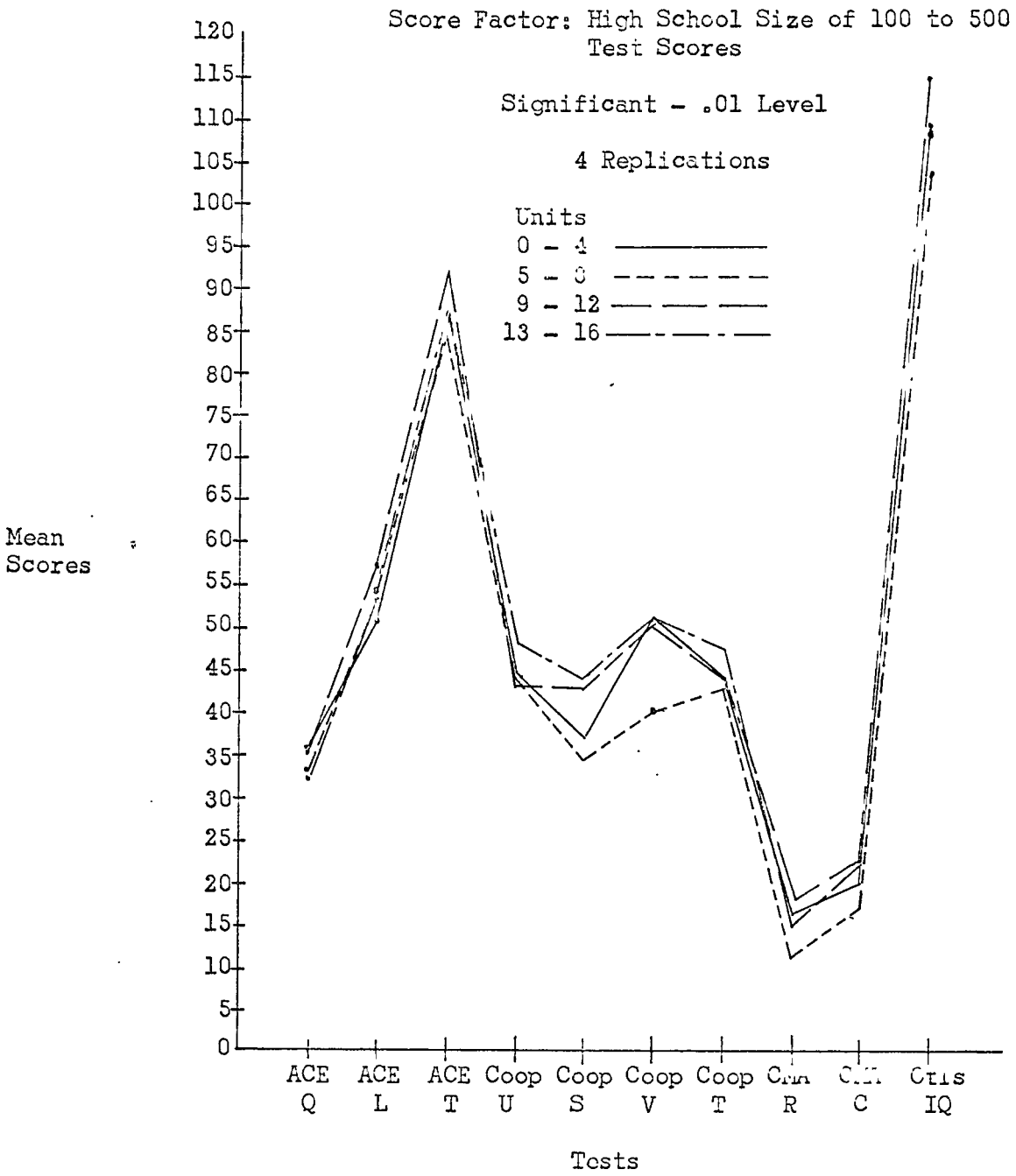


FIGURE 28

ANALYSIS III

DEPENDENT VARIABLES - Males - 20 to 29 - High School Size of 100+

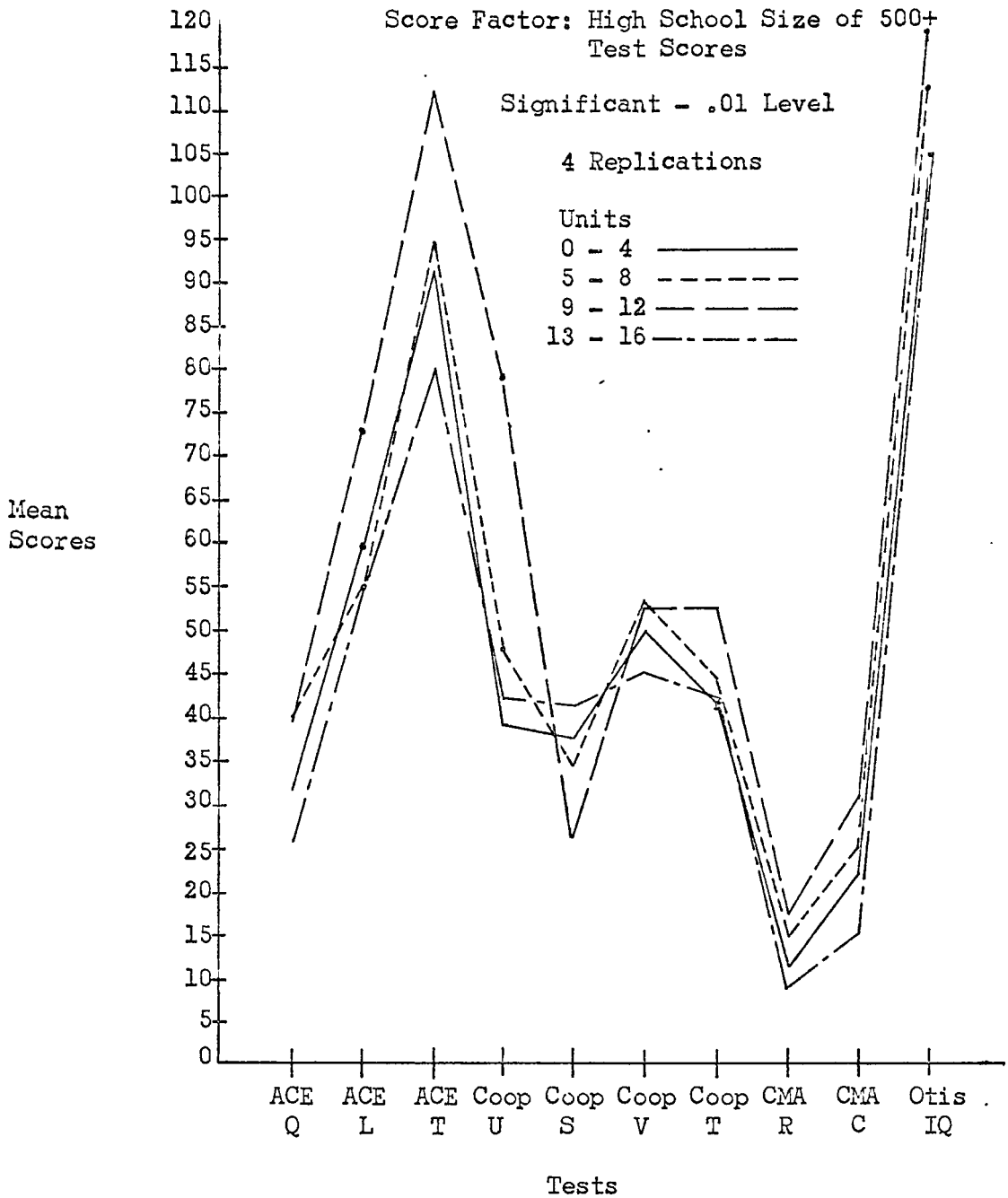


TABLE XXI

ANALYSIS IIIA--DEPENDENT VARIABLES--MALES, 20 TO 29,
HIGH SCHOOL SIZE OF 500+

Study Number	Application Number	A.C.E. Q	A.C.E. L	A.C.E. T	Coop. Inv. U	Coop. Inv. S	Coop. Inv. V	Coop. Inv. T	G.A.T. P	G.A.T. C	Otis I.Q.
27	1	26	41	67	38	37	39	38	12	13	91
35	2	29	50	79	38	51	61	50	13	22	102
48	3	32	31	63	27	2	9	13	7	6	91
67	4	50	53	103	43	37	44	41	25	33	121
70	5	26	29	55	35	3	13	17	4	11	92
75	6	32	60	92	36	36	58	42	9	23	107
89	7	41	71	112	43	46	47	45	15	30	111
95	8	27	57	84	45	50	55	50	7	23	112
117	9	35	63	98	47	53	53	51	10	23	118
122	10	24	34	58	38	40	47	41	6	12	90
141	11	27	67	94	38	30	56	41	9	21	101
5	2	25	45	70	40	30	46	39	11	21	97
19	3	40	58	98	51	32	48	42	26	35	108
30	4	36	51	87	41	28	48	39	15	23	108
42	6	33	67	100	70	8	31	36	11	27	104
55	8	51	51	102	43	32	44	36	15	30	118
65	10	46	49	95	36	34	39	36	11	7	115
84	11	31	48	79	59	52	56	56	17	27	131
138	15	30	74	104	53	61	65	60	12	25	113
145	16	32	43	75	45	49	43	46	6	23	103
151	17	37	45	82	52	28	53	44	13	16	102
158	18	41	92	133	66	66	73	68	19	32	127

TABLE XXI (continued)

	Study Number	Replication Number	A.C.E. Q	A.C.E. L	A.C.E. T	Coop. Eng. U	Coop. Eng. S	Coop. Eng. V	Coop. Eng. T	C.M.A. R	C.M.A. C	Otis I.Q.
High School Units 9-12	6	1	38	67	105	38	48	52	45	11	26	103
	15	2	58	86	144	63	58	72	65	26	34	120
	22	5	37	45	82	44	47	51	47	16	26	108
	61	9	35	53	88	34	32	45	38	16	21	103
	85	12	36	66	102	79	11	56	49	19	28	127
	97	14	27	68	95	54	47	58	53	16	30	119
	99	15	35	52	97	54	49	51	51	16	25	121
	120	18	53	59	112	50	62	56	56	23	27	121
	140	21	44	65	109	46	49	52	49	15	28	113
	150	22	40	48	88	52	48	48	49	17	26	122
	157	23	59	82	141	72	78	76	75	26	35	137
High School Units 13-16	8	1	25	60	85	41	30	54	41	10	19	99
	29	2	33	75	108	48	53	71	58	18	29	116
	38	3	29	56	85	44	48	53	48	9	23	114
	39	4	18	63	81	43	48	38	42	9	11	108
	71	5	34	63	97	51	47	55	51	16	24	112
	73	6	13	35	48	34	40	46	40	5	12	103
	83	7	36	61	97	46	39	50	45	11	13	118
	128	8	35	68	103	55	65	55	59	9	23	119
	130	9	50	59	109	50	49	52	50	27	32	118
	149	10	29	41	70	41	40	36	38	6	9	101
	156	11	34	75	109	50	44	64	53	15	27	117

TABLE XXII

ANALYSIS IIIA--DESIGN

Factor	Level	Code	I.D.	Type	Sort Order
High School Units	0- 4	1	U	B	A
	5- 8	2			
	9-12	3			
	13-16	4			
Replications	1 to 11	1 to 11	R	B	B
Score	ACE-Q	1	P	W	C
	ACE-L	2			
	ACE-T	3			
	Coop-U	4			
	Coop-S	5			
	Coop-V	6			
	Coop-T	7			
	CMA-R	8			
	CMA-C	9			
	Otis	10			

TABLE XXIII

ANALYSIS IIIA--ANALYSIS OF VARIANCE--MULTIVARIATE
HIGH SCHOOL UNITS--TEST SCORES

Source	D.F.	S.S.	M.S.	F-Ratio	P
Within Sub.	396	376339.2000			
P	9	344584.7000	38287.1900	470.2466	N.S.
UP	27	2443.6900	90.5100	1.1116	N.S.
(W)	360	29310.9800	81.4193		
Between Sub.	43	41072.9200			
U	3	9315.9000	3105.3000	3.9113	N.S.
(B)	40	31757.0200	793.9255		
Total	439	417412.1000			

Both sexes were included, but only subjects in their twenties were selected.

