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Education, guidance and counseling

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DIFFERENTIAL PREDICTIVE VALIDITY OF THE AMERICAN COLLEGE TEST (ACT) FOR MINORITY AND NON-MINORITY STUDENTS

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in the Graduate School of The Ohio State University

By

Gary Eugene Young, B.S., M.A.

* * * * *

The Ohio State University
1972

Approved by

[Signature]
Adviser
College of Education
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ACKNOWLEDGEMENTS

It has been said that, if nothing else, a doctoral dissertation is a "humbling experience." I agree. Defining humble in its etymological meaning "to make small," this project humbled me to the point that it surprised me that my doctoral committee could even find me in the room, let alone direct questions at me. Fortunately, they did and for their assistance I am grateful. In part, then, this is a thank you note to Dr. Joseph J. Quaranta, substitute for major adviser, Dr. Anthony Riccio. Appreciation similarly is extended to Dr. Donald J. Tosi and Dr. James V. Wigtil for their able assistance as members of my reading committee.

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at the Institutional Research Computer Center. Dr. Jagbir Singh, professor of statistics, also provided valuable insight for the statistical procedures employed in this study. Mr. Jackson J. Barnette and Dr. Wallace Fotheringham guided further the analysis of data.

 Mostly, (and not just because it's traditional) to my wife (and full-time typist), Patricia, and three children--Letty, Mark, and Lisa--go my thanks for their support for, patience with, and love of someone absorbed, impatient, and irritable over a very long stretch of time. To them a special note: I already am preparing a prospectus of a new study titled "On the Matter of Reciprocated Loving: How to Make Up for Lost Time."
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Studies in Developmental Psychology. Professor John Horrocks
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CHAPTER I

INTRODUCTION

Recent years have witnessed growing numbers of colleges and universities establishing special recruitment programs to increase minority student enrollment on their respective campuses. Growing in proportion to the numbers of such recruitment efforts is the concern about achievement test use and abuse in selection for admission, placement in multi-level courses, assignment to remedial, non-credit courses, etc. for minority students. Combatant camps have arisen, composed according to those who find little bad in the use of achievement tests, those who find almost no usefulness in such tests, and those who struggle to find a position in between that doesn't sound trite and non-committal.

It is probably accurate to say that most educators interested in and/or working with minority students reinforce each others' strong beliefs that many admissions and financial aid officers, minority recruitment program directors, and others continue to deny educational opportunity to minorities due to inappropriate interpretation and application of achievement test
results. Achievement test critics argue that such tests do not have predictive validity for minority students since achievement tests are constructed by middle-class educators to assess the particular level of skills required of middle-class students to succeed in college curricula taught by middle-class instructors.

Eight years ago Morgan State College President M.D. Jenkins (1964) observed that "... it is well known that standardized examinations have low validity for individuals and groups of restricted experiential background." If the low validity of standardized examinations for those with "restricted experiential background" were an established, well-known fact eight years ago as Dr. Jenkins submits, one might expect drastic changes in the use of standardized achievement tests between then and today. However, with the exception of the relatively few special recruitment programs across the country in which specially-adapted admission and financial aid procedures are practiced, admissions and financial aid officers' screening criteria remain virtually unchanged. For example, except for the few in "special" programs, colleges and universities with selective admissions policies continue to admit and reject all other students, regardless of experiential or cultural background, according to a formula primarily determined by the
students' high school grades and standardized achievement test scores. Typically, a high school average of "B" or better coupled with a composite score above an arbitrarily-set cut-off (using the American College Test [ACT] as an example) on an achievement test means automatic acceptance; a high school average of "C" or lower together with a composite score below an arbitrarily-set minimum on the ACT leads to a routine letter of rejection.

Since "special" programs often feature federal or other non-university funds that carry a mandate for special selection criteria for admission and financial aid and since such "special" programs frequently are instituted and then discontinued after a year or two, it becomes clear that outside these mostly dubious "special" programs, university policy-makers, in admissions and financial aids particularly, do not see and/or accept that standardized achievement tests have low validity for those with experiential backgrounds different from those of the dominant middle-class culture.

Due to the limited number of studies testing the validity of standardized achievement test prediction of minority students' success or failure in college, it appears that test critics hold so strongly to the subjective truth of their claims that they dismiss, as unnecessary, objective scrutiny of achievement test
predictive validity for minorities. Such an attitude may help to perpetuate the mis-use of achievement tests. Abundant experience supports the notion that decision-makers are persuaded, if at all, to modify existing policies through the process of convincing confrontation. Observation of the process of policy change also suggests that confrontation usually produces effective change when thoroughly documented (with objective data and/or demonstrated mass sentiment) and conversely, that confrontation of anachronistic or inappropriate policy and practice often fails when documentation is weak. There seems to be no evidence to conclude that university decision-makers react differently.

This investigation grew out of the researcher's puzzlement over how and why achievement test use in the college admission process has stimulated unflagging controversy in American higher education for more than a decade—with little or no resolution. Logic suggested that this issue could not have maintained its debate-eliciting energy over such a long time span unless several of the combatant positions leveled convincing arguments that resulted in stalemate. A possible explanation, then, was to classify the continuing controversy as a clash of intuitive judgments about issues that did not lend themselves to
empirical study. However, such an explanation missed the point since the debate centered on educational practice that could be objectively studied and, as a result, educational practice continued, modified, or scrapped in keeping with the evidence. The question remained: "Why, then, do we still experience the impasse reached by the proponents of various points of view regarding this issue?"

A heated debate observed by the author while attending the 1970 Annual Big Ten Counselors' Conference epitomizes two principal opposing arguments waged today concerning achievement test use and abuse in the college admissions process. Several psychologists began discussing this issue when a conferee observed that college admission criteria, more than any other single factor, remained the major obstacle for minority student access to a college education. In this case the psychologist's reference was to Black students who, he maintained angrily, were denied equal college educational opportunity by the widely-sanctioned use of admission selection (and rejection) formulas relying chiefly on high school grades (or class rank) and standardized achievement tests. He forwarded the now-common argument that the achievement tests, in particular, were culturally-biased and poor predictors of college academic
performance for any but middle-class, white students. Accordingly, he decried embitteredly the continued use of the traditional selection criteria in considering minority students (in this case, Black students) for admission to college. Immediately, several others present propounded reinforcing arguments only to meet howls of protest from still others who scoffed at the idea that standardized achievement tests are poor predictors of college performance for Blacks or, for that matter, any other minority group.

Advocates of the latter stance cited several validity studies conducted that demonstrated the near-equal predictive validity of the Scholastic Aptitude Test or American College Test for minority and non-minority students. In reply, those who argued that such tests were not valid predictors for Blacks listed documentation of the numerous cases where Black students, predicted to do very poorly, actually obtained satisfactory or high grades. At the end, all left with no change in attitude except for increased hostility.

This example illustrates the impasse mentioned earlier. Also, it typifies current endless numbers of dialogues of similar form and content among college
administrators, faculty, and students. Similarly, the example typifies the common result—increased alienation and no change.

Again the problem posed itself: "How can this impasse persist when the data can not support both points of view? That is, these tests must either be valid predictors for both minority and non-minority students or they are not valid for both groups. It can't be both ways."

Continued posing of the above question resulted in the curious answer that it, indeed, can be both ways. This study began to construct itself upon the assumption that the impasse over the testing issue has persisted because educators unknowingly have been debating several separate problems, cleverly masquerading, all this time, as a single issue. Understanding this assumption is crucial to identifying the raison d'être of the design and methodology of this study and to interpreting the data obtained. Furthermore, seeing the context from which implications for practical situations are deduced presupposes a basic grasp of this assumption.

Stating the assumption in a different way, it is assumed that a validity study of the American College Test (ACT), for the same group(s) of students at a given institution, can yield, simultaneously, results
showing 1) the ACT to be a valid predictor of academic performance and 2) the ACT not to be a valid predictor of academic performance. This can happen because the test makes two principal types of predictions:

1. Prediction of the overall group academic performance for all those entering freshmen who took the ACT

2. Prediction of each individual's academic performance

In addition, these group and individual predictions are used in two different ways:

1. To compose a Freshman Class primarily on the basis of wanting a majority of superior students. (Illustrative of highly-selective institutions.)

2. To compose a Freshman Class primarily on the basis of selecting those who are "college material" and rejecting those who are assumed to be likely failures at any college. (Illustrative of minimally-selective or non-selective institutions.)

To do a thorough study of the predictive validity of the ACT, then, we need to assess the validity of each type of prediction. Similarly, when we discuss the evidence compiled from empirical study of the predictive validity of the ACT (or other standardized achievement tests), we must be clear ourselves and be explicit to others of which types of prediction are under consideration. **Most important**, when we examine in this way the evidence, we will
understand that many of our current practices in using achievement test results relate to certain types of predictions not examined by most of our validation studies.

Validity studies reported in the literature commonly compared the association between predicted and actual performance within and between various groups of students by computing a correlation coefficient for predictor and criterion variables over the total range of scores. If the correlation coefficients thus obtained were significantly greater than zero, the study's conclusion section probably recorded that the test was a valid predictor. In between-group analyses, the same conclusion of validity was drawn if within-group correlation coefficients for the groups being compared were not significantly different and the respective regression equation slopes were not too dissimilar. Such analyses demonstrated only degree of association of prediction and criterion variables over the entire range of scores for the group or groups in question.

Those who argue that culture-bound achievement tests discriminate unfairly against non-middle-class students speak largely of those students who score poorly. That is, test critics generally do not worry about test abuse in the case of a Black student
who scores a 29 composite on the ACT. It is the Black student (or other minority student) who, for example, obtains a composite score of 9 and is automatically considered a potential college failure that raises vociferous objection. This being the case, it makes little sense to draw conclusions about the predictive validity of the ACT at a given institution only by obtaining correlation coefficients between predicted and actual performance for all males or all females or any other total group. Depending on the numbers in each range, an analysis by male or female regardless of range of score may yield a moderately good correlation. From such data, the analyst can conclude justifiably that, to a moderate degree, increases in test predicted values are accompanied by increases in criterion values when he considers a group or groups over the entire range of scores. Therefore, he can conclude that the test is a valid predictor that, as a group, students with high test scores will achieve higher grades than a certain group of students with low scores. Too, he can rightfully suggest that the overall correlation validates the instrument's ability to predict, to a moderate degree, that high scorers, as a group, will fail less frequently than low scorers taken as a group.
However, he can not conclude the following:

1. That the degree of association between predicted and actual performance reflected by the correlation coefficient computed over the entire range of possible test scores is the same in specified sub-ranges or segments of the overall range of possible test scores.

2. That the test is a valid predictor of an individual's performance.

3. That most low scorers will fail at any college.

Statement of the Problem

This study investigated the differential predictive validity of the American College Test (ACT) between an experimental and a control group. The experimental group was a sample composed of academically "disadvantaged" and/or culturally different students recruited through the 1971-72 Freshman Foundation Program. The control group included a similar number of students randomly-selected from the total number of entering freshmen, excluding Freshman Foundation Program students. All students in the study enrolled Autumn Quarter, 1971.

The study was designed to examine the validity of the several types of predictions made on the basis of achievement test results. Accordingly, in addition to comparing predicted and actual performance within
and between experimental and control groups over the entire range of ACT composite scores (1-36), experimental and control group males and females, respectively, also were studied according to four subgroups determined by ACT composite score. The four subgroups were defined by those students whose ACT composite scores fell in the ranges below:

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<td>Range II</td>
<td>15-19, inclusive</td>
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<tr>
<td>Range III</td>
<td>20-24, inclusive</td>
</tr>
<tr>
<td>Range IV</td>
<td>25-33, inclusive</td>
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The problem stated in terms of statistically-testable null hypotheses is as follows:

1. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) experimental group males will not be significantly different from zero at the .05 level of significance.

   A. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range I (1-14) experimental group males will not be significantly different from zero at the .05 level of significance.

   B. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range II (15-19) experimental group males will not be significantly different from zero at the .05 level of significance.
C. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range III (20-24) experimental group males will not be significantly different from zero at the .05 level of significance.

D. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range IV (25-33) experimental group males will not be significantly different from zero at the .05 level of significance.

The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) experimental group males will not be significantly different from zero at the .05 level of significance.

A. The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range I (1-14) experimental group males will not be significantly different from zero at the .05 level of significance.

B. The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range II (15-19) experimental group males will not be significantly different from zero at the .05 level of significance.

C. The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range III (20-24) experimental group males will not be significantly different from zero at the .05 level of significance.

D. The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range IV (25-33) experimental group males will not be significantly different from zero at the .05 level of significance.
3. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) experimental group females will not be significantly different from zero at the .05 level of significance.

A. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range I (1-14) experimental group females will not be significantly different from zero at the .05 level of significance.

B. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range II (15-19) experimental group females will not be significantly different from zero at the .05 level of significance.

C. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range III (20-24) experimental group females will not be significantly different from zero at the .05 level of significance.

D. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range IV (25-33) experimental group females will not be significantly different from zero at the .05 level of significance.

4. The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) experimental group females will not be significantly different from zero at the .05 level of significance.

A. The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range I (1-14) experimental group females will not be significantly different from zero at the .05 level of significance.
B. The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range II (15-19) experimental group females will not be significantly different from zero at the .05 level of significance.

C. The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range III (20-24) experimental group females will not be significantly different from zero at the .05 level of significance.

D. The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range IV (25-33) experimental group females will not be significantly different from zero at the .05 level of significance.

5. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) control group males will not be significantly different from zero at the .05 level of significance.

A. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range I (1-14) control group males will not be significantly different from zero at the .05 level of significance.

B. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range II (15-19) control group males will not be significantly different from zero at the .05 level of significance.
C. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range III (20-24) control group males will not be significantly different from zero at the .05 level of significance.

D. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range IV (25-33) control group males will not be significantly different from zero at the .05 level of significance.

6. The correlation between ACT predicted percentile freshman class rank and actual cumulative freshman class rank for all (1-33) control group males will not be significantly different from zero at the .05 level of significance.

A. The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range I (1-14) control group males will not be significantly different from zero at the .05 level of significance.

B. The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range II (15-19) control group males will not be significantly different from zero at the .05 level of significance.

C. The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range III (20-24) control group males will not be significantly different from zero at the .05 level of significance.

D. The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range IV (25-33) control group males will not be significantly different from zero at the .05 level of significance.
Quarter percentile freshman class rank for Range IV (25-33) control group males will not be significantly different from zero at the .05 level of significance.

7. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) control group females will not be significantly different from zero at the .05 level of significance.

A. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range I (1-14) control group females will not be significantly different from zero at the .05 level of significance.

B. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range II (15-19) control group females will not be significantly different from zero at the .05 level of significance.

C. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range III (20-24) control group females will not be significantly different from zero at the .05 level of significance.

D. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range IV (25-33) control group females will not be significantly different from zero at the .05 level of significance.

8. The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) control group females will not be significantly different from zero at the .05 level of significance.
A. The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range I (1-14) control group females will not be significantly different from zero at the .05 level of significance.

B. The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range II (15-19) control group females will not be significantly different from zero at the .05 level of significance.

C. The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range III (20-24) control group females will not be significantly different from zero at the .05 level of significance.

D. The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range IV (25-33) control group females will not be significantly different from zero at the .05 level of significance.

9. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) experimental group males will not be significantly different from the same correlation obtained for all (1-33) experimental group females.

10. The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) experimental group males will not be significantly different from the same correlation obtained for all (1-33) experimental group females.
11. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) control group males will not be significantly different from the same correlation obtained for all (1-33) control group females.

12. The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) control group males will not be significantly different from the same correlation obtained for all (1-33) control group females.

13. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) experimental group males will not be significantly different from the same correlation obtained for all (1-33) control group males.

14. The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) experimental group males will not be significantly different from the same correlation obtained for all (1-33) control group males.

15. The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) experimental group females will not be significantly different from the same correlation obtained for all (1-33) control group females.

16. The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) experimental group females will not be significantly different from the same correlation for all (1-33) control group females.
Significance of the Problem

A study of the predictive validity of the American College Test (ACT) for freshmen minority students, and comparison of predictive validity for these students with the predictive validity for a similar number of randomly-selected other freshmen marks an area worth investigation for the following reasons:

1. Studies of this area of investigation are limited in number.

2. Of the few published studies available, results are inconclusive because different studies yielded varying or contradictory conclusions, and conclusions were invalidated in some cases by poor research design.

3. Controversy still rages about the predictive validity of achievement tests when applied to minority students.

4. Previous studies have failed to account for the several different types of predictive uses of achievement tests.

5. Achievement test results, usually in concert with high school grades, constitute the primary "automatic acceptance or rejection" criteria used in screening admission applications in most colleges and universities across the nation. Therefore, if such tests make some predictions that are invalid, they influence the denial of college access to students who should not be denied access.

6. Since entering freshmen students often are assigned to certain levels of courses, especially introductory English and mathematics sequences, partially on the basis of achievement test predictions, the importance of the predictive validity of the tests in this process is evident.
7. Achievement test results usually are employed for diagnostic and grouping purposes in special supportive services programs for minority and/or "high risk" students.

8. A repeated conclusion of many of the significant achievement test validation studies is that since predictive validity for minority students varies from institution to institution, each institution should initiate and continue predictive validity studies of achievement tests as they relate to minority students. For example, in a recent study conducted at 19 integrated colleges and universities, Temp (1971) assessed differential prediction of the Scholastic Aptitude Test for Black and white students. This study and other similar investigations led David and Temp (1971) to conclude that the validity of the SAT for predicting college grades varies from institution to institution. Temp (1971) goes on to say the following:

   ... this study has demonstrated the urgency that institutions using the SAT (and other admissions tests and predictors) conduct validity analyses at their own institutions over the short and long haul.

9. Ohio State University, either on its own or in cooperation with the American College Testing Program, has not conducted a study of the predictive validity of the ACT in which results were isolated for minority students attending Ohio State University.

10. Though Ohio State University currently exercises an "open admissions" policy for Ohio residents, current plans call for limiting enrollment beginning the 1972-73 academic year. The Council on Admissions has indicated that screening criteria, particularly high school grades and achievement test scores, will assume increased significance in the next few years.
11. The Office of Minority Affairs at Ohio State University developed a recruitment program to enroll about 500 freshman minority students for the 1971-72 academic year. A refined recruitment program, based on last year's experiences, is currently underway to bring approximately 400 minority students to the University for the 1972-73 academic year. A strong need exists for isolating a set of effective selection criteria for admitting students under this program since twice as many as can be accepted will respond to recruitment efforts. Of particular concern is the role, if any, achievement test scores and predictions should play in the selection process.

**Population of the Study**

This study investigated the predictive validity of the American College Test (ACT) within and between a minority student population and a non-minority student population enrolled as freshmen during the 1971-72 academic year at Ohio State University. Ohio State University is a large, public-supported, mid-western university. An experimental group was drawn from the minority student population; a control group, from the non-minority student population.

**Minority Student Population**

The minority student population was composed of minority students who entered Ohio State University Autumn Quarter, 1971 as participants in the Freshman Foundation Special Recruitment program. A total population of 557 minority students enrolled through this recruitment program, 359 of whom had ACT records
available in the Office of Evaluation complete with ACT composite score, high school grades, and ACT percentile freshman class rank predictions. These 359 students composed the experimental group. Of the 359 experimental group students in this study, 155 were males; 204, females. Black students composed 85 per cent of the total population and experimental group sample, both of which also included 13 per cent "Appalachian" whites and two per cent "other" minorities.

All of the students in the population resided in Ohio and graduated from an accredited high school, thus meeting the only two requirements needed currently to be admitted to Ohio State University under the "open admissions" policy for Ohio residents.

Though a multi-racial group, rural and urban, students in this population shared the common experience that their socio-cultural, academic, and economic backgrounds varied significantly from the middle and upper-middle class student majority (non-minority student population).

**Non-minority Student Population**

The control group sample was obtained by randomly-selecting 361 students from the population of 10,191 students comprising the entering freshman class, excluding all Freshman Foundation Special Recruitment
students, who enrolled at Ohio State University Autumn Quarter, 1971. Of the 356 control group members, 156 were males; 205, females.

The population from which the control group sample was derived was representative of the middle and upper-middle class white majority who attend Ohio State University. The students in this population were rural and urban, Ohio and non-Ohio residents.

Each population of students pursued similar curricula in that all freshmen are required to enroll in University College, a non-degree granting college "portal of entry." Therefore, all students in this study were part of the University College advising and counseling framework as well as similarly pursuing liberal arts requirements prerequisite to declaring a major. The majority of the minority student population was assigned counselors of similar racial/ethnic background. This counseling staff composed what was termed the Office of Supportive Services. Though conceived as a supportive services team in a special program to provide intensive assistance to the recruited minority students, the staff included only the equivalent of four full-time counselors who were charged with academic advising responsibilities as well as counseling duties. The projected special supportive services
program, contingent on federal funding which was
denied, was to include over 20 full-time staff members.
Since this supportive services effort suffered from
severe under-staffing and inadequate funding, the
author concluded that the quality and quantity of
counseling, advising, and other services for the
minority student population were not enough different
from those enjoyed by the non-minority student popu­
lation to introduce a confounding variable.

Limitations of the Study

The major limitation of this study lies in the
academic time period employed in making the predictive
validity investigation. That is, the study analyzed
data from Autumn and Winter Quarters of the freshman
year, a restricted length of time that may not be
representative in all cases of the students' total
college academic performance. Not only would it
be better if time limitations for this study had
not prohibited including Spring Quarter academic
performance data, experience suggests that the validity
of achievement test predictions should be tested
at the end of each academic year for the students' entire baccalaureate program.
Definition of Terms

To facilitate understanding in reading this study, the following terms will be defined. Others will be defined as they appear in the text.

**Minority Student:** For the purposes of this study, minority student is defined in terms of the definition employed for the Freshman Foundation Special Recruitment Program. That is, a student was designated a minority group member if he belonged to one of the following racial/ethnic groups:

1. Afro-American (Black)
2. Appalachian White
3. American Indian
4. Mexican-American
5. Puerto Rican
6. Oriental

According to the composition of the experimental group, "minority student" in 85 per cent of the cases would be defined as Black; in 13 per cent of the cases, as "Appalachian" white, and in two per cent of the cases, as any one of the four remaining racial/ethnic groups.

**American College Test:** The American College Test is a battery of achievement tests consisting of the following four sections:
1. English  
2. Mathematics  
3. Social Studies  
4. Natural Sciences  

Test results report standard scores on a scale ranging from 1 (low) to 36 (high) for each of the four sections above. In addition, a composite score is determined by finding the average of the standard scores on each of the four sections.

Predictions of academic performance computed by the American College Testing Service for Ohio State University are of three different types:

1. Predicted overall grade point average  
2. Predicted percentile freshman class rank  
3. Probability of earning an overall average of 2.00 or higher on a 4.00 scale

Organization of the Remainder of this Report

This chapter's discussion was organized into several sections including: (1) An introduction to the study under investigation, (2) A statement of the problem, (3) Significance of the problem, (4) Population of the study, (5) Limitations of the study, and (6) Definition of terms.
Chapter II will review particulars of the literature that relate most significantly to the investigation. Chapter III will specify the study's design, methodology, instrumentation, and statistical procedures. In Chapter IV, findings obtained from the analysis of statistical data will be reported. Chapter V concludes the report of the investigation, summarizing the findings, drawing conclusions and implications for practical situations, and suggesting additional areas of research.
CHAPTER II

REVIEW OF THE LITERATURE

When first contemplating this study, the author assumed that the literature dealing with the differential predictive validity of standardized achievement tests for minority and non-minority populations would be voluminous. A little time in the library proved how erroneous such an assumption is. The literature concerning the predictive validity of such instruments with various minority populations is sparse when compared to the many studies of intellectual factors as predictors for white, middle-class students. More sparse yet are studies that compare the validity of achievement tests for middle-class white students to that for a certain minority student group. The majority of such studies involving minority groups—within-group and between-group studies—focused on Black students and were conducted at predominantly Black colleges. Many validity researchers comparing Black and white students were forced accordingly to draw one sample from one institution and the comparison group from another. Needless to say, common sense dictates that such procedure seriously affects any results obtained.
Only recently have "integrated" colleges and universities been able to identify sufficiently large samples of minority students to conduct meaningful validity analyses of standardized achievement test predictions for minorities. This explains why the following review of literature concentrates on recent studies. Too, it is important to remember that this investigation centers on the predictive validity of achievement tests. As a result, the review omits countless references to the several other aspects of such instruments that require empirical study.

Assessing whether or not a device is predictive is only one of many tests that instruments as potent as achievement tests must pass. That is, though an instrument may be a perfect predictor of something, it may serve to perpetuate a "something" wholly undesirable. For example, even if achievement test predictions for minority students (or any student) correlated perfectly with college performance, we could not conclude that such tests were beneficial of themselves. Such perfection could be used to justify maintaining an educational structure that rewards the simple biological and socio-economic inheritances of being white and middle-class. In short, statistical prediction does not show causation.
Once stating the limits of this study's scope, the fact remains that the evidence currently available on the predictive validity of standardized achievement tests for minority students is far from conclusive.

This review is divided into three parts: 1) Prediction and Validation—Some Generalizations, 2) Overview of Selected Predictive Validity Studies, and 3) Summary.

**Prediction and Validation—Some Generalizations**

The concept of prediction of academic performance draws as much or more criticism than the specific methods of prediction. Many educators argue that refined prediction of any future event requires the absence of intervening variables. By definition, then, those placing high value on prediction of academic performance can not place at the same time, equal emphasis on disturbing predicted events by introducing intervening treatments. From this we see why constructors of "special" educational efforts often view as anathema sophisticated prediction schemes and the agents of such schemes. As two of the largest and most "sophisticated" academic prediction agents, the College Entrance Examination Board and the American College Testing Program have been major targets
of this type of criticism. Wisdom and Shaw (1969) summarize the basis for this criticism:

In making admissions decisions, for instance, we have always used such traditional indices for predicting academic success as rank in the high school graduating class and college entrance tests scores . . . we have persisted in using these measuring devices despite existing evidence that the traditional indices have tended to measure what students have learned rather than what they can learn.

Plaut (1957) and Clark and Plotkin (1963) make similar observations.

Berger (1968) and Wisdom and Shaw (1969) among others expand this thought by noting that emphasis on prediction systems in nearly all colleges and universities is symptomatic of the prevailing philosophy of higher education: establishing fixed programs of study to which students must adapt. Obviously this runs counter to a philosophical stance gaining adherents which holds that the reverse should be true; namely, that educational systems remain flexible enough to respond vigorously to perceived needs, thus putting the onus on the system to adapt to those that compose it. Many proponents of this educational philosophy conclude that prediction has little relevance in such a setting. "After all," they ask, "why do we need grandiose prediction formulas—perhaps even the achievement tests, themselves—if, instead of
selectively accepting only those predicted to be most adaptable to the institution, we structure our institutions to take leadership in identifying educational needs and adapting to meet those needs?"

In response to these and other criticisms, in 1967 the College Entrance Examination Board invited 20 leading educators to serve on a Commission on Tests. The Commission was asked to review thoroughly and critically the College Board's "testing function in American education and to consider possibilities for fundamental changes in the present tests and their use . . . " (Pearson, 1967). While making several severe criticisms and responding with recommendations for constructive changes, the Commission concluded that the testing function should not be completely abandoned as suggested by some critics in recent years. To the criticism mentioned in the previous paragraph, the Commission issued the following remarks (Commission on Tests, 1970):

What is wrong with 'selective admissions' is partly that it has too often been conducted with too little regard for the intersection of socially and psychologically significant variables with scholastically significant variables—and partly that its application has not produced a sufficiently diverse set of colleges. The result is a collection of colleges fraught with crises of various kinds. Trying to solve any of these crises by discarding relevant information is a bad bet. Adjusting the entrance process will not solve all the problems, but it will help.
Hull (1970) suggests that prediction can not and should not be shelved entirely since it is socially naive and educationally unsound to believe that all colleges and universities will or should eliminate the concept of selective admission. Along with Belvin (1971) and Harris (1971), he implies that the public-supported institutions are the most hard-pressed to justify selective admission.

While some educators question the emphasis on academic prediction, others who consider effective prediction a very desirable goal wonder about the harm of using prediction schemes in view of their imprecision. This apprehension increases with the thought that such imprecise tools frequently are wielded by interpreters with little understanding of statistical prediction and/or of the instruments themselves. Fishman and others (1964) point out that this "caution is doubly merited when educational and psychological tests are administered to members of minority groups." They concluded the following:

Standardized tests in use present three principal difficulties when they are used with disadvantaged minority groups: (1) they may not provide reliable differentiation in the range of the minority group's scores, (2) their predictive validity for minority groups may be quite different from that for the standardization and validation groups.
and (3) the validity of their interpretation is strongly dependent upon an adequate understanding of the social and cultural background of the group in question.