Table XXIV provided the data necessary for the analysis. Table XXV gives the design for the analysis. Table XXVI shows the results of the output of the computer.

Figure 29 gives the general profile for all of the subjects in this analysis using the entrance test score data as the dependent variable.

Figure 30 compares the male and female profiles. It is interesting to note that while the males' initial test scores--particularly on the Total (T) score of the American Council on Education Psychological Examination and the I. Q. as measured by the Otis-Gamma Mental Ability Test--were better than the females' test scores, the males nevertheless turned in a poorer academic performance than did their female counterparts who should have been, according to these tests, less talented.

Figure 31-A compares the profiles for the males included in this analysis according to the number of high school units presented upon admission to Texas Technological College.

Figure 31-B compares the profiles for the females included in this analysis according to the number of high school units presented upon admission to Texas Technological College.

TABLE XXIV

ANALYSIS IV--DEPENDENT VARIABLES--MALES, FEMALES, 20 TO 29, HIGH SCHOOL SIZE OF 500+

		Study No.	Rep. No.	A.C.E. Q	A.C.E. L	A.C.E. T	Coop. Eng. U	Coop. Eng. S	Coop. Eng. V	Coop. Eng. T	C.M.A. R	C.M.A. C	Otis I.Q.
Males	High School Units 5-8	70	5	26	29	55	35	3	13	17	4	11	92
		89	7	41	71	112	43	46	47	45	15	30	111
		141	11	27	67	94	38	30	56	41	9	21	101
	High School Units 9-12	42	6	33	67	100	70	8	31	36	11	27	104
		64	9	29	62	91	70	6	43	46	10	17	109
		138	15	30	74	104	53	61	65	60	12	25	113
	High School Units 13-16	45	8	27	64	91	50	55	69	59	8	11	103
		97	14	27	68	95	54	47	58	53	16	30	119
		135	20	37	65	102	57	43	53	51	15	24	117
Females	High School Units 5-8	46	2	44	60	104	56	70	54	61	16	23	114
		98	4	26	41	67	36	42	45	40	5	9	96
		143	5	26	44	70	44	48	43	45	5	9	98
	High School Units 9-12	62	1	22	55	77	44	40	60	48	17	21	99
		109	2	8	44	52	43	53	50	49	3	8	91
		125	3	20	43	63	36	36	48	38	3	5	101
	High School Units 13-16	72	1	34	51	85	53	47	50	50	5	7	102
		131	3	27	67	94	61	48	57	55	10	14	104
		137	4	38	63	101	68	64	63	66	13	20	115

TABLE XXV

ANALYSIS IV--DESIGN

Factor	Level	Code	I.D.	Type	Sort Order
Sex	Male	1	X	B	A
	Female	2			
High School Units	0- 4	1	U	B	B
	5- 8	2			
	9-12	3			
	13-16	4			
Replications	One	1	R	B	C
	Two	2			
	Three	3			
Score	ACE-Q	1	P	W	D
	ACE-L	2			
	ACE-T	3			
	Coop-U	4			
	Coop-S	5			
	Coop-V	6			
	Coop-T	7			
	CMA-R	8			
	CMA-C	9			
	Otis	10			

TABLE XXVI

ANALYSIS IV--ANALYSIS OF VARIANCE--MULTIVARIATE
SEX--HIGH SCHOOL UNITS--TEST SCORES

Source	D.F.	S.S.	M.S.	F-Ratio	P
Within Sub.	162	150894.5000			
P	9	137324.5000	15258.2900	233.6711	0.1
XP	9	2748.5800	305.4000	4.6770	0.1
UP	18	1541.9900	85.6700	1.3119	.20
XUP	18	2227.4500	123.7500	1.8951	.05
(W)	108	7052.2000	65.2981		
Between Sub.	17	12711.0000			
X	1	336.2000	336.2000	.4688	N.S.
U	2	2417.2300	1208.6200	1.6855	N.S.
XU	2	1353.1000	676.5500	.9435	N.S.
(B)	12	8604.4700	717.0391		
Total	179	163605.5000			