Lavin (1964) points out several major problems in predicting academic performance for any group. First and foremost, he doubts the common assumption of linearity in prediction. He cites as indicative of this assumption of linearity that most studies assess the relationship between a predictor variable and a criterion variable through correlational analysis. One of Lavin's observations is particularly relevant to this study:

In almost all of these studies, the correlation methods assume linear relationships—that is, they assume unit increases in the predictor variable will be followed by unit increases (or decreases in the case of negative relationships) in the criterion, and that this will occur along the entire distribution of scores. For example, if intelligence is used to predict academic performance, the usual correlation methods assume that the overall correlation is equally representative at all levels of intelligence. (Italics mine.)

As indicated in Chapter I, this latter assumption was tested by determining association in four specified sub-ranges of the predictor variable as well as for the total range. McClelland (1958) suggests that ability and performance measures should be carefully scrutinized for increase, decrease, or threshold characteristics of ability in relation to performance at various sub-ranges along the overall ability range.
Second, in the same analysis Lavin forwards the notion that correlations of extreme magnitude—low and high—lead to difficulty in making inferences about the meaning of the relationship (or lack of relationship) demonstrated. Third, he submits that all too often researchers assume that statistical association signals causal relationship. Most distressing are those who know this fallacy and yet commit it anyway in their zeal to prove a certain hypothesis of causation. Another major problem in prediction of academic performance owes to the validation of predictive formulas almost exclusively by studies of static rather than longitudinal design. Lavin asks if we might find different results if predictive validity studies investigated validity at several points in time as opposed to a single point in time. This is especially true in that almost all studies are concerned with prediction of grades for the first semester of the freshman year. Finally, Lavin stresses that academic performance and its prediction involve much more than intellective factors. Other important variables include personality factors and social determinants.

Though the preceding pages register several of the problems and the confusion in prediction of
academic performance—especially for culturally different students from low socio-economic backgrounds—by no stretch of the imagination would it be accurate to conclude that present prediction systems have no defenders.

Jensen (1969) infers that achievement tests and other assessors of ability and intelligence reflect quite accurately the fact that Blacks and certain other populations have inbred more than most cultures and sub-cultures, resulting in genetically-based inferiority in "basic" intelligence and susceptibility to improvement of mental functioning. He concludes that this dooms most compensatory education programs to failure since they strive to increase the genetically-programmed ability levels of children and adults, levels which are highly resistant to modification. Jensen has been criticized severely for promulgating a quasi-Curse of Ham doctrine that suffers from lack of originality as well as its highly speculative quality.

Julian Stanley has emerged as a major spokesman of vocal defenders of the predictive validity of achievement tests for minority group students. In an article discussing the prediction of college success of the educationally disadvantaged, Stanley (1971) draws the following conclusions from the available evidence:
Many claims are made that [achievement] test scores have little or no value for predicting the success of disadvantaged applicants to colleges. Anecdotes are abundant, but upon investigation they are usually found to be atypical or cannot be verified. An admissions officer ignores test scores at his institution's peril.

The previous generalizations and examples represent several divergent viewpoints concerning the predictive validity of standardized achievement tests for minority and non-minority students, the emphasis being on the former. The next section of this review discusses selected studies relative to this issue.

Overview of Selected Studies

Empirical study of the previously-described criticisms and defenses of the differential predictive validity of achievement tests for minority and non-minority students had been virtually impossible in American higher education until recent years. Conducting such studies at "integrated" institutions was precluded by the limited numbers of minority students. Researchers found, more often than not, that they simply could not identify enough students belonging to a certain minority group to construct a sound comparative design. The advent of special
recruitment of minority student programs in the middle and late 60's produced a number of noteworthy studies.

Generally, these studies investigated the validity of standardized achievement tests for predicting grades of a given minority student population in traditional white, middle-class settings in one or both of the following ways:

1. If the test(s) were biased against the minority students, the relationship between test scores (and/or test predicted grades) and actual college grades would be significant for the majority culture students but not significant, or significantly lower, for the minority students.

2. Or given a similar relationship between test scores (and predicted grades) and actual grades for minority and majority group students, prediction bias would be reflected if grades earned by minority students at a given test score level were significantly higher than those earned by majority students in the same test score range.

Biaggio (1966) found that the validity of the Scholastic Aptitude Test (SAT) as a predictor of college grades for Blacks in Black colleges appears to be as high as the typical validity for white students in predominantly white institutions. Stanley and Porter (1967) conducted a similar study, finding results similar to those observed by Biaggio. Olsen (1957) and Roberts (1964) also demonstrated that when the SAT was used in combination with high school
rank, multiple correlation coefficients were not significantly different for students in Black and white institutions, respectively. Funches (1963) and Munday (1965) reported similar findings when the American College Test (ACT) rather than the SAT was used as a predictor. The evidence suggests overwhelmingly that achievement test scores are similarly associated with first-semester college grades for Blacks who attend Black colleges and whites who attend predominantly white institutions.

However, the validity of achievement test predictions for minority students attending predominantly white institutions seems undetermined at this point in time. For example, Clark and Plotkin (1963) studied a group of students who had applied for aid from the National Scholarship Service and Fund for Negro Students to make possible their attending interracial colleges during the 1952-56 academic years. They found the actual academic performance of these students to be significantly higher than what was indicated by the predictive indices of the SAT. Green and Farquhar (1965) compared the School and College Ability Test (SCAT) verbal-reasoning scores with high school grade-point-average for 104 Black males and 254 white males. They reported
a correlation coefficient between these two variables of only .01 for the Black males while the coefficient for white males was .62.

Cleary (1968) attempted to replicate the two studies reported above but obtained different results. In studying the differential predictive validity of the SAT for Black and white students at each of three different integrated colleges, Cleary concluded the following:

1. Regression lines for Blacks and whites were not significantly different in two eastern schools.

2. In a Southwestern college, the regression lines were significantly different, showing that Black student predicted grades were higher than actual grades—just the reverse of what was expected. This meant that a test bias was operating for the sample studied at this school, but it was a positive bias.

3. When SAT scores are combined with high school grades or rank, the degree of positive bias increases in predicting Black students' grades.

Cleary (1968) summed up her findings by stating the following:

The schools used in this study do not represent the full spectrum of colleges in the United States, so general conclusions can not be reached. In the three colleges studied, however, there was little evidence that the Scholastic Aptitude Test is biased as a predictor of college grades.
In contrast to Cleary's work cited above, Borup (1971) found that the ACT "does have an inherent bias, consistently favoring students of Anglo-American extraction" over a comparison group of Mexican-American students. In this study, Burup compared the validity of predictions based on ACT scores and high school rank, respectively, for 260 Mexican-American students and an equal number of Anglo-Americans. While mean ACT composite score and subscores were significantly higher for the Anglo-American group, no significant difference in first-semester college grade-point-average was found. High school rank and college performance were similarly associated for Mexican-Americans and Anglo-Americans. Cherdack (1970) followed a similar design in testing the predictive validity of the SAT for disadvantaged college students in a special education program at the University of California, Los Angeles. He found that SAT scores correlated with college grades consistently to a lesser degree for the special program students than for a comparison group of students reflecting the majority culture.

Davis and Temp (1971) conducted a comprehensive study at 19 integrated colleges and institutions which helps to account for the contradictory findings of the studies cited earlier. At six of the 19
institutions, predictive validity of the SAT for Blacks and whites was essentially equal. To the contrary, at five other schools, correlation coefficients between SAT scores and first semester grades obtained for Black students were not-significant while the same variables were significantly correlated for comparison groups of white students at each school. Regarding the seven remaining institutions, Davis and Temp reported data showing that prediction equations based on the predominantly white standardization groups actually over-predicted the actual grades earned by Black students at each institution.

Summary of the Review of Literature

A synopsis of the preceding review of literature regarding the predictive validity of standardized achievement tests is provided below:

1. Whether or not we establish that test scores validly predict college grades for both minority and non-minority students, we are still confronted with another fundamental dilemma. If test scores are conclusively proved valid for all students, does this imply that their present use in college admission is similarly validated? In other words, even if we possess a reliable predictor of a student's present educational level, do we use that information to adapt our educational system accordingly, or do we slice off all those predicted to fail on the basis of perpetuating our present highly-competitive system?
2. The available evidence strongly suggests that standardized achievement tests are as valid for predicting minority student performance as they are for predicting the performance of majority culture students at some institutions. However, at other institutions these tests are not valid predictors of minority students' college performance.

3. In some cases, prediction formulas based on non-minority student standardization groups actually overpredict rather than underpredict minority student college performance.

4. These diverse findings stress the obligation of each integrated institution in American higher education (or those desiring integration) to conduct validity analyses of achievement test predictions for their minority and non-minority student populations.
CHAPTER III

DESIGN, PROCEDURES, AND METHODOLOGY

This chapter includes a discussion of the overall design of the study, procedures in selecting members of the experimental and control groups, the instruments employed, methods of gathering data, and statistical operations for data analysis.

Overall Design

To investigate the predictive validity of the American College Test (ACT) for freshman minority and non-minority students enrolled at Ohio State University Autumn and Winter Quarters 1971-72, two sample groups—experimental and control—were identified. The following data relating to five variables were gathered for each member of the two groups:

1. ACT composite score
2. ACT predicted percentile freshman class rank
3. Autumn Quarter actual percentile freshman class rank
4. Winter Quarter actual percentile freshman class rank
5. Cumulative Autumn and Winter Quarter percentile freshman class rank
Variables 1 and 2 were predictor variables with variables 3, 4, and 5 constituting criterion variables.

Rank correlation coefficients between each variable were computed for experimental and control groups by males and females. In addition, rank correlation coefficients between each variable were obtained for experimental and control group males and females within the following subgroups:

1. Those with an ACT composite score falling within a sub-range of 1-14, inclusive, out of the total range of 1-36.

2. Those with an ACT composite score falling within a sub-range of 15-19, inclusive, out of the total range of 1-36.

3. Those with an ACT composite score falling within a sub-range of 20-24, inclusive, out of the total range of 1-36.

4. Those with an ACT composite score falling within a sub-range of 25-33, inclusive, out of the total range of 1-36.

Finally, rank correlation coefficients obtained for experimental and control group members were compared within and between experimental and control groups by male and female for significance of difference.

Selection of Subjects

Procedures in selecting experimental and control group members are summarized according to each group.
Experimental Group

A total of 359 minority students composed the experimental group. Of this total, 155 were males and 204 were females. This sample was obtained by selecting from the total population of 557 minority students who were recruited through the Freshman Foundation Special Recruitment Program all students whose American College Test (ACT) results, particularly composite score and predictive information, were stored on the Magnetic Tape Report. The Magnetic Tape Report is sent to Ohio State University by the American College Testing Program within four weeks of the test date. To assure obtaining the largest possible sample, each Magnetic Tape Report for the previous nine test dates (February, 1970 through October, 1971) was searched.

Control Group

A total of 361 students, 156 males and 205 females, composed the control group. This random sample was obtained by first identifying from the total population of 10,191 entering freshmen students, excluding Freshman Foundation Special Recruitment Program students, all those whose American College Test (ACT) results, particularly composite score and predictive information, were punched on the ACT Standard Punched
Card Report and on file in the Office of Evaluation at Ohio State University.

Once obtaining this identified deck of computer cards, the Office of Evaluation culled out every third card which carried a number "4" (an arbitrarily-selected number) in the last digit of the student registration number. This accomplished one of two randomization procedures in that the last digit of the student registration number is randomly assigned. This step generated 708 sequentially-numbered cards from which the final sample groups of 156 males and 205 females were drawn in stratified random samplings by using a random numbers table.

Description of Instruments

Two instruments were used in the investigation—the American College Test (ACT) and the Student Locator Grade Report for University College. A complete description of these two instruments follows.

American College Test

The American College Testing Program gathers information about prospective college students through a national Student Assessment Program. This Student Assessment Program features five test dates throughout each academic year during which students across
the nation who typically are seniors in high school and who plan to attend college are administered the American College Test for a fee of eight dollars. The five test dates come during the months of October, December, February, April, and July of each academic year. Adjustments in academic predictions are made according to which test date a student took the test. The American College Testing Program (Using ACT on the Campus, 1971) reports that more than 2000 institutions in all 50 states and the District of Columbia participate by requiring or recommending the ACT for its applicants.

The Student Assessment Program consists of the following:

1. A four-section battery of tests of educational development and academic potential.

2. Self-reported high school grades in English, mathematics, social studies, and natural sciences

3. A Student Profile Section designed to obtain information about educational and economic background, racial/ethnic origin, special needs, special interests, and potential for achievement in non-academic areas.

The four-section battery of tests of educational development is described in detail below (Using ACT on the Campus, 1971).
The English Usage Test is a 75-item, 40-minute test of the essentials of effective writing, emphasizing clarity of expression rather than rote recall of grammar rules. Four prose passages with certain portions underlined and numbered make-up this test's format. Four alternatives are given as changes that would improve underlined sections. The student must decide which alternative is most correct.

The Mathematics Usage Test is a 40-item, 50-minute test measuring mathematical reasoning ability. Test items assess quantitative reasoning powers instead of memorization of formulas or computational skills. Test items are of two main types: the first, verbal problems that present practical situations requiring the solution of quantitative problems; the second, formal exercises in arithmetic, algebra, and geometry. Each item poses a question and five alternative answers, the last of which may be "Not given."

The Social Studies Reading Test is a 52-item, 35-minute test that measures problem-solving skills required in social studies. This test is sub-divided into two types of questions. The first type includes four reading passages designed to test reading comprehension skills, the ability to make inferences, analogize between ideas expressed in the passages to new
situations, draw conclusions from experimental or graphic data, and recognize a writer's bias and style. The second form of questioning surveys general information taught in high school social studies courses. All items are multiple-choice with four alternatives.

The Natural Sciences Reading Test is a 52-item, 35-minute test in which all items are multiple-choice with four alternatives. Test items are of two types: those based on four reading passages; the second, on the general field of science. Reading passages discuss various scientific topics, requiring the student to interpret and evaluate scientific materials and, more important, to see an experiment's purpose, the relationship between purpose and hypotheses and between hypotheses, and to identify generalizations that can be made on the basis of the experiment. Other questions test recall of subject matter in high school science courses.

For each of the four test sections, results are reported in terms of a standard score. The range of standard scores is 1 (low) to 36 (high). An average of the standard scores on the four sub-tests is computed and reported as a fifth, composite score. National and local norms are provided for the five scores.
The American College Testing Program's research services provide predictions of academic potential to participating institutions who have supplied necessary data within the last three years. Predictive formulas take into account the four test scores, at least three self-reported high school grades, and information requested of the particular institution. Ohio State University receives three types of predictions for each student taking the American College Test (ACT) according to four main groups as follows:

1. Males enrolled at Columbus campus
2. Females enrolled at Columbus campus
3. Males enrolled at any branch campus
4. Females enrolled at any branch campus

The three types of predictive information computed by the American College Testing Program and reported to Ohio State University include the following (Using ACT on the Campus, 1971):

1. **Predicted college grade-point average**, reported in terms of a 4-point scale with 4 equal to A, 3 equal to B, 2 equal to C, and 1 equal to D. The grade-point-average prediction is computed in intervals of one-tenth over the 4-point range. For example, a grade-point-average prediction falling one-third of the distance between 2 and 3 of the 4-point scale would be indicated as 2.3.