FIGURE 29

ANALYSIS IV

DEPENDENT VARIABLES - Male - Female - 20 to 29 - High School Size of 500+

Score Factor: Test Scores

3 Replications

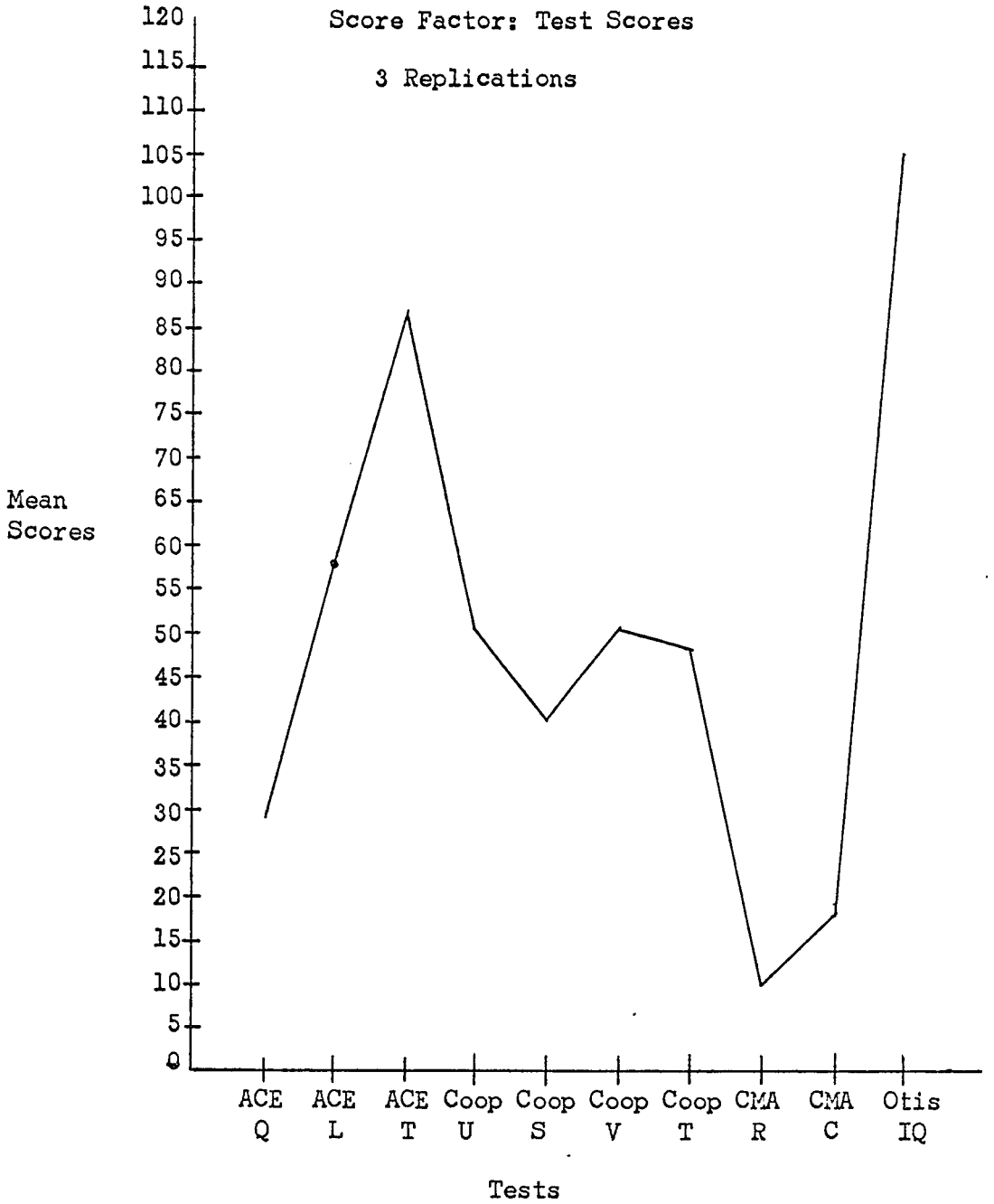


FIGURE 30

ANALYSIS IV

DEPENDENT VARIABLES - Male - Female - 20 to 29 - High School Size of 500+

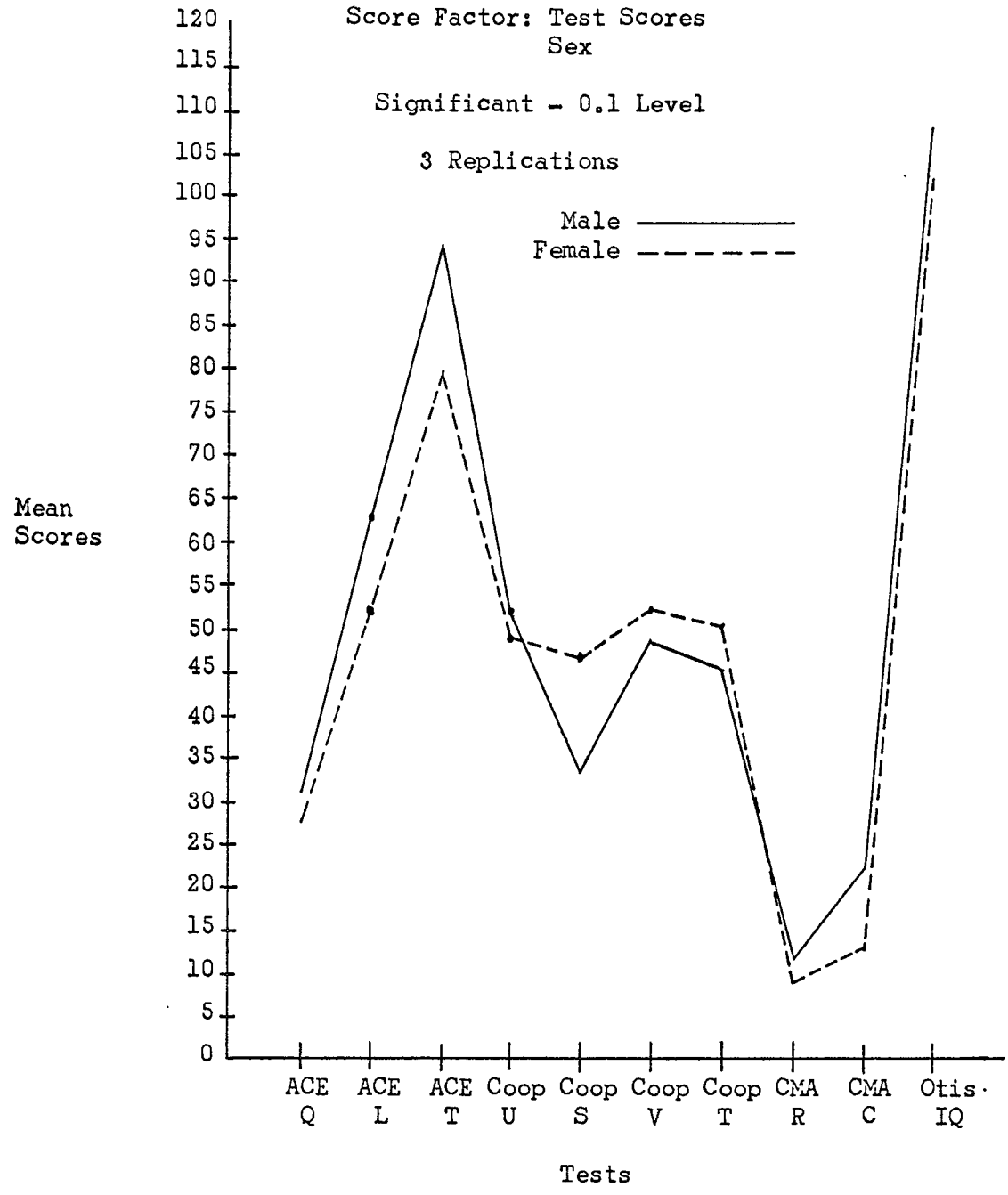


FIGURE 31-A

ANALYSIS IV

DEPENDENT VARIABLES - Male - Female - 20 to 29 - High School Size of 500+

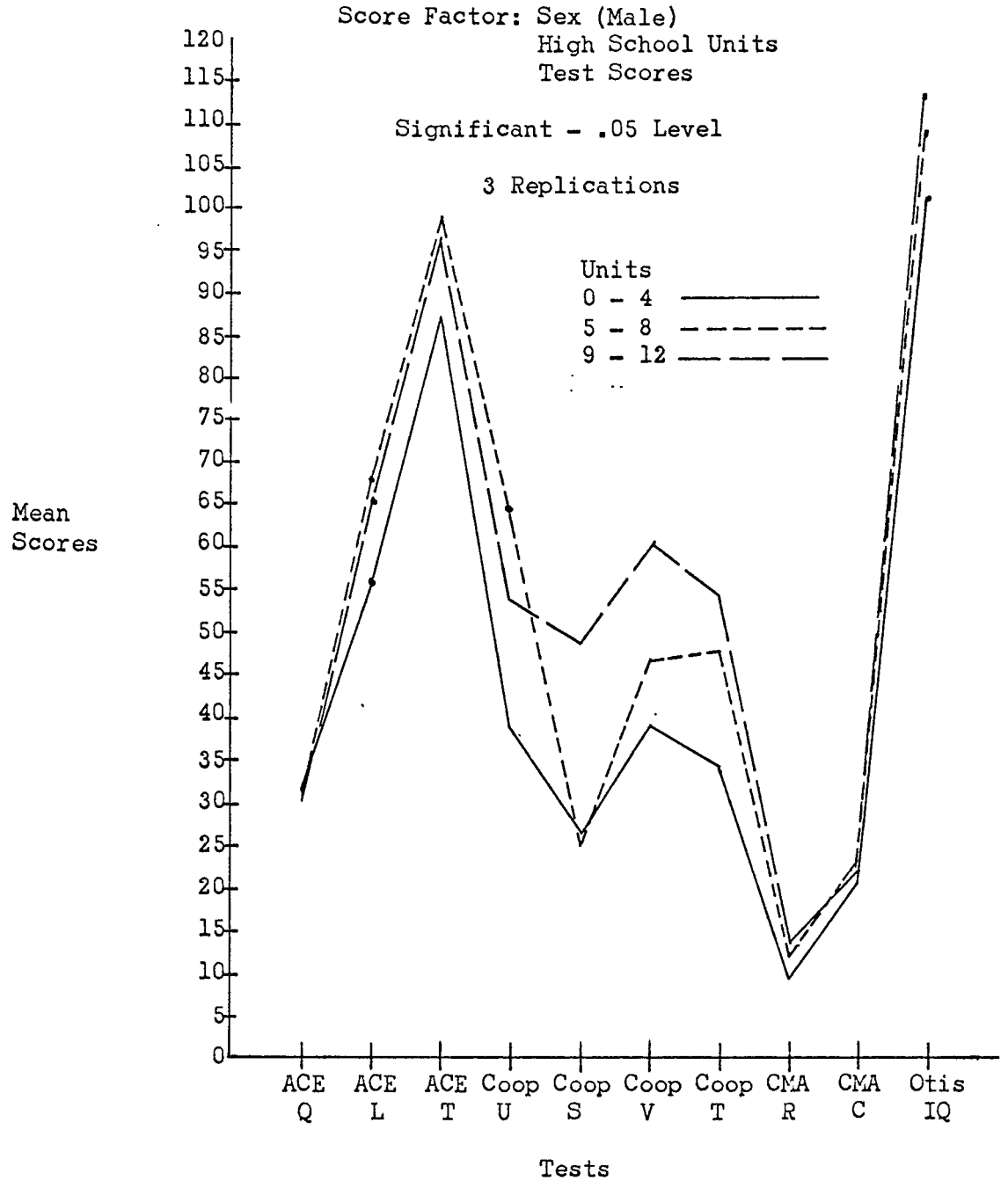
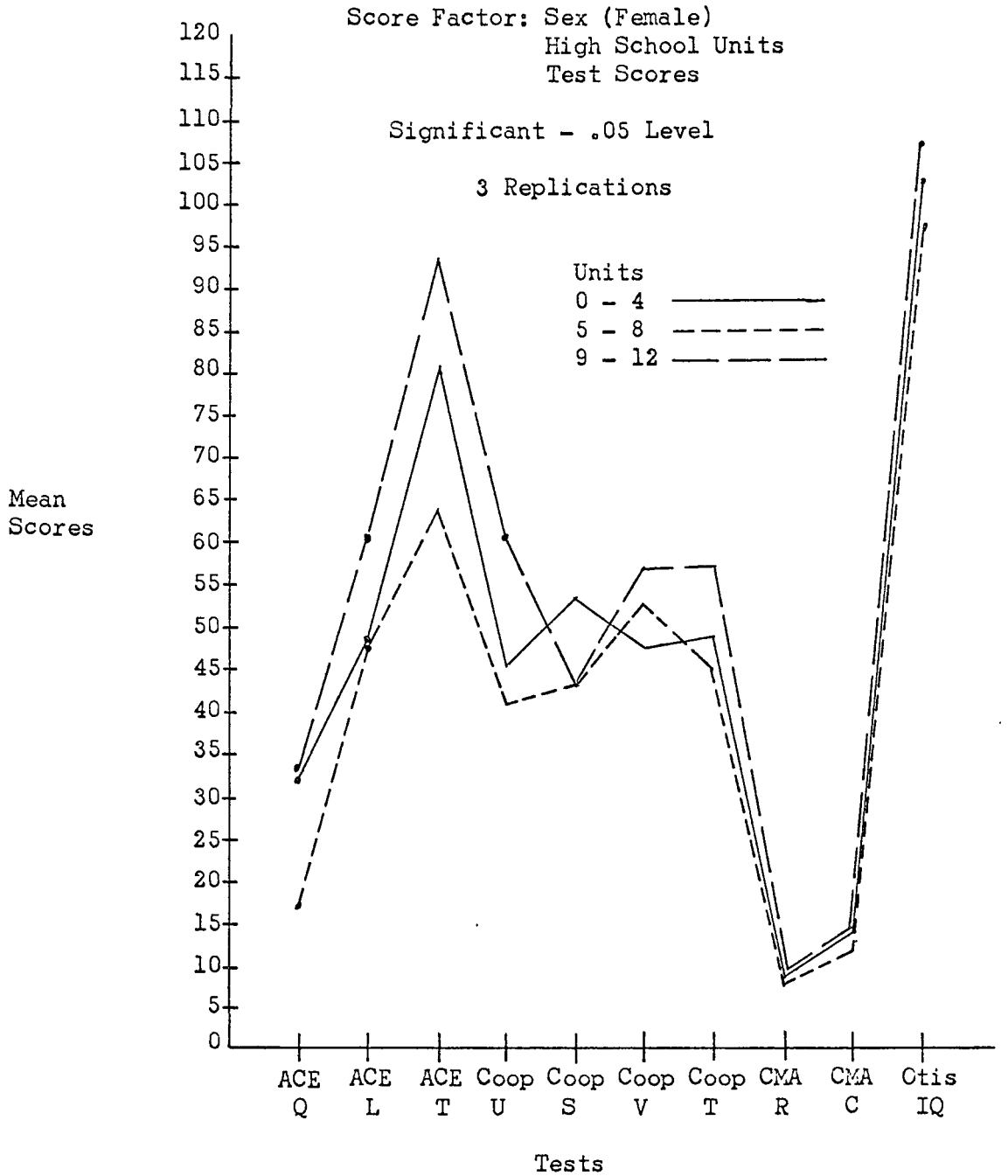


FIGURE 31-B

ANALYSIS IV

DEPENDENT VARIABLES - Male - Female - 20 to 29 - High School Size of 500+



Combined, Figures 31-A and 31-B shows that the students who presented between nine and twelve high school units upon admission to Texas Technological College showed the greatest academic potential. The two sexes, however, excelled on different tests.

IV. FACTOR ANALYSIS

In Chapter III it was stated that the data available on the non-high school graduates who attended Texas Technological College from 1954 through 1964 produced an unbalanced analysis of variance design. It was not possible to consider all independent or dependent variables simultaneously. A correlational factor analysis was made, therefore, in order to establish better the relationship between the variables.

Table XXVII shows the complete correlation matrix. Twenty-two variables were used. The intercorrelations among the twenty-two variable matrix were computed and from them the principal component analysis was made. The five factors shown in Table XXVIII constitute the principal factor analysis. The high loadings were then extracted from the principal factor pattern and are shown in Table XXIX. The varimax rotation factor analysis, Table XXX, and the varimax with only the high loadings showing, Table XXXI, comprise the complete analysis. By use of the procedure outlined by

TABLE XXVII

22 VARIABLE CORRELATION MATRIX

151 SUBJECTS

MEANS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
	1.2148	26.1611	7.5436	3.0336	30.6040	58.2349	1.3132	22.5235	.0604	949.5369	30.8725	54.7852	85.6510	47.8054	40.9664	50.6443	48.0403	11.6644	19.0738	108.4564	1.5906	58.0872
STANDARD DEVIATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
	.4107	7.7581	4.6924	3.4533	47.1873	110.0830	1.0941	14.9265	.2382	761.5908	11.3624	13.4307	21.5447	12.0918	14.8773	11.9608	14.8892	6.4926	8.4115	11.4549	.6132	3.8196