2. **Predicted freshman class percentile rank**. A percentile rank is reported which compares the prospective student's predicted overall grade-point-average with those
of all freshmen students in the same specified groupings the previous academic year. On the assumption that the profile of the entire group of students remains relatively constant from one year to the next, this comparison also provides a prediction in percentile class rank terms with all other prospective students who will enroll as freshmen.

3. Probability of obtaining a "C" average or higher is computed for each student indicating by a percentile his chances of earning a "C" average or higher on the basis of his test scores and high school grades.

Data from the Student Assessment Program is reported to Ohio State University in three main forms: (1) **Student Profile Report**, (2) **Standard Punched Card Report**, and (3) **Magnetic Tape Report**.

The **Student Profile Report** is a computer-printed, one-page summary of information gleaned from the Student Assessment Program and reported in a standardized format. (See sample form, p. 144).

The **Standard Punched Card Report** includes information selected from the ACT Basic Student Record, social security number, name, and college code number. This variable-format card is arranged according to specifications indicated by Ohio State University. For University purposes, it is termed a **Test and Course Placement Card**. (See sample card, p. 146).

The **Magnetic Tape Report** contains the complete student record. Since Ohio State University has
tape-handling devices in its computer installations, these reports facilitate easy storage and access to a vast quantity of data.

Student Locator Grade Report for University College

The Student Locator Grade Report for University College is a computerized print-out prepared for University College, a non-degree granting college for all freshmen and sophomores who have not yet declared a major field of study. Generally all freshmen must remain in University College for two full-time quarters. From the third to sixth quarters of full-time enrollment, the student can opt to remain in University College or transfer to a degree-granting college. During the sixth quarter of full-time study, he is required to declare a major field of study.

At the end of each quarter, the Student Locator Grade Report for University College provides an alphabetical listing of all students in University College, showing, among other information, the following important data:

1. Rank in college (freshman or sophomore)
2. Earned hours for the quarter
3. Cumulative earned hours
4. Quarter grade-point-average
5. Cumulative grade-point-average

6. Quarter class rank, indicating rank order placement in relation to all other freshmen or sophomores, whichever is the appropriate comparison group

7. Quarter college rank, indicating rank order placement in relation to all University College students

8. Cumulative class rank, following the same format as quarter college rankings

Grade-point-averages at Ohio State University are determined by finding the mean of individual grades (to three decimal places) on the basis of the following grading format:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>Number of Quality Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Highest quality of work</td>
<td>4</td>
</tr>
<tr>
<td>B</td>
<td>Second highest quality of work</td>
<td>3</td>
</tr>
<tr>
<td>C</td>
<td>Third highest quality of work</td>
<td>2</td>
</tr>
<tr>
<td>D</td>
<td>Lowest quality of work</td>
<td>1</td>
</tr>
<tr>
<td>E</td>
<td>Failing work</td>
<td>0</td>
</tr>
</tbody>
</table>

Therefore, a student earning grades of A, B, A, B for four courses completed in a given quarter would show a quarter-grade-point average of 3.500 in the Student Locator Grade Report.

Rank order standing in class (quarter and cumulative) is determined by rank ordering all students of the same year in college according to obtained grade-point-average. For example, a student with a 4.000 grade-point-average would rank first in his
class. If the next highest grade-point-average of the total group were 3.976, all students with that average would rank second in the class. Rank order standing in college is computed in the same manner.

Methods of Gathering Data

Data gathering methods differed for experimental and control groups. As a result, a description of methods in gathering data for each group is discussed separately.

Experimental Group

Because additional research studies are planned for the total group of minority students recruited through the Freshman Foundation Special Recruitment Program, procedures for gathering data reflected the researcher's desire to establish a data bank as large as possible, from which the data relevant to this particular study could be drawn while other data compiled would be available for other studies.

First, requirements were identified for accessing to information on the Magnetic Tape Report supplied to Ohio State University by the American College Testing Program. American College Test (ACT) records are stored on this tape by social security number and ACT identification number. Since the former was easier to obtain for each student, social security
numbers of each of the 557 originally recruited students were coded on digital scan sheets which were used, in turn, to generate computer punch cards carrying the number only. Social security numbers were obtained from records in the Admissions Office and the Office of Student Financial Aids.

A matching of social security numbers between punch cards and magnetic tape resulted in the complete record supplied by the American College Testing Program for 389 out of the original 557 students. The complete record from the tape was transformed into computer punch card form, requiring five cards for each student to house the data. A sixth card for each student included data compiled for each student not available from the Magnetic Tape Report. This card was obtained by coding desired information on scan sheets which were read by digital scanner to produce cards. Among other information, this card records college grade-point-averages (quarter and cumulative). (See summary of information on each card, beginning on p. 148.) Grade-point-averages and percentile class ranks (by converting rank order number to a per cent) for Autumn and Winter Quarter were obtained from the Student Locator Grade Report for University College, published at the end of each of the two quarters.
As described earlier, five variables were central to this investigation. They were as follows:

1. ACT composite score
2. ACT predicted percentile freshman class rank
3. Autumn Quarter actual percentile class rank
4. Winter Quarter actual percentile class rank
5. Cumulative Autumn and Winter Quarter actual percentile class rank

Accordingly, the values for each of these variables and a sex code for each student were identified on the six-card complete record by computer, and a single card was generated for each student carrying information on only the five variables plus a sequence number and sex code. Of these 389 single-card records, 30 did not include ACT predicted percentile class rank in that the student did not report at least three high school grades. In these cases, the American College Testing Program makes no predictions. These 30 cards were eliminated, leaving punch cards for 359 students defined as experimental group members.

Control Group

As described in more detail earlier, selection of control group members involved drawing punch cards randomly from the file housing an ACT Standard
Punch Card Report for all entering freshmen. Cards for 361 control group students included ACT composite scores and predicted percentile freshman class rank. Information on actual percentile rank, quarter and cumulative, was secured from the Student Locator Grade Report for University College for Autumn and Winter Quarter.

Values obtained for the five variables plus a sex code and sequence number were keypunched onto computer punch cards for the 361 control group members.

**Statistical Analysis**

Within group correlations between each of the five variables were computed for experimental and control groups according to the following sub-groups:

1. All males
2. All females
3. Males (ACT composite score in 1-14 range, inclusive)
4. Females (ACT composite score in 1-14 range, inclusive)
5. Males (ACT composite score in 15-19 range, inclusive)
6. Females (ACT composite score in 15-19 range, inclusive)
7. Males (ACT composite score in 20-24 range, inclusive)
8. Females (ACT composite score in 20-24 range, inclusive)
9. Males (ACT composite score in 25-33 range, inclusive)
10. Females (ACT composite score in 25-33 range, inclusive)

The final correlations were obtained by running appropriate cards on Computer Program BMD03D which computed Pearson product moment correlation coefficients for each sub-group listed above for experimental and control groups. A \( t \)-test done on each correlation coefficient tested for significance at the .05 level.

To serve as a check on these results, Computer Program BMD07D was run separately for experimental and control group. This computer program sorted the cards into the sub-groups indicated earlier, computed Pearson correlation coefficients, and printed-out a histogram of each of the five variables for each sub-group. Computer Programs BMD03D and BMD07D (originated at the Health Sciences Computing Facility, University of California at Los Angeles) are available at Ohio State University's Instructional Research Computer Center.

Correlation coefficients obtained for experimental and control group males and females were compared within and between the four groups. Each pair of correlations compared were converted into Fisher's \( z \) function. The significance of the difference
Between each pair of \( z \)'s was determined according to the following formula (Garrett, 1966):

\[
SE = \frac{Z_{1}-Z_{2}}{\sqrt{\frac{1}{N_{1}-3} + \frac{1}{N_{2}-3}}}
\]
CHAPTER IV

ANALYSIS AND RESULTS

Results of statistical analysis of the data compose this chapter. Findings are reported for each null hypothesis stated in Chapter I. Each null hypothesis is re-stated to eliminate referring to the earlier text. The reader will note that the order of stating hypotheses has been altered to facilitate presentation of data.

H

0

1: The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) experimental group males will not be significantly different from zero at the .05 level of significance.

H

0

2: The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) experimental group males will not be significantly different from zero.

To test each of the null hypotheses above, a Pearson product-moment correlation coefficient (hereafter referred to an "Pearson r") was computed and subjected to a t-test to determine significance. A summary of means and standard deviations for each
of the prediction and criterion variables related to all experimental group males is provided in Table 1. Table 2 summarizes data obtained in testing the null hypotheses stated above.

TABLE 1
MEANS AND SD OF THE FIVE VARIABLES FOR ALL EXPERIMENTAL MALES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Studentsa</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACT Composite Score</td>
<td>16.336</td>
<td>5.882</td>
<td>155</td>
</tr>
<tr>
<td>2. ACT Predicted % Rank</td>
<td>26.587</td>
<td>26.708</td>
<td>155</td>
</tr>
<tr>
<td>3. Actual Autumn % Rank</td>
<td>46.032</td>
<td>28.187</td>
<td>155</td>
</tr>
<tr>
<td>4. Actual Winter % Rank</td>
<td>40.885</td>
<td>28.368</td>
<td>139</td>
</tr>
<tr>
<td>5. Actual Cumulative % Rank</td>
<td>40.273</td>
<td>28.398</td>
<td>139</td>
</tr>
</tbody>
</table>

aNumber of students for computation differs since not all students completed both Autumn and Winter Quarter.

TABLE 2
PEARSON r AND t-TEST RESULTS FOR HYPOTHESES 1 AND 2

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>df</th>
<th>Pearson r</th>
<th>t</th>
<th>CR Valuea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 1</td>
<td>137</td>
<td>.4493b</td>
<td>6.669</td>
<td>1.98</td>
</tr>
<tr>
<td>Hypothesis 2</td>
<td>137</td>
<td>.5214c</td>
<td>7.137</td>
<td>1.98</td>
</tr>
</tbody>
</table>

aCritical value of t for significance at .05 level
bSignificant at .05 and .01 levels
cSignificant at .05 and .01 levels
As Table 2 shows, a significant relationship (at both .05 and .01) was found between ACT composite score and ACT predicted percentile freshman class rank, respectively, and actual cumulative Autumn and Winter Quarter percentile freshman class rank for experimental group males taken as a whole group. Therefore, Null Hypothesis 1 and Null Hypothesis 2 were rejected.

The second pair of null hypotheses to be considered are as follows:

\[ H_0^{1A} \text{: The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range I (1-14) experimental group males will not be significantly different from zero at the \( .05 \) level of significance.} \]

\[ H_0^{2A} \text{: The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range I (1-14) experimental group males will not be significantly different from zero at the \( .05 \) level of significance.} \]

To test each of the above null hypotheses, a Pearson \( r \) was computed and tested for significance by a \( t \)-test. A summary of means and standard deviations of prediction and criterion variables relating to Range I (1-14) experimental males is included in Table 3. Table 4 provides data obtained in testing Null Hypotheses 1A and 2A stated above.
TABLE 3
MEANS AND SD OF THE FIVE VARIABLES FOR RANGE I
(1-14) EXPERIMENTAL MALES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACT Composite Score</td>
<td>11.073</td>
<td>2.591</td>
<td>69</td>
</tr>
<tr>
<td>2. ACT Predicted % Rank</td>
<td>6.739</td>
<td>8.370</td>
<td>69</td>
</tr>
<tr>
<td>3. Actual Autumn % Rank</td>
<td>37.072</td>
<td>24.907</td>
<td>69</td>
</tr>
<tr>
<td>4. Actual Winter % Rank</td>
<td>33.2625</td>
<td>28.288</td>
<td>64</td>
</tr>
<tr>
<td>5. Actual Cumulative % Rank</td>
<td>30.2031</td>
<td>25.968</td>
<td>64</td>
</tr>
</tbody>
</table>

TABLE 4
PEARSON r AND t-TEST RESULTS
FOR HYPOTHESES 1A AND 2A

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>df</th>
<th>Pearson r</th>
<th>t</th>
<th>CR Valuea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 1A</td>
<td>62</td>
<td>.1353b</td>
<td>1.106</td>
<td>2.00</td>
</tr>
<tr>
<td>Hypothesis 2A</td>
<td>62</td>
<td>.2335c</td>
<td>1.896</td>
<td>2.00</td>
</tr>
</tbody>
</table>

aCritical value of t for significance at .05 level
bNot significant
cNot significant

As Table 4 demonstrates, the relationship is not significant between ACT composite score and ACT predicted percentile freshman class rank, respectively, and actual cumulative Autumn and Winter Quarter percentile freshman class rank for experimental group males whose ACT composite scores fell in a range of 1-14, inclusive. Therefore, Null Hypothesis 1A and Null Hypothesis 2A were accepted.
The next pair of null hypotheses to be considered are as follows:

\[ H_0 \]

1B: The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range II (15-19) experimental group males will not be significantly different from zero at the .05 level of significance.

\[ H_0 \]

2B: The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range II (15-19) experimental group males will not be significantly different from zero at the .05 level of significance.

To test each of the above null hypotheses, a Pearson \( r \) was computed and tested for significance by a t-test. A summary of means and standard deviations of prediction and criterion variables relating to Range II (15-19) experimental group males is included in Table 5. Table 6 summarizes data obtained in testing Null Hypotheses 1B and 2B stated above.

From Table 6, it is clear that there is no significant relationship between ACT composite score and ACT predicted percentile freshman class rank, respectively, and actual cumulative Autumn and Winter Quarter percentile freshman class rank for those experimental group males who obtained an ACT composite
score in the range of 15-19, inclusive. Therefore, Null Hypothesis 1B and Null Hypothesis 2B were accepted.

**TABLE 5**

**MEANS AND SD OF THE FIVE VARIABLES FOR RANGE II (15-19) EXPERIMENTAL GROUP MALES**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACT Composite Score</td>
<td>16.790</td>
<td>1.492</td>
<td>38</td>
</tr>
<tr>
<td>2. ACT Predicted % Rank</td>
<td>23.921</td>
<td>12.465</td>
<td>38</td>
</tr>
<tr>
<td>3. Actual Autumn % Rank</td>
<td>46.421</td>
<td>26.128</td>
<td>38</td>
</tr>
<tr>
<td>4. Actual Winter % Rank</td>
<td>38.818</td>
<td>24.155</td>
<td>33</td>
</tr>
<tr>
<td>5. Actual Cumulative % Rank</td>
<td>40.697</td>
<td>23.790</td>
<td>33</td>
</tr>
</tbody>
</table>

**TABLE 6**

**PEARSON r AND t-TEST RESULTS FOR HYPOTHESES 1B AND 2B**

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>df</th>
<th>Pearson r</th>
<th>t</th>
<th>CR Valuea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 1B</td>
<td>31</td>
<td>.1145b</td>
<td>.672</td>
<td>2.04</td>
</tr>
<tr>
<td>Hypothesis 2B</td>
<td>31</td>
<td>.1827c</td>
<td>1.008</td>
<td>2.75</td>
</tr>
</tbody>
</table>

aCritical value of t for significance at .05 level
bNot significant
cNot significant
The next pair of null hypotheses to be considered are as follows:

\[ H_0^1C: \text{The correlation between ACT composite score and actual Autumn and Winter Quarter percentile freshman class rank for Range III (20-24) experimental group males will not be significantly different from zero at the .05 level of significance.} \]

\[ H_0^2C: \text{The correlation between ACT predicted percentile freshman class rank and actual Autumn and Winter Quarter percentile freshman class rank for Range III (20-24) experimental group males will not be significantly different from zero at the .05 level of significance.} \]

To test each of the above null hypotheses, a Pearson \( r \) was computed and tested for significance by a \( t \)-test. A summary of means and standard deviations of prediction and criterion variables relating to Range III (20-24) experimental group males is included in Table 7. Table 8 summarizes data obtained in testing Null Hypotheses 1C and 2C stated above.

Table 8 shows that a significant relationship exists between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for those experimental group males whose ACT composite scores fell in a range of 20-24, inclusive. An even stronger relationship for the same students
is demonstrated between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank. Therefore, Null Hypothesis 1C and Null Hypothesis 2C were rejected.

**TABLE 7**

MEANS AND SD OF THE FIVE VARIABLES FOR RANGE III (20-24) EXPERIMENTAL GROUP MALES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACT Composite Score</td>
<td>21.844</td>
<td>1.439</td>
<td>32</td>
</tr>
<tr>
<td>2. ACT Predicted % Rank</td>
<td>47.156</td>
<td>21.076</td>
<td>32</td>
</tr>
<tr>
<td>3. Actual Autumn % Rank</td>
<td>50.688</td>
<td>29.551</td>
<td>32</td>
</tr>
<tr>
<td>4. Actual Winter % Rank</td>
<td>47.172</td>
<td>25.673</td>
<td>29</td>
</tr>
<tr>
<td>5. Actual Cumulative % Rank</td>
<td>46.759</td>
<td>28.965</td>
<td>29</td>
</tr>
</tbody>
</table>

**TABLE 8**

PEARSON r AND t-TEST RESULTS FOR HYPOTHESES 1C AND 2C

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>df</th>
<th>Pearson r</th>
<th>t</th>
<th>CR Valuea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 1C</td>
<td>27</td>
<td>.3906b</td>
<td>2.184</td>
<td>2.05</td>
</tr>
<tr>
<td>Hypothesis 2C</td>
<td>27</td>
<td>.4773c</td>
<td>2.860</td>
<td>2.05</td>
</tr>
</tbody>
</table>

aCritical value of t for significance at .05 level
bSignificant at .05 level
cSignificant at .05 and .01 levels
The next pair of null hypotheses examined are as follows:

\[ H_0^{1D} \]: The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range IV (25-33) experimental group males will not be significantly different from zero at the .05 level of significance.

\[ H_0^{2D} \]: The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range IV (25-33) experimental group males will not be significantly different from zero at the .05 level of significance.

To test each of the above null hypotheses, a Pearson \( r \) was computed and tested for significance by a \( t \)-test. A summary of means and standard deviations of prediction and criterion variables relating to Range IV (25-33) experimental group males is included in Table 9. Table 10 summarizes data obtained in testing Null Hypotheses 1D and 2D stated above.

Table 10 indicates that no significant relationship exists between ACT composite score and ACT predicted percentile freshman class rank, respectively, and actual cumulative Autumn and Winter Quarter percentile freshman class rank for those whose ACT
composite scores were in a range of 25-33, inclusive. Therefore, Null Hypothesis 1D and Null Hypothesis 2D were accepted.

### TABLE 9

**MEANS AND SD OF THE FIVE VARIABLES FOR RANGE IV (25-33) EXPERIMENTAL GROUP MALES**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACT Composite Score</td>
<td>26.938</td>
<td>1.569</td>
<td>16</td>
</tr>
<tr>
<td>2. ACT Predicted % Rank</td>
<td>77.375</td>
<td>14.845</td>
<td>16</td>
</tr>
<tr>
<td>3. Actual Autumn % Rank</td>
<td>74.438</td>
<td>24.069</td>
<td>16</td>
</tr>
<tr>
<td>4. Actual Winter % Rank</td>
<td>69.615</td>
<td>25.471</td>
<td>13</td>
</tr>
<tr>
<td>5. Actual Cumulative % Rank</td>
<td>74.308</td>
<td>19.207</td>
<td>13</td>
</tr>
</tbody>
</table>

### TABLE 10

**PEARSON r AND t-TEST RESULTS**

**HYPOTHESES 1D AND 2D**

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>df</th>
<th>Pearson r</th>
<th>t</th>
<th>CR Value&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 1D</td>
<td>11</td>
<td>.0068&lt;sup&gt;b&lt;/sup&gt;</td>
<td>.033</td>
<td>2.20</td>
</tr>
<tr>
<td>Hypothesis 2D</td>
<td>11</td>
<td>.4352&lt;sup&gt;c&lt;/sup&gt;</td>
<td>1.617</td>
<td>2.20</td>
</tr>
</tbody>
</table>

<sup>a</sup>Critical value of t for significance at .05 level  
<sup>b</sup>Not significant  
<sup>c</sup>Not significant
The next pair of hypotheses examined are as follows:

\( H_0^3 \): The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) experimental group females will not be significantly different from zero at the .05 level of significance.

\( H_0^4 \): The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) experimental group females will not be significantly different from zero at the .05 level of significance.

To test each of the above null hypotheses, a Pearson \( r \) was computed and tested for significance by a \( t \)-test. A summary of means and standard deviations of prediction and criterion variables relating to experimental group females as a total group is included in Table 11. Table 12 summarizes data obtained in testing Null Hypotheses 3 and 4 stated above.

Table 12 shows that a significant relationship exists between ACT composite score and ACT predicted percentile freshman class rank, respectively, and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all experimental group females.
taken as a whole group. Therefore, Null Hypothesis 3 and Null Hypothesis 4 were rejected.

TABLE 11
MEANS AND SD OF THE FIVE VARIABLES FOR ALL (1-33) EXPERIMENTAL GROUP FEMALES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACT Composite Score</td>
<td>15.525</td>
<td>5.500</td>
<td>204</td>
</tr>
<tr>
<td>2. ACT Predicted % Rank</td>
<td>25.819</td>
<td>26.258</td>
<td>204</td>
</tr>
<tr>
<td>3. Actual Autumn % Rank</td>
<td>46.108</td>
<td>26.959</td>
<td>204</td>
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<tr>
<td>4. Actual Winter % Rank</td>
<td>43.540</td>
<td>27.624</td>
<td>189</td>
</tr>
<tr>
<td>5. Actual Cumulative % Rank</td>
<td>42.333</td>
<td>26.690</td>
<td>189</td>
</tr>
</tbody>
</table>

TABLE 12
PEARSON r AND t-TEST RESULTS FOR HYPOTHESSES 3 AND 4

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>df</th>
<th>Pearson r</th>
<th>t</th>
<th>CR Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>187</td>
<td>.3282b</td>
<td>4.795</td>
<td>1.97</td>
</tr>
<tr>
<td>4</td>
<td>187</td>
<td>.4170c</td>
<td>6.302</td>
<td>1.97</td>
</tr>
</tbody>
</table>

a Critical value of t for significance at .05 level
b Significant at .05 and .01 levels
c Significant at .05 and .01 levels
The next pair of hypotheses examined are as follows:

H
O
3A: The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range I (1-14) experimental group females will not be significantly different from zero at the .05 level of significance.

H
O
4A: The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range I (1-14) experimental group females will not be significantly different from zero at the .05 level of significance.

To test each of the above hypotheses, a Pearson \( r \) was computed and tested for significance by a \( t \)-test. A summary of means and standard deviations of prediction and criterion variables relating to Range I (1-14) experimental group females is included in Table 13. Table 14 summarizes data obtained in testing Null Hypotheses 3A and 4A.

Data from Table 14 indicates that no significant relationship exists between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for those experimental group females whose ACT composite scores ranged from 1-14, inclusive. However, a significant relationship
is observed for this same group between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter percentile freshman class rank. Therefore, we accept Null Hypothesis 3A was accepted but Null Hypothesis 4A was rejected.

TABLE 13
MEANS AND SD OF THE FIVE VARIABLES FOR RANGE I (1-14) EXPERIMENTAL GROUP FEMALES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACT Composite Score</td>
<td>10.670</td>
<td>2.385</td>
<td>94</td>
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<tr>
<td>2. ACT Predicted % Rank</td>
<td>8.075</td>
<td>9.141</td>
<td>94</td>
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<tr>
<td>3. Actual Autumn % Rank</td>
<td>39.383</td>
<td>25.624</td>
<td>94</td>
</tr>
<tr>
<td>4. Actual Winter % Rank</td>
<td>39.739</td>
<td>25.507</td>
<td>88</td>
</tr>
<tr>
<td>5. Actual Cumulative % Rank</td>
<td>36.523</td>
<td>23.346</td>
<td>88</td>
</tr>
</tbody>
</table>

TABLE 14
PEARSON r and t-TEST RESULTS FOR HYPOTHESES 3A AND 4A

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>df</th>
<th>Pearson r</th>
<th>t</th>
<th>CR Valuea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 3A</td>
<td>86</td>
<td>.0921b</td>
<td>.837</td>
<td>1.99</td>
</tr>
<tr>
<td>Hypothesis 4A</td>
<td>86</td>
<td>.3337c</td>
<td>3.255</td>
<td>1.99</td>
</tr>
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</table>

aCritical value of t for significance at .05 level
bNot significant
c Significant at .05 and .01 levels
The next pair of hypotheses examined are as follows:

\( H_0^{3B} \): The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range II (15-19) experimental group females will not be significantly different from zero at the .05 level of significance.

\( H_0^{4B} \): The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range II (15-19) experimental group females will not be significantly different from zero at the .05 level of significance.

To test each of the above hypotheses, a Pearson r was computed and tested for significance by a t-test. A summary of means and standard deviations of prediction and criterion variables relating to Range II (15-19) experimental group females is included in Table 15. Table 16 summarizes data obtained in testing Null Hypotheses 3B and 4B.

From Table 16, it is clear that no significant relationship exists between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for experimental group females whose ACT composite scores fell in a range of 15-19, inclusive. However, ACT predicted percentile freshman
class rank is significantly correlated with percentile freshman class rank for the same students. Therefore, Null Hypothesis 3B was accepted but Null Hypothesis 4B was rejected.

TABLE 15
MEANS AND SD OF THE FIVE VARIABLES FOR RANGE II (15-19) EXPERIMENTAL GROUP FEMALES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACT Composite Score</td>
<td>16.707</td>
<td>1.439</td>
<td>58</td>
</tr>
<tr>
<td>2. ACT Predicted % Rank</td>
<td>22.966</td>
<td>15.456</td>
<td>58</td>
</tr>
<tr>
<td>3. Actual Autumn % Rank</td>
<td>42.207</td>
<td>26.928</td>
<td>58</td>
</tr>
<tr>
<td>4. Actual Winter % Rank</td>
<td>40.882</td>
<td>29.450</td>
<td>51</td>
</tr>
<tr>
<td>5. Actual Cumulative % Rank</td>
<td>38.490</td>
<td>27.793</td>
<td>51</td>
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</table>

TABLE 16
PEARSON r AND t-TEST RESULTS FOR HYPOTHESIS 3B AND 4B

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>df</th>
<th>Pearson r</th>
<th>t</th>
<th>CR Valuea</th>
</tr>
</thead>
<tbody>
<tr>
<td>3B</td>
<td>49</td>
<td>.0973b</td>
<td>.700</td>
<td>2.01</td>
</tr>
<tr>
<td>4B</td>
<td>49</td>
<td>.2880c</td>
<td>2.100</td>
<td>2.01</td>
</tr>
</tbody>
</table>

aCritical value of t for significance at .05 level
bNot significant
cSignificant at .05 level
The next pair of hypotheses examined are stated below:

\( H_0 \)

3C: The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range III (20-24) experimental group females will not be significantly different from zero at the .05 level of significance.

\( H_0 \)

4C: The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range III (20-24) experimental group females will not be significantly different from zero at the .05 level of significance.

To test each of the above hypotheses, a Pearson \( r \) was computed and tested for significance by a t-test. A summary of means and standard deviations of prediction and criterion variables relating to Range III (20-24) experimental group females is given in Table 17. Table 18 summarizes data obtained in testing Null Hypotheses 3C and 4C.

The results given in Table 18 indicate no significant relationship between ACT composite score and ACT predicted percentile freshman class rank, respectively, and actual cumulative Autumn and Winter Quarter percentile freshman class rank for experimental
group females whose ACT composite scores fell in a range of 20-24, inclusive. Therefore, Null Hypothesis 3C and Null Hypothesis 4C were accepted.

TABLE 17

MEANS AND SD OF THE FIVE VARIABLES FOR RANGE III (20-24) EXPERIMENTAL GROUP FEMALES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACT Composite Score</td>
<td>21.763</td>
<td>1.441</td>
<td>38</td>
</tr>
<tr>
<td>2. ACT Predicted % Rank</td>
<td>53.816</td>
<td>18.646</td>
<td>38</td>
</tr>
<tr>
<td>3. Actual Autumn % Rank</td>
<td>58.079</td>
<td>23.073</td>
<td>38</td>
</tr>
<tr>
<td>4. Actual Winter % Rank</td>
<td>48.500</td>
<td>24.953</td>
<td>36</td>
</tr>
<tr>
<td>5. Actual Cumulative % Rank</td>
<td>51.917</td>
<td>24.513</td>
<td>36</td>
</tr>
</tbody>
</table>

TABLE 18

PEARSON r AND t-TEST RESULTS FOR HYPOTHESES 3C and 4C

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>df</th>
<th>Pearson r</th>
<th>t</th>
<th>CR Valuea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 3C</td>
<td>34</td>
<td>.1415b</td>
<td>.812</td>
<td>2.03</td>
</tr>
<tr>
<td>Hypothesis 4C</td>
<td>34</td>
<td>.2499c</td>
<td>1.508</td>
<td>2.03</td>
</tr>
</tbody>
</table>

aCritical value of t for significance at .05 level

bNot significant
cNot significant
The next pair of hypotheses examined are given below:

\[ H_0^{3D}: \] The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range IV (25-33) experimental group females will not be significantly different from zero at the .05 level of significance.

\[ H_0^{4D}: \] The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range IV (25-33) experimental group females will not be significantly different from zero at the .05 level of significance.