INTERCORRELATIONS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Sex..... 1	1.0000	.2567	-.0301	-.0193	-.0434	.0183	.2905	.3057	.0046	-.0360	-.2890	-.1097	-.2206	.0638	.1802	.1372	.1852	-.3178	-.2416	-.1678	.2159	.1506
Age..... 2	.2567	1.0000	-.3548	-.0824	-.1648	-.0827	.1790	.1061	-.0634	-.2041	-.3647	-.2146	-.3265	-.2326	-.0116	.0582	-.1028	-.3255	-.3591	-.2041	.0646	.1311
H.S. Units..... 3	-.0301	-.3548	1.0000	.2329	.2890	.2359	-.0063	-.0610	.1597	.1169	.2065	.2440	.2632	.2133	.1094	.1317	.1353	.2058	.2838	.1624	-.1921	-.0610
No. Sem..... 4	-.0193	-.0824	.2329	1.0000	.9635	.9062	.3546	-.1260	.6339	-.0340	.0058	.0310	.0234	-.0129	.0382	-.0171	-.0576	-.0061	.0170	.2005	.0192	-.3406
Total Sem. Hrs..... 5	-.0434	-.1648	.2890	.9635	1.0000	.9361	.3484	-.1428	.7040	-.0280	.0650	.0785	.0855	.0492	.0630	-.0001	-.0332	.0371	.0647	.2394	-.0281	-.3400
Total Grade Points... 6	.0183	-.0827	.2359	.9062	.9361	1.0000	.4453	-.0801	.7984	-.0977	.0479	.0858	.0798	.0258	.0530	.0045	-.0301	.0072	.0458	.2307	.0200	-.2893
Grade-Point Average.. 7	.2905	.1790	-.0063	.3546	.3484	.4453	1.0000	.0799	.2768	.0011	.1525	.2384	.2325	.1630	.3476	.3183	.1208	.1088	.1508	.2864	.2688	.1445
Major..... 8	.3057	.1061	-.0610	-.1260	-.1428	-.0801	.0799	1.0000	-.0278	-.0662	-.2229	-.1126	-.1937	.0727	-.1379	-.0752	-.0245	-.2203	-.3065	-.2114	.1195	.1200
Degree..... 9	.0046	-.0634	.1597	.6339	.7048	.7984	.2768	-.0278	1.0000	-.1817	.0103	-.0169	-.0050	-.0588	.0366	-.0372	-.0404	-.0433	.0212	.0932	-.0604	-.2344
H.S. Size.....10	-.0360	-.2041	.1169	-.0340	-.0280	-.0977	.0011	-.0662	-.1817	1.0000	.0957	.0812	.1013	.1014	-.0620	.0639	-.0583	.0286	.0827	.0017	.0497	.0101
A.C.E.-Q.....11	-.2890	-.3647	.2065	.0058	.0650	.0479	.1525	-.2229	.0103	.0957	1.0000	.4864	.8355	.3143	.2768	.2917	.2214	.7434	.7326	.6492	-.0528	.0649
A.C.E.-L.....12	-.1097	-.2146	.2440	.0310	.0785	.0858	.2384	-.1126	-.0169	.0812	.4864	1.0000	.8842	.5484	.4145	.6902	.5025	.4504	.5778	.6853	.0178	.0218
A.C.E.-T.....13	-.2206	-.3265	.2632	.0234	.0855	.0798	.2325	-.1937	-.0050	.1013	.8355	.8842	1.0000	.5081	.4133	.5895	.4319	.6766	.7514	.7613	-.0118	.0495
Coop. Eng.-U.....14	.0638	-.2326	.2133	-.0129	.0492	.0258	.1630	.0727	-.0588	.1014	.3143	.5484	.5081	1.0000	.0240	.2750	.5359	.3090	.4031	.5127	.0255	-.0345
Coop. Eng.-S.....15	.1802	-.0116	.1094	.0382	.0630	.0530	.3476	-.1379	.0366	-.0620	.2768	.4145	.4133	.0240	1.0000	.6684	.3150	.2763	.3331	.3986	.1537	.1868
Coop. Eng.-V.....16	.1372	.0582	.1317	-.0171	-.0001	.0045	.3183	-.0752	-.0372	.0639	.2917	.6902	.5895	.2750	.6684	1.0000	.4219	.3467	.4447	.5147	.1137	.0929
Coop. Eng.-T.....17	.1852	-.1028	.1353	-.0576	-.0332	-.0301	.1208	-.0245	-.0404	-.0583	.2214	.5025	.4319	.5359	.3150	.4219	1.0000	.2423	.3036	.4154	.0687	.0938
C.M.A.-R.....18	-.3178	-.3255	.2058	-.0061	.0371	.0072	.1088	-.2203	-.0433	.0286	.7434	.4504	.6766	.3090	.2763	.3467	.2423	1.0000	.7778	.5953	.0026	.1792
C.M.A.-C.....19	-.2416	-.3591	.2838	.0170	.0647	.0458	.1508	-.3065	.0212	.0827	.7326	.5778	.7514	.4031	.3331	.4447	.3036	.7778	1.0000	.6643	-.0371	.0884
Otis-Gamma I.Q.....20	-.1678	-.2041	.1624	.2005	.2394	.2307	.2864	-.2114	.0932	.0017	.6492	.6853	.7613	.5127	.3986	.5147	.4154	.5953	.6643	1.0000	.0161	-.0317
Sem. Entered.....21	.2159	.0646	-.1921	.0192	-.0281	.0200	.2688	.1195	-.0604	.0497	-.0528	.0178	-.0118	.0255	.1537	.1137	.0687	.0026	-.0371	.0161	1.0000	.3362
Year Entered.....22	.1506	.1311	-.0610	-.3406	-.3400	-.2893	.1445	.1200	-.2344	.0101	.0649	.0218	.0495	-.0345	.1868	.0929	.0938	.1792	.0884	-.0317	.3362	1.0000

TABLE XXVIII

PRINCIPAL AXIS FACTOR LOADINGS

Variables	Factor Loadings--E Values				
	1 6.0418	2 3.8190	3 2.4082	4 1.4369	5 1.2411
1 Sex	-.1748	.0218	.7037	.3105	.0287
2 Age	-.3713	-.0396	.5044	-.2879	-.3397
3 High School Units	.3618	.2106	-.2201	.3786	.1104
4 No. Semesters	.2051	.9177	.0235	-.0205	.0628
5 Total Sem. Hours	.2705	.9287	-.0189	.0147	.0631
6 Total Grade Points	.2506	.9380	.0864	-.0201	.0585
7 Grade-Point Aver.	.3371	.3335	.6004	-.1463	.2008
8 Major	-.2599	-.0679	.3559	.4307	.1947
9 Degree	.1335	.8048	.0430	-.0574	-.0400
10 High School Size	.0879	-.1193	-.1556	.2355	.5120
11 A.C.E.--Q	.7770	-.1478	-.2659	-.1958	.1576
12 A.C.E.--L	.8232	-.1474	.1290	.1661	-.1684
13 A.C.E.--T	.9295	-.1701	-.0570	-.0048	-.0211
14 Coop. Eng.--U	.5624	-.1292	.0732	.5949	.0017
15 Coop. Eng.--S	.5109	-.0741	.4608	-.2976	-.1603
16 Coop. Eng.--V	.6443	-.1758	.4413	-.0590	-.2506
17 Coop. Eng.--T	.5102	-.1908	.3068	.3934	-.2459
18 C.M.A.--R	.7430	-.1949	-.2315	-.2553	.1794
19 C.M.A.--C	.8284	-.1574	-.1996	-.1461	.0851
20 Otis-Gamma I.Q.	.8487	.0173	.0251	-.0484	-.1029
21 Semester Entered	.0167	-.0635	.5087	-.1547	.5453
22 Year Entered	.0275	-.4257	.3720	-.2605	.4554

TABLE XXIX

HIGH LOADINGS ON PRINCIPAL FACTORS

Variables	Factor Loadings				
	1	2	3	4	5
1 Sex			.7037		
2 Age	-.3713		.5044		-.3397
3 High School Units	.3618			.3786	
4 No. Semesters		.9177			
5 Total Sem. Hours		.9287			
6 Total Grade Points		.9380			
7 Grade-Point Aver.	.3371	.3335	.6004		
8 Major			.3559	.4307	
9 Degree		.8048			
10 High School Size					.5120
11 A.C.E.--Q	.7770				
12 A.C.E.--L	.8232				
13 A.C.E.--T	.9295				
14 Coop. Eng.--U	.5624			.5949	
15 Coop. Eng.--S	.5109		.4608		
16 Coop. Eng.--V	.6443		.4413		
17 Coop. Eng.--T	.5102			.3934	
18 C.M.A.--R	.7430				
19 C.M.A.--C	.8284				
20 Otis-Gamma I.Q.	.8487				
21 Semester Entered			.5087		.5453
22 Year Entered		-.4257	.3720		.4554

Harman[1] for approximating the standard error of the factor loadings, it was found that loadings greater than .350 were significant at the .05 level. The loadings were arbitrarily referred to as high (.751 and above), medium (.501 to .750), or low (.350 to .500).

In both the principal axis factor analysis and the varimax rotation factor analysis the negative signs represented the male students while the positive correlations represented the female students.

Interpretation of Principal Axis Factor Analysis

The first factor analysis, the principal axis, extracted from the twenty-two variable correlation matrix the variability with respect to the variables. The five factors explained all of the variance that can be explained.

Factor I. This factor was significantly loaded on variables 11 through 20. These are the tests required by the Committee on Admissions at Texas Technological College before a non-high school graduate can be considered for admission. "General Ability" was a suitable name for this factor because obviously it was related to some general ability as measured by all of these tests. Variable 13, the Total score on the

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[1]Harry H. Harman, Modern Factor Analysis (Chicago: University of Chicago Press, 1962).

American Council on Education Psychological Examination, measured this ability better than any of the others. It was noted that variables 11, 12, 13, 18, 19, and 20 were high loadings while the Co-Operative English Examination, variables 14, 15, 16, and 17, were medium loadings. This was probably due to the fact that the Co-Operative English Examination measures achievement while the American Council on Education Psychological Examination, the California Multiple Aptitude Tests, and the Otis-Gamma Mental Ability Test measure native ability.

Factor II. The second factor on the principal axis analysis was quite different from the first. None of the entrance examination scores was significantly loaded; and all except variable 20, the Otis-Gamma Mental Ability Test, had negative signs. The loadings on this factor indicated that it was measuring some form of tenacity or longevity. It showed merely that the more semesters a student attends, the more semester hours and total grade points he will have. He will not necessarily have the highest grade-point average, however. Variable 7, grade-point average, had a low marginal loading, which fact indicated that there was only a slight relationship between this variable and the other variables measured by this factor. For variable 22, year entered, a low negative loading appeared, which seemed to indicate that those students who remained in Texas Technological College the

longest period of time enrolled during the 1950's. This fact, however, was of very little significance.

Factor III. The third factor on the principal axis was primarily an academic performance factor. The largest loading was a positive loading for sex, which indicated that the females tended to succeed better than the males. The age variable was moderately loaded, which indicated that the older females exhibited the kind of academic performance measured by the grade-point average. Two of the entrance examinations, the Co-Operative English Examination Spelling and Vocabulary tests, seemed to pick out the females. The verbal ability that these two tests measure probably gave the females an ability to make better grade averages than the males.

Variable 8, Major, had a low loading, which indicated that the female students normally chose a major other than mathematics, science, or engineering. The basis for coding the majors in this analysis was determined by the importance of mathematics to the major.

The loadings on variables 21 and 22, semester entered and year entered, showed that those females who entered the Spring Semester during the 1960's tended to perform better academically.

Factor IV. The fourth factor had only four loadings, and they were not particularly high. It seemed to

indicate that the more high school units a person had upon admission the better his scores on the Co-Operative English Examination Usage and Total score will be. Variable 8, Major, showed a low loading, indicating that the chances were the students will enter a non-mathematics area.

Factor V. The fifth factor, as did the fourth, had only four loadings that were not particularly high. It seemed to be something of an artifact. Variable 10, high school size, had a loading of .51, which means that those students from the larger high schools--particularly the younger male students from the larger high schools--exhibited the most of what this factor measures. They seemed to be students who entered Texas Technological College during either a spring semester or a summer session. This factor could be called a "High School Size" factor.

Interpretation of Varimax Rotation Factor Analysis

The varimax rotation factor analysis extracted 67.94 percent of the total variance with respect to groups of variables. The five factors extracted from the intercorrelation matrix are shown in Table XXX. Table XXXI shows the high loadings on each factor.