To test each of the above hypotheses, a Pearson $r$ was computed and tested for significance by a $t$-test. A summary of means and standard deviations of prediction and criterion variables relating to Range IV (25-33) experimental group females can be found in Table 19. Table 20 summarizes data obtained in testing Null Hypotheses 3D and 4D.

The data in Table 20 reveals no significant relationship between ACT composite score and ACT predicted percentile freshman class rank, respectively, and actual cumulative Autumn and Winter Quarter percentile freshman class rank for those experimental
group females whose ACT composite score fell in a range of 25-33, inclusive. Therefore, Null Hypothesis 3D and Null Hypothesis 4D were accepted.

TABLE 19
MEANS AND SD OF THE FIVE VARIABLES FOR RANGE IV (25-33) EXPERIMENTAL GROUP FEMALES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACT Composite Score</td>
<td>26.286</td>
<td>1.267</td>
<td>14</td>
</tr>
<tr>
<td>2. ACT Predicted % Rank</td>
<td>80.786</td>
<td>16.554</td>
<td>14</td>
</tr>
<tr>
<td>3. Actual Autumn % Rank</td>
<td>74.929</td>
<td>15.775</td>
<td>14</td>
</tr>
<tr>
<td>4. Actual Winter % Rank</td>
<td>64.357</td>
<td>31.765</td>
<td>14</td>
</tr>
<tr>
<td>5. Actual Cumulative % Rank</td>
<td>68.214</td>
<td>28.339</td>
<td>14</td>
</tr>
</tbody>
</table>

TABLE 20
PEARSON r AND t-TEST RESULTS FOR HYPOTHESES 3D AND 4D

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>df</th>
<th>Pearson r</th>
<th>t</th>
<th>CR Valuea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 3D</td>
<td>12</td>
<td>.1525b</td>
<td>.525</td>
<td>2.18</td>
</tr>
<tr>
<td>Hypothesis 4D</td>
<td>12</td>
<td>.0058c</td>
<td>.035</td>
<td>2.18</td>
</tr>
</tbody>
</table>

aCritical value of t for significance at .05 level
bNot significant
cNot significant

The data reported to this point provides the results of statistical tests of each hypothesis for experimental group males and females. The hypotheses
examined within-group (for 10 subgroups) correlations between ACT composite score and ACT predicted percentile freshman class rank, respectively, and actual cumulative Autumn and Winter Quarter percentile freshman class rank. Table 21 below provides a capsule of these findings.

### TABLE 21

**SUMMARY OF CORRELATIONS BETWEEN PREDICTION AND CRITERION VARIABLES FOR EXPERIMENTAL GROUP**

<table>
<thead>
<tr>
<th>ACT Comp. Score Range</th>
<th>No. of Cases</th>
<th>$r$, Variables 1 &amp; 5 S/N(^b)</th>
<th>$r$, Variables 2 &amp; 5 S/N(^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-33</td>
<td>139</td>
<td>.4493 S</td>
<td>.5214 S</td>
</tr>
<tr>
<td>I. 1-14</td>
<td>64</td>
<td>.1353 N</td>
<td>.2335 N</td>
</tr>
<tr>
<td>II. 15-19</td>
<td>33</td>
<td>.1145 N</td>
<td>.1827 N</td>
</tr>
<tr>
<td>III. 20-24</td>
<td>29</td>
<td>.3906 S</td>
<td>.4773 S</td>
</tr>
<tr>
<td>IV. 25-33</td>
<td>13</td>
<td>.0068 N</td>
<td>.4352 N</td>
</tr>
<tr>
<td>Females</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-33</td>
<td>189</td>
<td>.3282 S</td>
<td>.4170 S</td>
</tr>
<tr>
<td>I. 1-14</td>
<td>88</td>
<td>.0921 N</td>
<td>.3337 S</td>
</tr>
<tr>
<td>II. 15-19</td>
<td>51</td>
<td>.0973 N</td>
<td>.2880 S</td>
</tr>
<tr>
<td>III. 20-24</td>
<td>36</td>
<td>.1415 N</td>
<td>.2499 N</td>
</tr>
<tr>
<td>IV. 25-33</td>
<td>14</td>
<td>.1525 N</td>
<td>.0058 N</td>
</tr>
</tbody>
</table>

\(^a\)Computed $r$ between ACT composite score and actual Cumulative Autumn and Winter Quarter percentile freshman class rank.

\(^b\)"S" indicates $r$ is significant at .05 level; "N" indicates $r$ not significant.

\(^c\)Computed $r$ between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshmen class rank.
An analysis of Table 21 reveals a curious phenomenon: for both males and females, the correlation between prediction and criterion variables for Ranges I, II, III, and IV, respectively, is substantially lower in each case than the correlation between prediction and criterion variables for the same ranges combined (over the entire range of 1-33). For example, the correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for experimental group males taken as an entire group (regardless of the range of his ACT composite score) is .4493. When we group these same experimental group males according to specified ranges (I, II, III, and IV) of ACT composite scores, we observe that the correlation between the identical variables for each range is .1353, .1145, .3906, and .0068, respectively. The same pattern is observed for females.

The unusual quality of these findings lies not in the fact that correlations for whole groups (male and female) were higher than some of those obtained for males and females grouped by ranges. It will be recalled from Chapter I that we suggested that correlations obtained for the entire range of ACT composite scores may be misleading in that correlations for certain sub-ranges within the overall range may be very high while correlations for other
sub-ranges may be very low. The example given postulated that the correlation between prediction and criterion variables for those with high ACT composite scores might be considerably higher than the correlation for those with low ACT composite scores. Indeed, if this had occurred, the findings would not have been surprising to the researcher and, perhaps, not surprising to the reader as well. However, the fact is that the correlations between prediction and criterion variables for each and all sub-ranges of males and females are substantially lower than the correlation obtained when the sub-ranges are combined.

Consultation with three professors who specialize in statistics at Ohio State University yielded the following conclusions:

1. This, indeed, is a surprising finding.
2. All data and computations should be verified.
3. The finding could be legitimate since it can be explained statistically.
4. If no errors are found in any part of the statistical analysis, a histogram plotting distribution of data for Ranges I, II, III, and IV might help to clarify the results.

Verification of all aspects of data gathering and analysis as being without error led to a careful
analysis of the distribution of data for Ranges I, II, III, and IV for experimental group males and females. This step seemed especially important since a similar finding resulted for control group students as will be shown later in this chapter.

Figure I presents a computer-formulated histogram plotting the distribution of actual cumulative Autumn and Winter Quarter percentile freshman class rank for each experimental group male within ACT composite score Range I (1-14), Range II (15-19), Range III (20-24), and Range IV (25-33), respectively. Each asterisk represents a student's actual percentile rank. Asterisks are printed in a horizontal line for each interval up to a maximum of nine scores. When more than nine scores fall in a given interval, a line of nine asterisks will be followed by a numeral indicating the number of scores in that interval.

From Figure I it becomes clear that for Ranges I-IV grouped by ACT composite score, percentile rank values are distributed throughout the interval (0-100) in each range. A glance at the histogram reveals that the correlation within each range would be quite low. Similarly, looking at the histogram as a whole, rather than at each range, it is evident that a slight pattern of clustering of values occurs if one traces with his eye an imaginary diagonal
%Rank
Interval

<table>
<thead>
<tr>
<th>100.000</th>
<th>90.000</th>
<th>80.000</th>
<th>70.000</th>
<th>60.000</th>
<th>50.000</th>
<th>40.000</th>
<th>30.000</th>
<th>20.000</th>
<th>10.000</th>
<th>0.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>)</td>
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<td>**</td>
</tr>
</tbody>
</table>

Range I | Range II | Range III | Range IV
(1-14)   | (15-19)   | (20-24)   | (25-33)

Fig. 1.—Histogram of actual cumulative Autumn and Winter Quarter percentile freshman class rank for ACT composite score Ranges I, II, III, and IV, experimental group males.

from left to right representing a positive linear correlation. This would account for the fact that the correlation for combined ranges was observed to be higher than each range taken separately.

Figure 2 plots for experimental group females actual cumulative Autumn and Winter Quarter percentile freshman class rank within each range of ACT composite score. The format of presentation is the same as that explained in detail above for experimental group males.

As in the case of experimental group males, Figure 2 shows that percentile rank scores are distributed over several intervals within each range of ACT composite score, picturing low correlation between
% Rank  
Interval

<table>
<thead>
<tr>
<th>% Rank</th>
<th>Range I (1-14)</th>
<th>Range II (15-19)</th>
<th>Range III (20-24)</th>
<th>Range IV (25-33)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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</tr>
<tr>
<td>82.500</td>
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<tr>
<td>75.000</td>
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<tr>
<td>67.500</td>
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<td>60.000</td>
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<td></td>
</tr>
<tr>
<td>52.500</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37.500</td>
<td></td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.500</td>
<td></td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.500</td>
<td></td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 2.—Histogram of actual cumulative Autumn and Winter Quarter percentile freshman class rank for ACT composite score Ranges I, II, III, and IV, experimental group females.

these prediction and criterion variables.

Looking at the histogram as a whole, rather than at each range, the eye tends to scan the plotted scores along a diagonal from left to right representing, in gross terms, a positive linear correlation.

Reviewing the data for experimental group males and females, the following generalizations can be drawn:

1. ACT composite score and actual college performance (as measured by grade-point-average) are significantly related for males and females viewed as total groups, respectively. In the same context, an even stronger relationship exists
between ACT predicted percentile freshman class rank and actual college performance when males and females are not grouped by certain ranges of ACT composite scores.

2. On the other hand, when all males and females are differentiated according to specified ranges of ACT composite scores, no significant relationship exists between ACT composite score and college performance (as measured by grade-point-average) for any range except for males whose ACT score is in the 20-24 range, inclusive. Not only is the relationship between ACT composite score and actual college grade-point-average (and actual percentile class rank) not statistically significant for all ranges but the exception noted, the correlation coefficients obtained are all below .16.

3. In terms of the relationship between ACT predicted percentile freshman class rank and actual class rank for two completed quarters, males grouped by the four ranges reflect a different set of results than those for the four ranges of females. While higher than in those computations using only ACT composite score as a prediction variable, the correlations between ACT predicted percentile class rank and actual class rank for males grouped by ranges of score are not significant in any range except for males whose ACT composite score falls in Range III (20-24). However, the correlations are significant between ACT predicted percentile class rank and actual class rank for Ranges I (1-14) and II (15-19) females and not significant for Ranges III (20-24) and IV (25-33).

The reporting of findings for control group males and females follows the same format as that established for the experimental group. That is,
a pair of related hypotheses will be stated, followed by summary data of means and standard deviations and results of subjecting each hypothesis to statistical tests of significance.

The first pair of null hypotheses for the control group appears below:

\[
H_0 \quad 5: \text{The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) control group males will not be significantly different from zero at the .05 level of significance.}
\]

\[
H_0 \quad 6: \text{The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) control group males will not be significantly different from zero at the .05 level of significance.}
\]

To test the above hypotheses, a Pearson \( r \) was computed and tested for significance by a \( t \)-test. A summary of means and standard deviations of prediction and criterion variables for control group males taken as a total group (undifferentiated into ranges of ACT composite score) is included in Table 22. Table 23 summarizes the data obtained in testing Null Hypotheses 5 and 6.
TABLE 22
MEANS AND SD OF THE FIVE VARIABLES FOR ALL (1-33) CONTROL GROUP MALES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACT Composite Score</td>
<td>22.699</td>
<td>5.166</td>
<td>156</td>
</tr>
<tr>
<td>2. ACT Predicted % Rank</td>
<td>52.404</td>
<td>31.626</td>
<td>156</td>
</tr>
<tr>
<td>3. Actual Autumn % Rank</td>
<td>54.910</td>
<td>26.610</td>
<td>156</td>
</tr>
<tr>
<td>4. Actual Winter % Rank</td>
<td>49.918</td>
<td>31.339</td>
<td>146</td>
</tr>
<tr>
<td>5. Actual Cumulative % Rank</td>
<td>50.863</td>
<td>30.043</td>
<td>146</td>
</tr>
</tbody>
</table>

TABLE 23
PEARSON r AND t-TEST RESULTS FOR HYPOTHESES 5 AND 6

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>df</th>
<th>Pearson r</th>
<th>t</th>
<th>CR Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 5</td>
<td>144</td>
<td>.4381b</td>
<td>5.856</td>
<td>1.98</td>
</tr>
<tr>
<td>Hypothesis 6</td>
<td>144</td>
<td>.4961c</td>
<td>6.960</td>
<td>1.98</td>
</tr>
</tbody>
</table>

aCritical value of t for significance at .05 level
bSignificant at .05 and .01 levels
cSignificant at .05 and .01 levels

Table 23 indicates a significant relationship between ACT composite score and ACT predicted percentile freshman class rank, respectively, and actual cumulative Autumn and Winter Quarter percentile freshman class rank for control group males undifferentiated by range of ACT composite score. Therefore, Null Hypothesis 5 and Null Hypothesis 6 were rejected.
The next pair of hypotheses examined for control group males is stated below:

\[ H_0 \]

5A: The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range I (1-14) control group males will not be significantly different from zero at the .05 level of significance.

\[ H_0 \]

6A: The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range I (1-14) control group males will not be significantly different from zero at the .05 level of significance.

To test the above hypotheses, a Pearson \( r \) was computed and tested for significance by a \( t \)-test.

A summary of means and standard deviations of prediction and criterion variables for Range I (1-14) control group males is included in Table 24. Table 25 summarizes the data obtained in testing Null Hypotheses 5A and 6A.

Table 25 shows that no significant relationship exists between ACT composite score and ACT predicted percentile freshman class rank, respectively, and actual cumulative Autumn and Winter Quarter percentile freshman class rank for control group males whose composite scores ranged between 1-14, inclusive. The rather high negative correlations are not that meaningful in that only nine students composed this
TABLE 24
MEANS AND SD OF THE FIVE VARIABLES FOR RANGE I (1-14) CONTROL GROUP MALES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACT Composite Score</td>
<td>11.000</td>
<td>2.828</td>
<td>10</td>
</tr>
<tr>
<td>2. ACT Predicted % Rank</td>
<td>2.300</td>
<td>1.494</td>
<td>10</td>
</tr>
<tr>
<td>3. Actual Autumn % Rank</td>
<td>36.300</td>
<td>23.429</td>
<td>10</td>
</tr>
<tr>
<td>4. Actual Winter % Rank</td>
<td>38.111</td>
<td>32.880</td>
<td>9</td>
</tr>
<tr>
<td>5. Actual Cumulative % Rank</td>
<td>32.222</td>
<td>25.099</td>
<td>9</td>
</tr>
</tbody>
</table>

TABLE 25
PEARSON r AND t-TEST RESULTS FOR HYPOTHESES 5A AND 6A

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>df</th>
<th>Pearson r</th>
<th>t</th>
<th>CR Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 5A</td>
<td>7</td>
<td>-.4167b</td>
<td>1.190</td>
<td>2.36</td>
</tr>
<tr>
<td>Hypothesis 6A</td>
<td>7</td>
<td>-.5606c</td>
<td>1.742</td>
<td>2.36</td>
</tr>
</tbody>
</table>

\[^a\text{Critical value of } t \text{ for significance at .05 level}\]
\[^b\text{Not significant}\]
\[^c\text{Not significant}\]

male range. As a better statistical measure of correlation with very small sample sizes, Kendall's Tau was computed for the students in this range. The results of this statistical test revealed a Tau of 9. Checked against a Table for Distribution of Kendall's Tau, this value indicated that at significance levels of less than
.242, one can not accept the hypothesis of association of correlated values.\footnote{I wish to thank Professor Jagbir Singh, Department of Statistics, Ohio State University, for introducing me to this lesser known correlation formula.} Therefore, even though the size of this sample is small, the results of two tests of correlation (one especially sensitive to small samples) prompt the acceptance of Null Hypothesis 5A and Null Hypothesis 6A.

The next pair of hypotheses examined for control group males is stated below:

\[ H_0^{5B}: \text{The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range II (15-19) control group males will not be significantly different from zero at the .05 level of significance.} \]

\[ H_0^{6B}: \text{The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range II (15-19) control group males will not be significantly different from zero at the .05 level of significance.} \]

To test the above hypotheses, a Pearson \( r \) was computed and tested for significance by a \( t \)-test.

A summary of means and standard deviations of prediction and criterion variables for Range II (15-19) control group males is included in Table 26. Table 27 summarizes the data obtained in testing Null Hypotheses 5B and 6B.
TABLE 26
MEANS AND SD OF THE FIVE VARIABLES FOR RANGE II
(15-19) CONTROL GROUP MALES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACT Composite Score</td>
<td>17.387</td>
<td>1.453</td>
<td>31</td>
</tr>
<tr>
<td>2. ACT Predicted % Rank</td>
<td>15.000</td>
<td>7.349</td>
<td>31</td>
</tr>
<tr>
<td>3. Actual Autumn % Rank</td>
<td>44.032</td>
<td>23.821</td>
<td>31</td>
</tr>
<tr>
<td>4. Actual Winter % Rank</td>
<td>29.643</td>
<td>23.547</td>
<td>28</td>
</tr>
<tr>
<td>5. Actual Cumulative % Rank</td>
<td>31.429</td>
<td>23.018</td>
<td>28</td>
</tr>
</tbody>
</table>

TABLE 27
PEARSON r AND t-TEST RESULTS
FOR HYPOTHESES 5B AND 6B

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>df</th>
<th>Pearson r</th>
<th>t</th>
<th>CR Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 5B</td>
<td>28</td>
<td>.0332</td>
<td>.153</td>
<td>2.06</td>
</tr>
<tr>
<td>Hypothesis 6B</td>
<td>28</td>
<td>.1922</td>
<td>.969</td>
<td>2.06</td>
</tr>
</tbody>
</table>

*aCritical value of t for significance at .05 level
bNot significant
cNot significant

Table 27 reflects the fact that no significant relationship is observed between ACT composite score and ACT predicted percentile freshman class rank, respectively, and actual cumulative Autumn and Winter Quarter percentile freshman class rank for those control group males whose ACT composite scores ranged from
15-19, inclusive. It is noteworthy that both prediction variables correlate at less than .20 with actual percentile rank, with the correlation between ACT composite score and actual cumulative percentile rank being .03. Therefore, Null Hypothesis 5B and Null Hypothesis 6B were accepted.

The next pair of null hypotheses examined for control group males is given below:

\[ H_0 \]
\[ 5C: \text{The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range III (20-24) control group males will not be significantly different from zero at the .05 level of significance.} \]

\[ H_0 \]
\[ 6C: \text{The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range III (20-24) control group males will not be significantly different from zero at the .05 level of significance.} \]

To test the above hypotheses, a Pearson r was computed and tested for significance by a t-test. A summary of means and standard deviations of prediction and criterion variables for Range III (20-24) control group males is included in Table 28. Table 29 summarizes the data obtained in testing Null Hypotheses 5C and 6C.
TABLE 28
MEANS AND SD OF THE FIVE VARIABLES FOR RANGE III (20-24) CONTROL GROUP MALES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACT Composite Score</td>
<td>22.519</td>
<td>1.488</td>
<td>52</td>
</tr>
<tr>
<td>2. ACT Predicted % Rank</td>
<td>47.500</td>
<td>17.040</td>
<td>52</td>
</tr>
<tr>
<td>3. Actual Autumn % Rank</td>
<td>53.442</td>
<td>27.372</td>
<td>52</td>
</tr>
<tr>
<td>4. Actual Winter % Rank</td>
<td>44.380</td>
<td>29.674</td>
<td>50</td>
</tr>
<tr>
<td>5. Actual Cumulative % Rank</td>
<td>47.300</td>
<td>28.658</td>
<td>50</td>
</tr>
</tbody>
</table>

TABLE 29
PEARSON r AND t-TEST RESULTS
FOR HYPOTHESES 5C AND 6C

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>df</th>
<th>Pearson r</th>
<th>t</th>
<th>CR Valuea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 5C</td>
<td>48</td>
<td>.0834b</td>
<td>.552</td>
<td>2.01</td>
</tr>
<tr>
<td>Hypothesis 6C</td>
<td>48</td>
<td>.1010c</td>
<td>.690</td>
<td>2.01</td>
</tr>
</tbody>
</table>

aCritical value of t for significance at .05 level
bNot significant
cNot significant

Table 29 shows that no significant relationship exists between ACT composite score and ACT predicted percentile rank, respectively, and actual cumulative Autumn and Winter Quarter percentile freshman class rank for control group males whose ACT composite score fell in a range of 20-24, inclusive. As with Range II (15-19) control group males, correlations
for both prediction variables are quite low—.08 and .10, respectively. Therefore, Null Hypothesis 5C and Null Hypothesis 6C were accepted.

The last pair of null hypotheses to be examined for control group males is stated below:

\[ H_0^{5D} \]: The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range IV (25-33) control group males will not be significantly different from zero at the .05 level of significance.

\[ H_0^{6D} \]: The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range IV (25-33) control group males will not be significantly different from zero at the .05 level of significance.

To test the above hypotheses, a Pearson \( r \) was computed and tested for significance by a \( t \)-test. A summary of means and standard deviations of variables for Range IV (25-33) control group males is provided in Table 30. Table 31 summarizes the data obtained in testing Null Hypotheses 5D and 6D.

Table 31 reveals no significant relationship (although closely approaching significance) between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for control group males whose ACT scores were in a range
### TABLE 30

MEANS AND SD OF THE FIVE VARIABLES FOR RANGE IV (25-33) CONTROL GROUP MALES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACT Composite Score 27-318</td>
<td>27.318</td>
<td>2.198</td>
<td>63</td>
</tr>
<tr>
<td>2. ACT Predicted % Rank 82.810</td>
<td>82.810</td>
<td>13.086</td>
<td>63</td>
</tr>
<tr>
<td>3. Actual Autumn % Rank 64.429</td>
<td>64.429</td>
<td>24.306</td>
<td>63</td>
</tr>
<tr>
<td>4. Actual Winter % Rank 66.034</td>
<td>66.034</td>
<td>28.169</td>
<td>59</td>
</tr>
<tr>
<td>5. Actual Cumulative % Rank 65.950</td>
<td>65.950</td>
<td>27.394</td>
<td>59</td>
</tr>
</tbody>
</table>

### TABLE 31

PEARSON r AND t-TEST RESULTS FOR HYPOTHESES 5D AND 6D

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>df</th>
<th>Pearson r</th>
<th>t</th>
<th>CR Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 5D</td>
<td>57</td>
<td>.2395 b</td>
<td>1.820</td>
<td>2.00</td>
</tr>
<tr>
<td>Hypothesis 6D</td>
<td>57</td>
<td>.3895 c</td>
<td>3.168</td>
<td>2.65</td>
</tr>
</tbody>
</table>

- **a**Critical value of t at .05 level of significance
- **b**Not significant
- **c**Significant at .05 and .01 levels

of 25-33, inclusive. However, a significant relationship is observed for the same students between the criterion variable mentioned above and ACT predicted percentile freshman class rank. Therefore, Null Hypothesis 5D was accepted but Null Hypothesis 6D was rejected.
The first pair of null hypotheses examined for control group females reads as follows:

\[ H_0^7 \] The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) control group females will not be significantly different from zero at the .05 level of significance.

\[ H_0^8 \] The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) control group females will not be significantly different from zero at the .05 level of significance.

To test the above hypotheses, a Pearson \( r \) was computed and tested for significance by a t-test. A summary of means and standard deviations of variables for all control group females, undifferentiated by range of ACT composite score, is included in Table 32. Table 33 summarizes data obtained in testing Null Hypotheses 7 and 8.

Table 33 indicates that a significant relationship exists between ACT composite score and ACT predicted percentile freshman class rank, respectively, and actual cumulative Autumn and Winter Quarter percentile freshman class rank for control group females undifferentiated by range of ACT composite score. Therefore, Null Hypothesis 7 and Null Hypothesis 8 were rejected.
### TABLE 32
MEANS AND SD OF THE FIVE VARIABLES FOR ALL (1-33) CONTROL GROUP FEMALES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACT Composite Score</td>
<td>21.371</td>
<td>5.120</td>
<td>205</td>
</tr>
<tr>
<td>2. ACT Predicted % Rank</td>
<td>49.220</td>
<td>30.705</td>
<td>205</td>
</tr>
<tr>
<td>3. Actual Autumn % Rank</td>
<td>60.503</td>
<td>25.734</td>
<td>205</td>
</tr>
<tr>
<td>4. Actual Winter % Rank</td>
<td>56.907</td>
<td>27.867</td>
<td>183</td>
</tr>
<tr>
<td>5. Actual Cumulative % Rank</td>
<td>58.060</td>
<td>26.780</td>
<td>183</td>
</tr>
</tbody>
</table>

### TABLE 33
PEARSON r AND t-TEST RESULTS FOR HYPOTHESES 7 AND 8

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>df</th>
<th>Pearson r</th>
<th>t</th>
<th>CR Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 7</td>
<td>183</td>
<td>.4533b</td>
<td>6.885</td>
<td>1.97</td>
</tr>
<tr>
<td>Hypothesis 8</td>
<td>183</td>
<td>.4678c</td>
<td>7.155</td>
<td>1.97</td>
</tr>
</tbody>
</table>

*aCritical value of t for significance at .05 level

*bSignificant at .05 and .01 levels

*cSignificant at .05 and .01 levels

The next pair of null hypotheses examined for control group females is stated below:

H

0

7A: The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range I (1-14) control group females will not be significantly different from zero at the .05 level of significance.
H. 0

8A: The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range I (1-14) control group females will not be significantly different from zero at the .05 level of significance.

To test the above hypotheses, a Pearson r was computed and tested for significance by a t-test. A summary of means and standard deviations of prediction and criterion variables for Range I (1-14) control group females is included in Table 34. Table 35 summarizes data obtained in testing Null Hypotheses 7A and 8A.

Table 35 shows that no significant relationship exists between ACT composite score and ACT predicted percentile freshman class rank, respectively, and actual cumulative Autumn and Winter Quarter percentile freshman class rank for control group females whose ACT composite score ranged between 1-14, inclusive. As with Range I (1-14) control group males, a negative correlation was obtained for Range I (1-14) females. While it seems clear that the negative value indicates lack of relationship between both prediction variables and the criterion variable even though the sample of 15 is relatively small, the small sample size
precludes assuming an inverse relationship between predicted and actual performance.\(^2\) On the basis of the data, Null Hypothesis 7A and Null Hypothesis 8A were accepted.

**TABLE 34**

MEANS AND SD OF THE FIVE VARIABLES FOR RANGE I (1-14) CONTROL GROUP FEMALES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACT Composite Score</td>
<td>10.895</td>
<td>2.904</td>
<td>19</td>
</tr>
<tr>
<td>2. ACT Predicted % Rank</td>
<td>2.895</td>
<td>2.378</td>
<td>19</td>
</tr>
<tr>
<td>3. Actual Autumn % Rank</td>
<td>39.056</td>
<td>23.814</td>
<td>18</td>
</tr>
<tr>
<td>4. Actual Winter % Rank</td>
<td>44.000</td>
<td>31.738</td>
<td>15</td>
</tr>
<tr>
<td>5. Actual Cumulative % Rank</td>
<td>38.067</td>
<td>21.479</td>
<td>15</td>
</tr>
</tbody>
</table>

**TABLE 35**

PEARSON \(r\) AND \(t\)-TEST RESULTS FOR HYPOTHESES 7A AND 8A

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>df</th>
<th>Pearson (r)</th>
<th>(t)</th>
<th>CR Value(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 7A</td>
<td>13</td>
<td>-.1688(^b)</td>
<td>.612</td>
<td>2.16</td>
</tr>
<tr>
<td>Hypothesis 8A</td>
<td>13</td>
<td>-.2905(^c)</td>
<td>1.080</td>
<td>2.16</td>
</tr>
</tbody>
</table>

\(^a\)Critical value of \(t\) for significance at .05 level

\(^b\)Not significant

\(^c\)Not significant

The researcher currently is investigating further the findings for the limited samples of control group males and females whose ACT composite score fell in range 1-14, inclusive, by conducting a similar study of approximately 500 students in this range.
The next pair of null hypotheses examined for control group females is given below:

\( H_0 \)

7B: The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range II (15-19) control group females will not be significantly different from zero at the .05 level of significance.

\( H_0 \)

8B: The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range II (15-19) control group females will not be significantly different from zero at the .05 level of significance.