Factor I. The high loadings seemed to indicate that this factor was measuring a quantitative or non-verbal reasoning ability. The negative loading for Sex, variable 1,

TABLE XXX

VARIMAX ROTATION FACTOR LOADINGS

Variables	Factor Loadings				
	1	2	3	4	5
1 Sex	-.6748	.0371	.3285	.2105	-.1203
2 Age	-.3206	-.0862	.1334	-.0872	-.6757
3 High School Units	.0669	.2601	-.1653	.2533	.4666
4 No. Semesters	.0297	.9411	-.0299	-.0230	.0347
5 Total Sem. Hours	.0647	.9614	-.0619	.0225	.0867
6 Total Grade Points	.0169	.9758	.0077	.0339	.0136
7 Grade-Point Aver.	-.0708	.4636	.5500	.3136	-.1624
8 Major	-.5819	-.0925	.1938	.0188	.1927
9 Degree	.0053	.8130	-.0707	-.0312	-.0723
10 High School Size	.0406	-.0884	.2088	-.0513	.5550
11 A.C.E.--Q	.7123	.0161	.1115	.4266	.2395
12 A.C.E.--L	.2635	.0328	.0118	.8316	.0994
13 A.C.E.--T	.5452	.0305	.0708	.7477	.1856
14 Coop. Eng.--U	-.1019	-.0133	-.0747	.6899	.4474
15 Coop. Eng.--S	.2000	.0779	.3318	.5381	-.3838
16 Coop. Eng.--V	.1334	-.0050	.2051	.7622	-.2574
17 Coop. Eng.--T	-.1474	-.0724	-.0355	.7579	.0585
18 C.M.A.--R	.7190	-.0313	.1699	.3944	.1965
19 C.M.A.--C	.6666	.0182	.0918	.5327	.2063
20 Otis-Camma I.Q.	.4596	.1986	.0462	.6918	.0527

TABLE XXX (continued)

Variables	Factor Loadings				
	1	2	3	4	5
21 Semester Entered	-.1189	.0201	.7538	-.0130	.0382
22 Year Entered	.0543	-.3428	.6891	.0047	-.0162
Percentage of Total Variance	13.9401	17.7427	8.2069	20.4186	7.6315
Total Variance Extracted--67.94%					

TABLE XXXI

HIGH LOADINGS ON VARIMAX ROTATION FACTORS

Variables	Factor Loadings				
	1	2	3	4	5
1 Sex	-.6748				
2 Age					-.6757
3 High School Units					.4666
4 No. Semesters		.9411			
5 Total Sem. Hours		.9614			
6 Total Grade Points		.9758			
7 Grade-Point Aver.		.4636	.5500		
8 Major	-.5819				
9 Degree		.8130			
10 High School Size					.5550
11 A.C.E.--Q	.7123			.4266	
12 A.C.E.--L				.8316	
13 A.C.E.--T	.5452			.7477	
14 Coop. Eng.--U				.6899	.4474
15 Coop. Eng.--S				.5381	-.3838
16 Coop. Eng.--V				.7622	
17 Coop. Eng.--T				.7579	
18 C.M.A.--R	.7190			.3944	
19 C.M.A.--C	.6666			.5327	
20 Otis-Gamma I.Q.	.4596			.6918	
21 Semester Entered			.7538		
22 Year Entered		-.3428	.6891		

showed that the male students exhibited more of this quantitative reasoning ability than did the females. The negative loading on the Major variable, variable 8, showed that those male students were more likely to go into a mathematics, science, or engineering area than were the females. This factor included almost 14 percent of the variance extracted.

Factor II. In Factor II there was essentially the same thing as in the second factor in the principal axis analysis. This seemed to be a tenacity or longevity factor. The scores were almost identical with the scores in the loadings on the second factor in the principal axis analysis; the intercorrelation indicated essentially the same thing and showed merely that the more semesters a student attended, the more semester hours and total grade points he would have. Eighteen percent of the variance is included in this factor.

The principal axis analysis and the varimax rotation analysis are completely different types of solutions, yet in this particular case the same answer was given, which is somewhat unusual.

Factor III. Factor III had only three significant loadings. This factor was similar to the fifth factor in the principal axis analysis and was not too significant. It showed that those female students, evidenced by positive loadings,

who entered during the spring or summer in the 1960's tended to have higher grade-point averages than those entering in the fall. This factor represented only eight percent of the total variance extracted.

Factor IV. This factor was similar to the first factor in the principal axis analysis. The high loadings on variables 11 through 20, the entrance test scores, indicated that it was a general ability or I. Q. factor and primarily a female ability factor. The highest loadings were on the linguistic measures.

Factor V. Factor V was negatively loaded on Age, indicating that the younger male students usually come from the larger high schools. This was shown by the loading on variable 10, size of the high school. Those students presented several high school units upon admission to Texas Technological College and usually had good scores on the Co-Operative English Examination Usage test, variable 14, and bad scores on the Spelling test of the Co-Operative English Examination, variable 15. In general, they were probably young males who were juniors in large high schools when dropping out. This factor did not indicate anything at all about their performance. This ability was not related, therefore, to ability in Texas Technological College. No statements can be made on the basis of this factor about how these students

would perform at Texas Technological College as a result of knowing that all of them have a common background and some kinds of abilities in common.

V. SCHOOL OF ENROLLMENT AND DISTRIBUTION OF DEGREES

The distribution of degrees according to school of enrollment and major areas of study is reported in Tables XXXII through XXXVI.

Table XXXII presents the number of degrees earned according to the school of enrollment. Tables XXXIII through XXXVI present statistical data regarding degree attainment and major areas of study according to school of enrollment.

Included in Tables XXXII through XXXVI were those non-high school graduates who received degrees. Of the 151 students studied, thirteen, or 8.7 percent of the total, attained degrees. The distribution of degrees is shown in Table XXXII. A total of five schools were included as those in which the students were enrolled at the College. Degrees were earned in four of these schools.

School of Enrollment

Examination of the data in Table XXXII revealed that the largest number of students, eight students or 53.0 percent, was enrolled in the School of Arts and Sciences. Five of these students, or 6.3 percent, earned degrees.

Forty-one students, 27.1 percent, were enrolled in the School of Business Administration. Three of these students, or 7.3 percent, earned degrees.

Third in number of students studied enrolled in the School of Engineering. The total was twenty, of whom one student, or 5.0 percent, earned a degree.

The School of Agriculture was fourth in number with a total of seven students, 4.6 percent. Four of these students, 57.1 percent, completed all degree requirements and were graduated.

The School of Home Economics had the smallest number of students enrolled, a total of three or 2.0 percent, of whom none earned a degree.

TABLE XXXII

TOTAL NUMBER OF DEGREES EARNED BY NON-HIGH SCHOOL GRADUATES ACCORDING TO SCHOOL OF ENROLLMENT

School	Number	Percentage	Number of Degrees	Percentage
Agriculture	7	4.6	4	30.8
Arts and Sciences	80	53.0	5	38.5
Business Administration	41	27.1	3	23.1
Engineering	20	13.3	1	7.6
Home Economics	3	2.0	0	0.0
Totals	151	100.0	13	100.0

Tables XXXIII through XXXVI are companion tables to Table XXXII. They depict the distribution of degrees, by specific type, according to the major in the respective schools in which the students were enrolled.

School of Agriculture. Of the total degrees earned by the non-high school graduates, four or 30.8 percent, were awarded to those students who completed the degree requirements in the School of Agriculture.

Table XXXIII indicates that four students, or 75 percent, of the total School of Agriculture enrollees who earned degrees, were granted Bachelor of Science degrees. One student enrolled in the School of Agriculture earned a Master of Science degree.

The table shows that two of these students, or 50.0 percent, earned the Bachelor of Science degree in Agricultural Education. One student, 25.0 percent, earned the Bachelor of Science degree with a major in agronomy. The Master of Science degree in Agricultural Education was earned by one student, or 25.0 percent.

School of Arts and Sciences. Table XXXIV shows the distribution of degrees earned by the non-high school graduates who were enrolled in the School of Arts and Sciences from 1954 through 1964. Two of the students, 40.0 percent, earned the Bachelor of Science, one in elementary education

TABLE XXXIII

DISTRIBUTION OF DEGREES EARNED BY NON-HIGH SCHOOL GRADUATES ACCORDING TO MAJOR IN THE SCHOOL OF AGRICULTURE

Major	B.S.	B.A.	M.S.	M.A.	Total
Agricultural Education	2		1		3
Agronomy	1				1
Totals	3	0	1	0	4

and one in mathematics. One student, 20.0 percent, earned a Bachelor of Arts degree with a major in Spanish. The Master of Science degree was earned by two of the students, or 40.0 percent, one with a major in elementary education and one with a major in mathematics.

TABLE XXXIV

DISTRIBUTION OF DEGREES EARNED BY NON-HIGH SCHOOL GRADUATES ACCORDING TO MAJOR IN THE SCHOOL OF ARTS AND SCIENCES

Major	B.S.	B.A.	M.S.	M.A.	Total
Elementary Education	1		1		2
Mathematics	1		1		2
Spanish		1			1
Totals	2	1	2	0	5

School of Business Administration. Table XXXV presents the distribution of degrees, by type, earned by the

non-high school graduates enrolled in the School of Business Administration. The Bachelor of Business Administration degree was earned by three students, one with a major in accounting, one with a major in finance, and one with a major in international trade.

TABLE XXXV

DISTRIBUTION OF DEGREES EARNED BY NON-HIGH SCHOOL GRADUATES ACCORDING TO MAJOR IN THE SCHOOL OF BUSINESS ADMINISTRATION

Major	B.B.A.	Total
Accounting	1	1
Finance	1	1
International Trade	1	1
Totals	3	3

School of Engineering. In the School of Engineering only one degree was earned, as shown in Table XXXVI. The degree earned in the School of Engineering was a Bachelor of Science degree with a major in petroleum engineering.

TABLE XXXVI

DISTRIBUTION OF DEGREES EARNED BY NON-HIGH SCHOOL GRADUATES ACCORDING TO MAJOR IN THE SCHOOL OF ENGINEERING

Major	B.S.	B.A.	M.S.	M.A.	Total
Petroleum Engineering	1				1
Totals	1				1

VI. SUMMARY

This chapter has presented data relating to the scholastic success of the 151 non-high school graduates included in this study. Tables and graphs were presented to show the relationship between certain variables and the academic success of these students. These variables included sex, age at time of admission, total number of high school units presented upon admission, number of semesters attended, total number of semester hours attempted, school in which enrolled within Texas Technological College, college major, degree earned, size of the high school attended, and scores on recognized selective tests.

Evidence concerning the student characteristics revealed that 77.6 percent of the students were males and 22.4 percent were females. The percentage of the group between the ages of twenty and twenty-nine was 82.1; 11.3 percent were between the ages of thirty and thirty-nine; whereas only 6.6 percent were forty years of age and above.

The records show that 30.5 percent of the students included in this study dropped out of high school while in the ninth grade or lower grade. The percentage which dropped out in the tenth grade was 27.2, and 29.1 percent in the eleventh. The remaining 13.2 percent dropped out of high school during the senior year. A large majority of the

students had attended high schools with an enrollment of over 500 students.

The percentage of students who attended Texas Technological College five semesters or less was 85.4, and 63.9 percent of this group either failed or withdrew before the end of the first semester.

Representatives from this group were enrolled in each of the five schools within Texas Technological College. The largest percentage was enrolled in the School of Arts and Sciences. A total of thirteen degrees, which included three Master's degrees, were attained, representing 8.6 percent of the total group of students included in this study.

Four separate analyses were made using the analysis of variance technique. The first analysis was made using a sample of the twenty-year-old male group from high schools larger than 100 enrollment. This group completed an average of 3.48 semesters with a mean grade-point average of .90. According to the grading system at Texas Technological College this mean grade-point average would be slightly below a "D" average.

In the second analysis the males and females between the ages of twenty and twenty-nine from high schools of over 500 enrollment were used. It was evident that the females had greater academic success than the males. The mean grade-point average for the males was .93, and for the females it

was 2.48. This analysis also indicated that the students who presented between nine and twelve high school units upon entering tended to achieve better than those who presented fewer high school units. The female students exceeded the males no matter how many high school units the females had. The success of the males increased with the greater number of high school units they presented.

In the third analysis the same subjects were used as in the first and second analyses, but the entrance test scores were used as the dependent variables. It was noted that a better composite test score was made by those students from large high schools of over 500 enrollment and especially by those students who dropped out of high school during the junior year. This group of students scored higher than any of the other students from the smaller high schools on all of the tests except the spelling test.

In analysis four only subjects from high schools with an enrollment of over 500 were used. Both sexes of ages between twenty and twenty-nine were included. This analysis pointed out that the male students' initial test scores were better than the females' test scores. The males, nevertheless, turned in a poorer academic performance than did their female counterparts. Those students who presented between nine and twelve high school units upon admission showed the greatest academic potential.

In order better to establish the relationship between the variables and the non-high school graduate's academic success, a factor analysis was made. It was again made clear, as in the analysis of variance section, that the females tended to succeed better than the males. It was interesting to note that the students who entered during a spring semester or a summer session during the 1960's tended to perform better academically.

This analysis showed that the female students were less likely than the male students to choose a major in which mathematics is emphasized.

The male students usually had a higher quantitative or non-verbal reasoning ability than did the females. Conversely, the female students had higher scores on the verbal or linguistic tests.

Of the 151 non-high school graduates included in this study a total of ten students earned a bachelor's degree and three students earned a Master's degree. A breakdown according to sex reveals that 7 of the 117 males earned the bachelor's degree and one earned the Master's degree. Three of the thirty-four females completed the course work and received the bachelor's degree, while two earned the Master's degree.

Data included in the student's permanent record file indicated that some of the non-high school graduates applied

for admission to Texas Technological College with no intention of earning a degree even though they were admitted to a degree program. This seemed to be the case for some of those students admitted to the School of Business Administration, particularly the older male students who listed accounting as their major subject. Thirteen of the eighteen students enrolled as accounting majors attended as part-time evening students carrying three to six semester hours of accounting and related courses per semester. The average length of time that these students attended was two semesters. There is the possibility, therefore, that these students wished only to improve their knowledge of business practices in order that they might be more efficient in their work.

Over all, the findings substantiated those in studies of academic success reported in Chapter II.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

I. INTRODUCTION

This study, "An Analysis of the Relationship of Selective Factors to the Scholastic Success of Non-High School Graduates Who Attended Texas Technological College from 1954 to 1964," has been an analysis of selected recorded college data to determine the effect of these variables on the scholastic success of non-high school graduates. A statistical analysis using the analysis of variance technique and a factor analysis has been presented in the preceding chapters.

This chapter reviews the preceding study in the following order: Literature and Research, Research Procedures, Findings on the Non-High School Graduates, Conclusions, and Recommendations.

II. REVIEW OF LITERATURE AND RESEARCH

Literature and research pertaining to the academic success of non-high school graduates who attended various institutions of higher learning and those which dealt with prediction of academic success were reviewed. Considerably more literature and research were available concerning the

prediction of academic success than for non-high school graduates who attended various institutions.

Studies dealing with the prediction of academic success were included because it is necessary for the college admissions officer to be able to predict within reasonable limits the potential scholastic abilities of non-high school graduates seeking admission to avoid unfair and inaccurate judgments in their selection. For the most part, the practice of admitting carefully selected younger students who were not graduated from high school has been highly successful in terms of scholastic performance of these students. The results of admitting older students, however, have not been so clear.

From the studies reported there seemed to be no apparent relationship between the number or pattern of high school units completed by the student and his success in college. It can be assumed, therefore, that high school graduation is not necessarily essential to scholastic success in college. A properly motivated student of average aptitude who was not graduated from high school can, after three years of high school, compete successfully in college with high school graduates even though his performance for the freshman year may be at a lower level.

Studies have looked at high school rank in class, high school grades, aptitude and subject-matter test scores,

personality tests, and data on interests and socio-economic background of students to determine the value of these criteria for predictive purposes. The prediction studies showed that of the several criteria that have been used to predict scholastic success, the high school grade average seemed to be the most efficient single instrument, with the high school class rank second.

The value of aptitude tests for prediction has been found to vary, for they give only a rough estimate of a student's ability. Test results, therefore, have greater significance in predicting college academic success when they are combined with other factors such as the high school grade average or the high school class rank.

III. REVIEW OF RESEARCH PROCEDURES

Non-high school graduates enrolled in Texas Technological College from the Fall Semester 1954 through the Spring Semester 1964 totaled 158. Seven of the students were excluded from this study because adequate statistical data were not available for them. The remaining 151 students were used in this study.

The permanent record provided the data for inclusion in this study. In addition to the scholastic record, a number of other variables were included: sex, age at time of admission, total number of high school units presented

upon admission, number of semesters attended, total number of semester hours attempted, school in which enrolled within Texas Technological College, college major, degree earned, and size of the high school attended. The test scores these students made on the required battery were obtained from the files of the Testing and Counseling Center.

A master sheet was designed to facilitate recording. This master sheet was arranged on a page 8½" x 11" in size with ten sets of squares for grades and courses. Other smaller squares were used to indicate the other variables.

Following the collection of data, a tally sheet was designed on a page 8½" x 11" in size on which the data were tallied in cells according to sex, age, number of high school units, and the size of the high school attended. Block diagrams were drawn for each of the four main effects and the interactions between these main effects. From the data in the block diagrams, graphs were drawn depicting the main effects and their interactions.

All data were coded and punched on data cards. The data were then analyzed in a factoral analysis of variance design using the IBM 1620 computer.

The data available on the non-high school graduates who attended Texas Technological College produced an unbalanced analysis of variance design because it was not possible to consider all independent or dependent variables

simultaneously. The data, therefore, were punched on additional IBM cards and programmed for a factor analysis. Tables and graphs were then set up to show the complete summary of the statistical results of the analysis of variance and the factor analysis.

IV. REVIEW OF THE FINDINGS ON THE NON-HIGH SCHOOL GRADUATES

The findings in this study concerning the non-high school graduates were drawn from all of the data sources employed in this study. The findings have been reported in detail in Chapter IV. This section briefly summarizes these findings, thereby bringing them into sharper focus. The findings have been reported according to factors which have been listed and discussed in previous chapters.

Sex. A total of 151 students who were not graduated from high school were included in this study. One hundred seventeen, or 77.6 percent, were males and thirty-four, or 22.4 percent, were females.

Age. The percentage of the group found to be between the ages of twenty and twenty-nine was 82.1. The students between the ages of thirty and thirty-nine comprised 11.3 percent, whereas those forty and above comprised only 6.6 percent of the total group.

High school units. About an equal number of the non-high school graduates dropped out of high school while in the ninth, tenth, and eleventh grades. The percentage presenting between zero and four high school units was 30.5, while 27.2 percent and 29.1 percent presented between five and eight units and between nine and twelve units respectively. The remaining 13.2 percent presented over thirteen units, indicating that they dropped out of high school some time during their senior year.

Size of high school attended. Composition of the group according to the size of the high school attended ranged from 57.6 percent of the students from high schools with an enrollment of 500 students and above, to 11.3 percent from high schools with less than 100 students enrolled. The percentage of those from high schools with an enrollment of between 100 and 500 students was 31.1.

Number of semesters of attendance at Texas Technological College. The non-high school graduate enrollment decreased as the number of semesters in attendance increased. The range was from 85.4 percent of the students who attended from one to five semesters, to .7 percent for those attending sixteen or more semesters. Of the 129 students attending between one and five semesters, seventy-eight, or 60.4 percent, attended

only one semester or less. Of these seventy-eight students, twenty-five or 32.1 percent failed and were not eligible to continue. Seventeen students, 21.8 percent, withdrew before completing the first semester. It is interesting to note that the one student who completed sixteen semesters was not graduated. His over-all grade-point average was high enough to allow him to remain in school, but was slightly under the "C" average required for a degree at Texas Technological College.

Analysis of Variance

Only limited tests of the experimental hypothesis that there would be a relationship between certain of the variables and the academic-success measures were possible since all of the variables could not be considered simultaneously. These limited tests were made selectively in those cells in the tally sheet where sufficient subjects existed to satisfy a balanced analysis of variance design. Four analyses were made.

In the first analysis the high school sizes were pooled into two classes and only the male students in the twenty-year-old range were used. Only the main effect for the score factor, grade-point average and number of semesters attended, was significant. The average number of semesters completed by the subjects included in this particular analysis was 3.48, and the mean grade-point average was .90.

Males and females between the ages of twenty and twenty-nine from high schools of over 500 enrollment were used in analysis two. The score factor used was the grade-point average and the number of semesters attended. This analysis made it unmistakably clear that the young females who attended large high schools have greater success in Texas Technological College than do the young males. The mean grade-point average was .93 for the males and 2.48 for the females.

This analysis also indicated that those male students who presented between nine and twelve high school units upon admission tended to achieve better than those who presented fewer high school units. The superiority of the female student, however, exceeded the males no matter how many high school units the females have upon entering the College.

In the third analysis the same subjects were used as in the first two analyses. The dependent variables used were the entrance test scores. The analysis indicated that those students from high schools with an enrollment of 500 or more, and especially those students who dropped out of high school during their junior year, had a greater academic potential as measured by the entrance tests. The male students had consistently higher scores than did the female students. The female students, however, had greater academic success.

In the fourth analysis both sexes between the ages of twenty and twenty-nine from high schools with an enrollment of over 500 students were included, using the entrance test scores as the dependent variables. This analysis confirmed the findings in the three previous analyses. The male students between the ages of twenty and twenty-nine who presented between nine and twelve high school units upon admission made better scores on the entrance examinations than did their female counterparts, but consistently turned in poorer academic performances.

Factor Analysis.

A correlational factor analysis was made in order to better establish the relationship between the variables. Five factors were extracted from the twenty-two variable correlation matrix for both the principal factor analysis and the varimax rotation factor analysis.

In the factor analysis, as in the analysis of variance section, it was again pointed out that the females tended to succeed better than the males. The female students tended to choose non-mathematics majors. The factor analysis also pointed out that those female students who entered during a spring semester or a summer session in the 1960's performed better academically.

The factor analysis verified the findings of the analysis of variance technique.

School of Enrollment and Distribution of Degrees

This study has described 151 non-high school graduates at Texas Technological College. Of this group 8.6 percent attained degrees.

The school of enrollment of the total sample ranged from 53.0 percent for the School of Arts and Sciences to 2.0 percent for the School of Home Economics. Enrolled in the Schools of Business Administration, Engineering, and Agriculture were 27.1 percent, 13.3 percent, and 4.6 percent respectively.

School of Arts and Sciences. In the School of Arts and Sciences, which had the largest percentage of school enrollment, there were two Bachelor of Science degrees--one each in elementary education and mathematics--and one Bachelor of Arts degree with a major in Spanish. There were two Master's degrees, both the Master of Science. One was with a major in elementary education and the other in mathematics.

School of Business Administration. In this school was comprised 27.1 percent of the total non-high school graduate enrollment. As in the School of Arts and Sciences, there were three bachelor's degrees awarded. All three of the degrees attained were Bachelor of Business Administration degrees with majors in accounting, finance and international trade.

School of Engineering. The next highest percentage of enrollment, 13.3, was in the School of Engineering. Only one student of the twenty enrolled in this school attained a degree. This degree was the Bachelor of Science degree with a major in petroleum engineering.

School of Agriculture. Only seven students included in this study were enrolled, or only 4.6 percent of the total enrollment of non-high school graduates. Four of these students, or 57.1 percent, attained degrees. Of the total of three Bachelor of Science degrees, two were in agricultural education and the other in agronomy. One Master of Science degree was earned with a major in agricultural education.

School of Home Economics. Of the non-high school graduates enrolled, this school had only three students, or 2.0 percent. There were no degrees attained in the School of Home Economics.

V. CONCLUSIONS

This study has concerned itself with 151 non-high school graduates attending Texas Technological College from the Fall Semester 1954 through the Spring Semester 1964. The findings of this study have been based completely on the selected group of non-high school graduates and their scholastic success in relation to definite influencing factors.

Throughout this study the findings have been reported according to definite factors and the corresponding relationship to scholastic success. Conclusions are presented in this section according to the sequence in which the factors were investigated:

Sex

Seventy-eight percent of the non-high school graduate group were male students and twenty-two percent were female. In all analyses made, the female students consistently had greater academic success than did their male counterparts. On the basis of this study, therefore, the sex variable was related to scholastic success in Texas Technological College.

Age

Data regarding age revealed that 82 percent of the group were between the ages of twenty and twenty-nine when they were admitted. Eleven percent were between thirty and thirty-nine, and those students forty years of age and above comprised seven percent of the group. Those students in the twenty- to twenty-nine age bracket exceeded all others in academic achievement.

Number of High School Units Presented Upon Admission

About an equal number of the non-high school graduates dropped out of high school while in the ninth, tenth, and

eleventh grades. The analyses showed that those male students who presented between nine and twelve units upon admission usually achieved better than those who presented fewer high school units. The female student, however, exceeded the male no matter how many high school units she had upon admission. Upon the basis of this study the pattern of high school units cannot be reliably related to scholastic success.

High School Size

Approximately 58 percent of the students included in this study were from high schools with an enrollment of 500 students and over. Both sexes from the large high schools consistently made higher scores on the entrance examinations and were more successful academically than those students from the smaller high schools. The mean grade-point average was .93 for the male non-high school graduates between the ages of twenty and twenty-nine who presented between nine and twelve high school units upon admission and had attended high schools with an enrollment of 500 and over. For the females in the same category the mean grade-point average was 2.48.

Number of Semesters of Attendance at Texas Technological College

The volume of student enrollment decreased as the span of semesters attended increased, with 85 percent of the

students having attended only from one to five semesters. Of this group which included 129 students, 78 attended only one semester or less. Twenty-five of this group failed and were not eligible to continue at the end of the first semester, and seventeen withdrew before completing a full semester. The findings indicate, therefore, that the length of attendance had a negative influence on enrollment and a positive influence on scholastic achievement.

School of Enrollment and Distribution of Degrees

The non-high school graduate enrollment was distributed among five colleges. Enrolled in the School of Arts and Sciences were 53 percent of the students, and slightly more than 27 percent were enrolled in the School of Business Administration. The enrollments in the Schools of Engineering, Agriculture, and Home Economics comprised 13.3 percent, 4.6 percent, and 2.0 percent respectively.

The findings concerning the distribution of degrees according to majors in the School of Arts and Sciences revealed that there were two Bachelor of Science degrees, one Bachelor of Arts degree, and two Master's degrees earned. The five degrees attained in this school were distributed over three major areas.

In the School of Business Administration all of the degrees attained by the non-high school graduates were

Bachelor of Business Administration degrees. A total of three degrees were attained with majors in accounting, finance, and international trade.

Findings indicated that in the School of Engineering only one degree was earned by the twenty students enrolled. This degree was a Bachelor of Science degree with a major in petroleum engineering.

Data concerning the non-high school graduates enrolled in the School of Agriculture revealed that 57.1 percent attained degrees, a higher percentage than in any other school. Only seven students included in this study were enrolled in the School of Agriculture. There were three Bachelor of Science degrees and one Master of Science degree earned. Two of the Bachelor of Science degrees and the Master of Science degree were in the field of agricultural education.

In the School of Home Economics, which had only 2.0 percent of the total non-high school graduate enrollment, there were no degrees attained.

It may be concluded, therefore, that according to school of enrollment and degree attainment of the non-high school graduates in each school, the scholastic ranking was higher for those attaining degrees than for the total group. Conversely, the scholastic achievement for those students who did not earn a degree was lower in every school except

in the School of Business Administration than that of the total sample. In the School of Business Administration it was apparent that the purpose of a large majority of the non-high school graduates was not to earn a degree, but only to obtain instruction in special courses.

The Non-High School Graduate

This study supplements previous research in regard to the non-high school graduate who attended various institutions of higher learning. The findings concerning these non-high school graduates in some instances substantiated previous findings. Other findings concerning this group, while not negating previous findings, would indicate that further investigation is needed.

VI. RECOMMENDATIONS

This research investigation has been a statistical study which has established limited findings on one particular group of non-high school graduates at one specific college during a given period of time. The data used in the study were obtained from the permanent records of the college. Limitations of the findings of this study are directly related to the limitations of the available data.

Findings from this study in the instances noted in the preceding section substantiated previous findings. Other

factors examined in this particular study revealed the need for further investigation.

The writer makes the following recommendations:

1. Further research should be conducted on the non-high school graduate in order to give admissions officials of colleges and universities a more distinct picture of the needs and problems involved in admission of non-high school graduates.

2. College personnel should be made aware that individual differences and a wide range of variations exist among the non-high school graduates.

3. Counselors and personnel workers in colleges and universities should be acquainted with the various problems peculiar to the non-high school graduate in order to help him adjust to problems such as lack of college prerequisites, difference in age, and special entry problems.

4. Counselors and administrative officials vested with the responsibility of administering high school educational programs should be made aware of the various problems encountered by the non-high school graduate applying for admission to college in order to be more efficient in their counseling programs.

5. Statistical data concerning the non-high school graduate should be made available and familiar to the academic deans and counseling personnel of the various schools within the college.

6. A more thorough screening process should be instigated at Texas Technological College in view of the large number of non-high school graduates who either fail or withdraw before completing one semester.

7. Two different sets of admission criteria should be developed for the non-high school graduate applying for admission, one for those students desiring to pursue a degree and one for those students desiring only to receive instruction in a special group of courses.

8. Data in such areas as personality patterns and personal standards and values descriptive of the non-high school graduates are needed.

9. A more thorough examination should be made of the non-high school graduate in order to formulate and interpret data concerning his previous educational experiences other than the high school background.

This study, as is the case in any such investigation, reveals the need for additional studies. It appears that recommendations consistent with the study, as presented immediately above, include the problems which warrant investigation.

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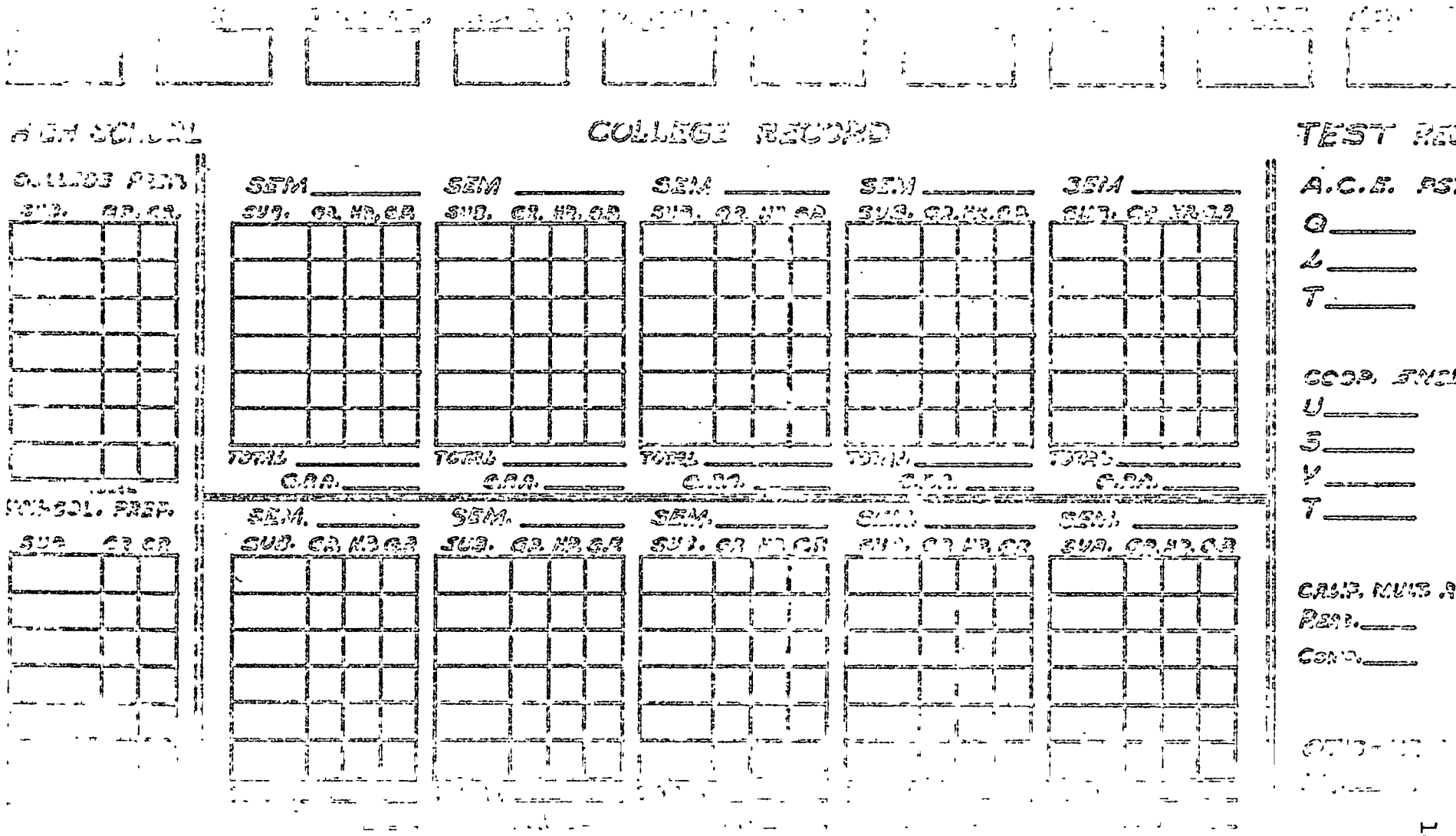
APPENDIX A. MASTER WORKSHEET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APPENDIX B. TALLY SHEETS

TALLY SHEET

SEX = AGE = HIGH SCHOOL UNITS = HIGH SCHOOL SIZE

AGE 20 - 29

H.S. Units	0-99	100 - 499	500+
0 - 4	2	12	12
5 - 8	3	7	18
9 - 12	1	7	23
13 - 16	2	4	11

High School Size

AGE 30 - 39

H.S. Units	0-99	100 - 499	500+
0 - 4	1	2	1
5 - 8		3	2
9 - 12	1	1	
13 - 16			

High School Size

AGE 40+

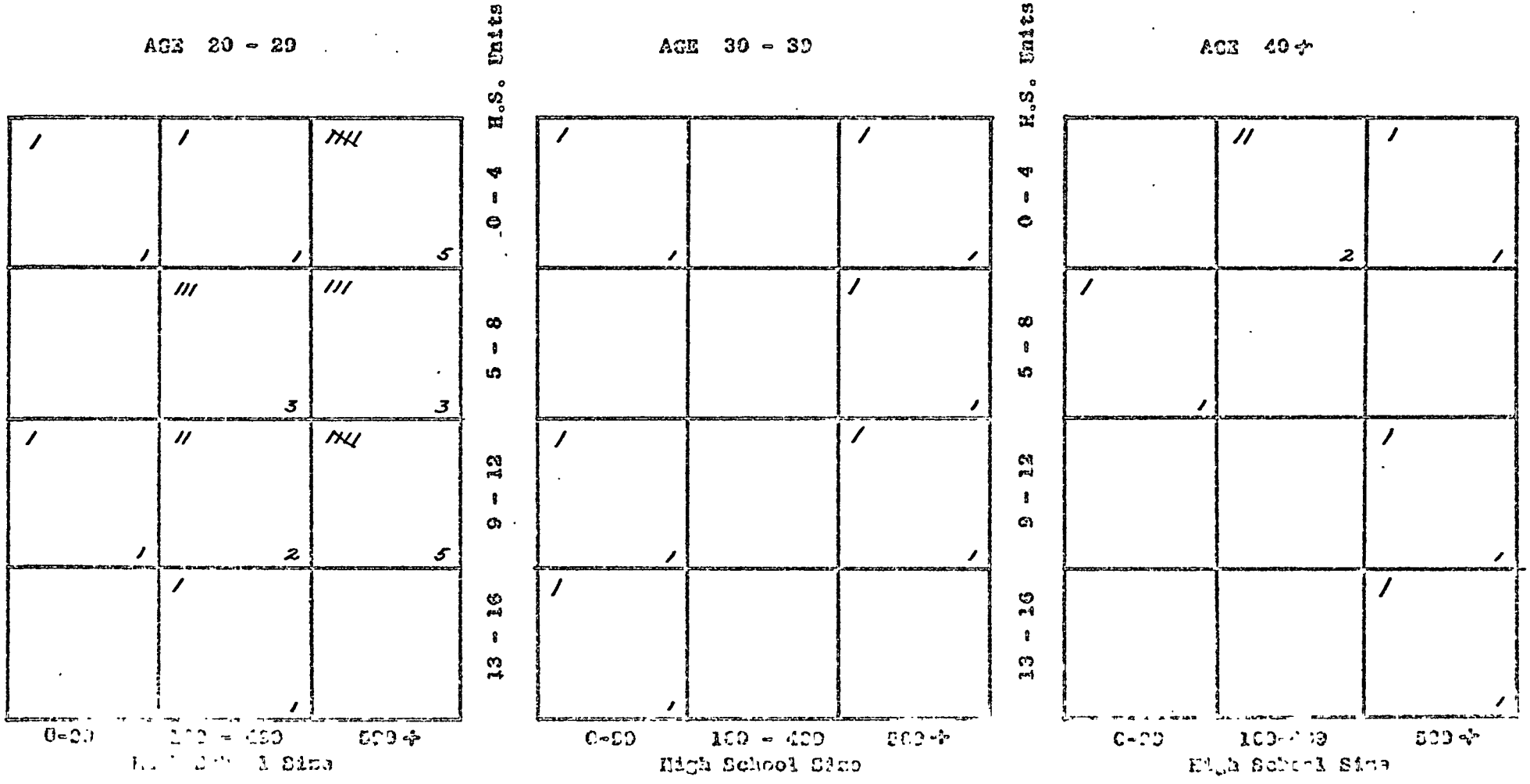
H.S. Units	0-99	100 - 499	500+
0 - 4	1	2	1
5 - 8			
9 - 12			
13 - 16			

High School Size

MALE

TALLY SHEET

SEX - AGE - HIGH SCHOOL UNITS - HIGH SCHOOL SIZE



SEX FEMALE

TALLY SHEET

SEX = AGE = HIGH SCHOOL UNITS = HIGH SCHOOL SIZE

STUDY NUMBER AND REPLICATION NUMBER

AGE 20 - 29

H.S. Units	0 - 99	100 - 499	500 +
0 - 4	43-1 50-2	24-1 32-2 54-3 66-4 80-5 93-6 106-7 110-8 127-9 136-10 146-11 153-12	27-1 35-2 48-3 67-4 70-5 75-6 89-7 95-8 117-9 122-10 141-11 148-12
5 - 8	7-1 17-2 74-3	18-1 51-2 60-3 94-4 121-5 152-6 154-7	1-1 5-2 19-3 30-4 34-5 92-6 44-7 55-8 64-9 65-10 84-11 108-12 116-13 123-14 138-15 145-16 151-17 158-18
9 - 12	10-1	3-1 25-2 36-3 86-4 101-5 113-6 114-7	6-1 15-2 16-3 21-4 22-5 31-6 41-7 45-8 61-9 77-10 79-11 85-12 91-13 97-14 99-15 105-16 118-17 120-18 133-19 135-20 140-21 150-22 157-23
13 - 16	37-1 142-2	14-1 28-2 52-3 69-4	8-1 29-2 38-3 39-4 71-5 73-6 83-7 128-8 130-9 149-10 156-11

High School Size

AGE 30 - 39

H.S. Units	0 - 99	100 - 499	500 +
0 - 4	20-1	40-1 68-2	126-1
5 - 8		49-1 102-2 144-3	57-1 96-2
9 - 12	115-1	26-1	
13 - 16			

High School Size

AGE 40 +

H.S. Units	0 - 99	100 - 499	500 +
0 - 4	100-1	59-1 111-2	132-1
5 - 8			
9 - 12			
13 - 16			

High School Size

SEX MALE

TALLY CHART

SEX - AGE - HIGH SCHOOL UNITS - HIGH SCHOOL SIZE

STUDY NUMBER AND REPLICATION NUMBER

AGE 20 - 29

H.S. Units	0-99	100 - 499	500+
0 - 4	4-1	107-1	12-1 46-2 53-3 98-4 143-5
5 - 8		58-1 76-2 78-3	62-1 109-2 125-3
9 - 12	103-1	87-1 112-2	72-1 81-2 131-3 137-4 139-5
13 - 16		11-1	

High School Size

AGE 30 - 39

H.S. Units	0-99	100 - 499	500+
0 - 4	9-1		92-1
5 - 8			23-1
9 - 12	147-1		124-1
13 - 16	104-1		

High School Size

AGE 40+

H.S. Units	0-99	100 - 499	500+
0 - 4		56-1 134-2	33-1
5 - 8	88-1		
9 - 12			155-1
13 - 16			47-1

High School Size

SEX FEMALE

TALLY SHEET

SEX - AGE - HIGH SCHOOL UNITS - HIGH SCHOOL SIZE

REPLICATION NUMBER AND SEMESTER HOURS

AGE 20 - 29

H.S. Units	0 - 99	100 - 499	500 +
0 - 4	1-11 2-10	1-0 7-3 2-0 8-12 3-192 9-30 4-0 10-0 5-0 11-0 6-22 12-16	1-10 7-0 2-0 8-3 3-0 9-61 4-31 10-15 5-0 11-3 6-40 12-27
5 - 8	1-12 2-35 3-32	1-0 2-0 3-36 4-24 5-16 6-9 7-12	1-0 10-125 2-0 11-3 3-3 12-17 4-6 13-45 5-0 14-128 6-15 15-30 7-0 16-3 8-43 17-16 9-10 18-24
9 - 12	1-0	1-0 2-135 3-0 4-43 5-3 6-169 7-6	1-0 9-37 17-92 2-15 10-165 18-13 3-134 11-0 19-6 4-0 12-109 20-12 5-15 13-60 21-32 6-0 14-13 22-122 7-17 15-31 23-33 8-15 16-57
13 - 16	1-161 2-15	1-193 2-30 3-0 4-12	1-0 7-34 2-69 8-15 3-58 9-9 4-190 10-15 5-69 11-25 6-165

0-99 100 - 499 500 +

High School Size

AGE 30 - 39

H.S. Units	0 - 99	100 - 499	500 +
0 - 4	1-6	1-27 2-18	1-8
5 - 8		1-4 2-5 3-6	1-6 2-4
9 - 12	1-3	1-0	
13 - 16			

0-99 100 - 499 500 +

High School Size

AGE 40 +

H.S. Units	0 - 99	100 - 499	500 +
0 - 4	1-3	1-3 2-29	1-6
5 - 8			
9 - 12			
13 - 16			

0-99 100 - 499 500 +

High School Size

SEX MALE

TALLY SHEET

SEX - AGE - HIGH SCHOOL UNITS - HIGH SCHOOL SIZE

REPLICATION NUMBER AND SEMESTER HOURS

AGE 30 - 39

H.S. Units	0-99	100 - 499	500+
0 - 4	1-127		1-0
5 - 8			1-39
9 - 12	1-178		1-3
13 - 16	1-3		

AGE 40+

H.S. Units	0-99	100-499	500+
0 - 4		1-0 2-43	1-29
5 - 8	1-3		
9 - 12			1-11
13 - 16			1-3

SEX *FEMALE*

APPENDIX C. BLOCK DIAGRAMS

BLOCK DIAGRAMS FOR ANALYSIS OF VARIANCE

MAIN EFFECTS

MALE	FEMALE	TOTAL
117	34	151

SEX

20-29	30-39	40+	TOTAL
124	17	10	151

AGE

0-4	5-8	9-12	13-16	TOTAL
46	41	44	20	151

HIGH SCHOOL UNITS

0-99	100-499	500+	TOTAL
17	47	87	151

HIGH SCHOOL SIZE

FIRST ORDER MAIN EFFECTS INTERACTION

SEX–AGE

20-29	30-39	40+	TOTAL	
102	11	4	117	MALE
22	6	6	34	FEMALE
124	17	10	151	TOTAL

AGE–H.S. UNITS

	0-4	5-8	9-12	13-16	TOTAL
20-29	33	34	39	18	124
30-39	6	6	4	1	17
40+	7	1	1	1	10
TOTAL	46	41	44	20	151

SEX–H.S. UNITS

0-4	5-8	9-12	13-16	TOTAL	
34	33	33	17	117	MALE
12	8	11	3	34	FEMALE
46	41	44	20	151	TOTAL

AGE–H.S. SIZE

	0-99	100-499	500+	TOTAL
20-29	10	37	77	124
30-39	5	6	6	17
40+	2	4	4	10
TOTAL	17	47	87	151

SEX–H.S. SIZE

0-99	100-499	500+	TOTAL	
11	38	68	117	MALE
6	9	19	34	FEMALE
17	47	87	151	TOTAL

H.S. UNITS–H.S. SIZE

	0-4	5-8	9-12	13-16	TOTAL
0-99	6	4	4	3	17
100-499	19	13	10	5	47
500+	21	24	30	12	87
TOTAL	46	41	44	20	151

SEX-AGE-H.S.UNITS

0-4	5-8	9-12	13-16	TOTAL	
26	28	31	17	102	20-29
4	5	2	0	11	30-39
4	0	0	0	4	40+
34	33	33	17	117	TOTAL

MALE

SEX-AGE- H.S.UNITS

	0-4	5-8	9-12	13-16	TOTAL
20-29	7	6	8	1	22
30-39	2	1	2	1	6
40+	3	1	1	1	6
TOTAL	12	8	11	3	34

FEMALE

SEX-AGE-H.S. SIZE

0-99	100-499	500+	TOTAL	
8	30	64	102	20-29
2	6	3	11	30-39
1	2	1	4	40+
11	38	68	117	TOTAL

MALE

SEX-AGE-H.S. SIZE

	0-99	100-499	500+	TOTAL
20-29	2	7	13	22
30-39	3	0	3	6
40+	1	2	3	6
TOTAL	6	9	19	34

FEMALE

SEX-H.S.UNITS -H.S. SIZE

0-4	5-8	9-12	13-16	TOTAL	
4	3	2	2	11	0-99
16	10	8	4	38	100-499
14	20	23	11	68	500+
34	33	33	17	117	TOTAL

MALE

SEX-H.S.UNITS - H.S. SIZE

	0-4	5-8	9-12	13-16	TOTAL
0-99	2	1	2	1	6
100-499	3	3	2	1	9
500+	7	4	7	1	19
TOTAL	12	8	11	3	34

FEMALE

SECOND ORDER MAIN EFFECTS INTERACTION (CON'T)

AGE-H.S.UNITS-H.S.SIZE

	0-99	100-499	500+	TOTAL
0-4	3	13	17	33
5-8	3	10	21	34
9-12	2	9	28	39
13-16	2	5	11	18
TOTAL	10	37	77	124

20-29

AGE-H.S.UNITS-H.S.SIZE

	0-99	100-499	500+	TOTAL
0-4	2	2	2	6
5-8	0	3	3	6
9-12	2	1	1	4
13-16	1	0	0	1
TOTAL	5	6	6	17

30-39

AGE-H.S.UNITS-H.S.SIZE

	0-99	100-499	500+	TOTAL
0-4	1	4	2	7
5-8	1	0	0	1
9-12	0	0	1	1
13-16	0	0	1	1
TOTAL	2	4	4	10

40+

THIRD ORDER MAIN EFFECTS INTERACTION

SEX - AGE - H.S. UNITS - H.S. SIZE

	0-99	100-499	500+	TOTAL
0-4	2	12	12	26
5-8	3	7	18	28
9-12	1	7	23	31
13-16	2	4	11	17
TOTAL	8	30	64	102

MALE
20-29

	0-99	100-499	500+	TOTAL
0-4	1	2	1	4
5-8	0	3	2	5
9-12	1	1	0	2
13-16	0	0	0	0
TOTAL	2	6	3	11

MALE
30-39

	0-99	100-499	500+	TOTAL
0-4	1	2	1	4
5-8	0	0	0	0
9-12	0	0	0	0
13-16	0	0	0	0
TOTAL	1	2	1	4

MALE
40+

	0-99	100-499	500+	TOTAL
0-4	1	1	5	7
5-8	0	3	3	6
9-12	1	2	5	8
13-16	0	1	0	1
TOTAL	2	7	13	22

FEMALE
20-29

	0-99	100-499	500+	TOTAL
0-4	1	0	1	2
5-8	0	0	1	1
9-12	1	0	1	2
13-16	1	0	0	1
TOTAL	3	0	3	6

FEMALE
30-39

	0-99	100-499	500+	TOTAL
0-4	0	2	1	3
5-8	1	0	0	1
9-12	0	0	1	1
13-16	0	0	1	1
TOTAL	1	2	3	6

FEMALE
40+