To test the above hypotheses, a Pearson \( r \) was computed and tested for significance by a \( t \)-test. A summary of means and standard deviations of prediction and criterion variables for Range II (15-19) control group females is included in Table 36. Table 37 summarizes data obtained in testing Null Hypotheses 7B and 8B.

Table 37 indicates that no significant relationship exists between ACT composite score and ACT predicted percentile freshman class rank, respectively, and actual Autumn and Winter Quarter percentile freshman class rank for control group females whose ACT composite score ranged from 15-19, inclusive.
TABLE 36
MEANS AND SD OF THE FIVE VARIABLES FOR RANGE II (15-19) CONTROL GROUP FEMALES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACT Composite Score</td>
<td>17.480</td>
<td>1.282</td>
<td>50</td>
</tr>
<tr>
<td>2. ACT Predicted % Rank</td>
<td>19.940</td>
<td>9.204</td>
<td>50</td>
</tr>
<tr>
<td>3. Actual Autumn % Rank</td>
<td>48.646</td>
<td>23.985</td>
<td>48</td>
</tr>
<tr>
<td>4. Actual Winter % Rank</td>
<td>44.930</td>
<td>26.872</td>
<td>43</td>
</tr>
<tr>
<td>5. Actual Cumulative % Rank</td>
<td>44.721</td>
<td>26.148</td>
<td>43</td>
</tr>
</tbody>
</table>

TABLE 37
PEARSON r AND t-TEST RESULTS FOR HYPOTHESES 7B AND 8B

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>df</th>
<th>Pearson r</th>
<th>t</th>
<th>CR Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 7B</td>
<td>41</td>
<td>.2814 b</td>
<td>1.856</td>
<td>2.02</td>
</tr>
<tr>
<td>Hypothesis 8B</td>
<td>41</td>
<td>.0869 c</td>
<td>.512</td>
<td>2.02</td>
</tr>
</tbody>
</table>

aCritical value of t for significance at .05 level
bNot significant
cNot significant

It is especially interesting to observe that while both are non-significant, the correlation between ACT composite score alone and the criterion variable is higher than that between ACT predicted percentile class rank--based on a combination of ACT composite
score and high school grades—and the criterion variable. From the findings, Null Hypothesis 7B and Null Hypothesis 8B were accepted.

The next pair of null hypotheses examined for control group females reads as follows:

\[ H_0^{7C} \]: The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range III (20-24) control group females will not be significantly different from zero at the .05 level of significance.

\[ H_0^{8C} \]: The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range III (20-24) control group females will not be significantly different from zero at the .05 level of significance.

To test the above hypotheses, a Pearson r was computed and tested for significance by a t-test. A summary of means and standard deviations of prediction and criterion variables for Range III (20-24) control group females is included in Table 38. Table 39 summarizes data obtained in testing Null Hypotheses 7C and 8C.

From the data in Table 39, it is obvious that there is no significant relationship between ACT composite score and ACT predicted percentile freshman
TABLE 38
MEANS AND SD OF THE FIVE VARIABLES FOR RANGE III (20-24) CONTROL GROUP FEMALES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACT Composite Score</td>
<td>21.824</td>
<td>1.574</td>
<td>68</td>
</tr>
<tr>
<td>2. ACT Predicted % Rank</td>
<td>49.015</td>
<td>14.762</td>
<td>68</td>
</tr>
<tr>
<td>3. Actual Autumn % Rank</td>
<td>61.328</td>
<td>25.576</td>
<td>67</td>
</tr>
<tr>
<td>4. Actual Winter % Rank</td>
<td>53.984</td>
<td>25.972</td>
<td>61</td>
</tr>
<tr>
<td>5. Actual Cumulative % Rank</td>
<td>56.984</td>
<td>25.696</td>
<td>61</td>
</tr>
</tbody>
</table>

TABLE 39
PEARSON r AND t-TEST RESULTS FOR HYPOTHESES 7C AND 8C

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>df</th>
<th>Pearson r</th>
<th>t</th>
<th>CR Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 7C</td>
<td>59</td>
<td>.0485b</td>
<td>.385</td>
<td>2.00</td>
</tr>
<tr>
<td>Hypothesis 8C</td>
<td>59</td>
<td>.1403c</td>
<td>1.001</td>
<td>2.00</td>
</tr>
</tbody>
</table>

aCritical value of t for significance at .05 level
bNot significant
cNot significant
class rank, respectively, and actual cumulative Autumn and Winter Quarter percentile freshman class rank for control group females whose ACT composite scores fall in the range of 20-24, inclusive. Therefore, Null Hypothesis 7C and 8C were accepted.
The last pair of null hypotheses examined for control group females appears below:

\[ H_{07D} \]: The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range IV (25-33) control group females will not be significantly different from zero at the .05 level of significance.

\[ H_{08D} \]: The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for Range IV (25-33) control group females will not be significantly different from zero at the .05 level of significance.

To test the above hypotheses, a Pearson \( r \) was computed and tested for significance by a \( t \)-test. A summary of means and standard deviations of prediction and criterion variables for Range IV (25-33) control group females is provided in Table 40. Table 41 summarizes data obtained in testing Null Hypotheses 7D and 8D.

Table 41 reveals that no significant relationship exists between ACT composite score and ACT predicted percentile freshman class rank, respectively, and actual cumulative Autumn and Winter Quarter percentile freshman class rank for those control group females whose ACT composite scores range between 25-33, inclusive. Therefore, Null Hypothesis 7D and Null Hypothesis 8D were accepted.
TABLE 40

MEANS AND SD OF THE FIVE VARIABLES FOR RANGE IV (25-33) CONTROL GROUP FEMALES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACT Composite Score</td>
<td>26.706</td>
<td>1.536</td>
<td>68</td>
</tr>
<tr>
<td>2. ACT Predicted % Rank</td>
<td>83.897</td>
<td>10.974</td>
<td>68</td>
</tr>
<tr>
<td>3. Actual Autumn % Rank</td>
<td>73.735</td>
<td>19.555</td>
<td>68</td>
</tr>
<tr>
<td>4. Actual Winter % Rank</td>
<td>70.766</td>
<td>23.555</td>
<td>64</td>
</tr>
<tr>
<td>5. Actual Cumulative % Rank</td>
<td>72.734</td>
<td>21.167</td>
<td>64</td>
</tr>
</tbody>
</table>

TABLE 41

PEARSON r AND t-TEST RESULTS FOR HYPOTHESES 7D AND 8D

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>df</th>
<th>Pearson r</th>
<th>t</th>
<th>CR Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 7D</td>
<td>62</td>
<td>.1660b</td>
<td>1.340</td>
<td>2.00</td>
</tr>
<tr>
<td>Hypothesis 8D</td>
<td>62</td>
<td>.1663c</td>
<td>1.340</td>
<td>2.00</td>
</tr>
</tbody>
</table>

aCritical value of t for significance at .05 level
bNot significant
cNot significant

Summary of Within Group Study

To this point, Chapter IV has reported within-group findings for each of 20 sub-groups. Correlational study of two different prediction variables with actual college grade-point-average (expressed in percentile rank terms) for males and females in each sub-group
led to a disconcertingly large number of hypotheses. Let it be recorded that subjecting 40 hypotheses to statistical tests does not reflect the researcher's penchant for dazzling the reader with endless detail nor his desire to meet the all-too-often perceived image of a scholarly dissertation; that is, one measured in terms of how many tables it contains.

To the contrary, the author can not escape feeling somewhat apologetic for making the reader wade through many pages of specific data. However, a review of what the study sought to investigate will reveal that the number of specific hypotheses formulated and tested and for which results were reported was kept at an absolute minimum.

Another apprehension relates to the fact that the reader may have "missed the forest for the trees" in processing the many detailed results reported. Accordingly, a summary of within-group correlation data obtained for all subgroups of experimental and control group males and females is provided in Table 42.
### TABLE 42
SUMMARY OF WITHIN-GROUP CORRELATIONS FOR ALL GROUPS AND SUBGROUPS

<table>
<thead>
<tr>
<th>Act Composite Score Range</th>
<th>Pearson r for ACT Comp. Score and Criterion Variable&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Pearson r for ACT Pred. % Rank and Criterion Variable&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exp. Males</td>
<td>Control Males</td>
</tr>
<tr>
<td>1-33</td>
<td>.4493 [137] (R)</td>
<td>.4381 [144] (R)</td>
</tr>
<tr>
<td>15-19</td>
<td>.1145 [ 31] (A)</td>
<td>.0332 [ 26] (A)</td>
</tr>
<tr>
<td>20-24</td>
<td>.3906 [ 27] (R)</td>
<td>.0834 [ 48] (A)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Exp. Females</th>
<th>Control Females</th>
<th>Exp. Females</th>
<th>Control Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-33</td>
<td>.3282 [187] (R)</td>
<td>.4533 [181] (R)</td>
<td>.4170 [187] (R)</td>
<td>.4678 [181] (R)</td>
</tr>
<tr>
<td>15-19</td>
<td>.0973 [ 49] (A)</td>
<td>.2814 [ 41] (A)</td>
<td>.2880 [ 49] (A)</td>
<td>.0869 [ 41] (A)</td>
</tr>
<tr>
<td>20-24</td>
<td>.1415 [ 34] (A)</td>
<td>.0485 [ 59] (A)</td>
<td>.2499 [ 34] (A)</td>
<td>.1403 [ 59] (A)</td>
</tr>
</tbody>
</table>

Note: Smallcase a, b, c, and d indicate explanatory notes provided on the next page.
Correlation between ACT composite score and actual Autumn and Winter Quarter cumulative percentile class rank

Correlation between ACT predicted percentile rank and actual Autumn and Winter cumulative percentile class rank

Indicates degrees of freedom (N-2)

Indicates whether null hypothesis accepted or rejected

Looking at the columns in Table 42 that report correlations between Variables 1 and 5 and 2 and 5, respectively, for control group males and females, one observes, as with the experimental group, that correlations obtained in the four sub-ranges (1-14, 15-19, 20-24, and 25-33) uniformly are much lower than correlations obtained for the same students undifferentiated by ACT composite score range.

As was shown for experimental group males and females, Figures 3 and 4 help to clarify this unexpected finding for the control group. Since the explanations accompanying the histograms given for the experimental group are considered to be equally applicable to the control group, the frequency distributions plotting cumulative Autumn and Winter Quarter percentile rank scores within composite score ranges need little additional comment.
Fig. 3.—Histogram for control group males, plotting actual percentile rank in intervals by range of ACT composite score.

Fig. 4.—Histogram for control group females, plotting actual percentile rank in intervals by range of ACT composite score.
As shown earlier for experimental group males and females, Figures 3 and 4 indicate that the correlations for control group males and females are all quite low within ranges of ACT composite score because percentile rank values are distributed throughout the interval from 1-99 in each range. However, looking at each figure as a whole, we notice that the eye draws a crude form of a positive linear correlation. In each case, the frequency distributions give graphic support to what the mathematical data indicated.

In addition to the previously-summarized within-group correlation study, comparison of means and standard deviations of prediction and criterion variables yields important information. Table 43 summarizes the means and standard deviations of two prediction variables (ACT composite score and ACT predicted percentile rank) and the principal criterion variable (cumulative Autumn and Winter Quarter percentile freshman class rank). The reader should note that predicted and actual percentile rank values are translated into representative grade-point-averages which are shown in parentheses immediately after the percentile rank values.
### TABLE 43

**SUMMARY OF MEANS AND SD OF PREDICTION VARIABLES AND PRINCIPAL CRITERION VARIABLE FOR ALL SUBGROUPS**

<table>
<thead>
<tr>
<th>Subgroup</th>
<th>ACT Composite</th>
<th>ACT Pred. % Rank</th>
<th>Actual Earned % Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[No.] Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td><strong>Experimental Males</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All (1-33)</td>
<td>155</td>
<td>16.3</td>
<td>5.9</td>
</tr>
<tr>
<td>Range I (1-14)</td>
<td>69</td>
<td>11.1</td>
<td>2.6</td>
</tr>
<tr>
<td>Range II (15-19)</td>
<td>38</td>
<td>16.8</td>
<td>1.5</td>
</tr>
<tr>
<td>Range III (20-24)</td>
<td>32</td>
<td>21.8</td>
<td>1.4</td>
</tr>
<tr>
<td>Range IV (25-33)</td>
<td>16</td>
<td>26.9</td>
<td>1.6</td>
</tr>
<tr>
<td><strong>Experimental Females</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All (1-33)</td>
<td>204</td>
<td>15.5</td>
<td>5.5</td>
</tr>
<tr>
<td>Range I (1-14)</td>
<td>94</td>
<td>10.7</td>
<td>2.4</td>
</tr>
<tr>
<td>Range II (15-19)</td>
<td>58</td>
<td>16.7</td>
<td>1.4</td>
</tr>
<tr>
<td>Range III (20-24)</td>
<td>38</td>
<td>21.8</td>
<td>1.4</td>
</tr>
<tr>
<td>Range IV (25-33)</td>
<td>14</td>
<td>26.3</td>
<td>1.3</td>
</tr>
<tr>
<td><strong>Control Males</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All (1-33)</td>
<td>156</td>
<td>22.7</td>
<td>5.2</td>
</tr>
<tr>
<td>Range I (1-14)</td>
<td>10</td>
<td>11.0</td>
<td>2.8</td>
</tr>
<tr>
<td>Range II (15-19)</td>
<td>31</td>
<td>17.4</td>
<td>1.5</td>
</tr>
<tr>
<td>Range III (20-24)</td>
<td>52</td>
<td>22.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Range IV (25-33)</td>
<td>63</td>
<td>27.3</td>
<td>2.2</td>
</tr>
</tbody>
</table>
TABLE 43—Continued

<table>
<thead>
<tr>
<th>Subgroup</th>
<th>ACT Composite</th>
<th>ACT Pred. % Rank</th>
<th>Actual Earned % Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[No.] Mean</td>
<td>SD</td>
<td>Mean GPA SD</td>
</tr>
<tr>
<td>Control Females</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. All (1-33)</td>
<td>[205] 21.4</td>
<td>5.1</td>
<td>49.2 (2.43) 30.7</td>
</tr>
<tr>
<td>2. Range I (1-14)</td>
<td>[19] 10.9</td>
<td>2.9</td>
<td>2.9 (0.79) 2.4</td>
</tr>
<tr>
<td>3. Range II (15-19)</td>
<td>[50] 17.5</td>
<td>1.3</td>
<td>19.9 (1.79) 9.2</td>
</tr>
<tr>
<td>4. Range III (20-24)</td>
<td>[68] 21.8</td>
<td>1.6</td>
<td>49.0 (2.43) 14.8</td>
</tr>
<tr>
<td>5. Range IV (25-33)</td>
<td>[68] 26.7</td>
<td>1.5</td>
<td>83.9 (3.19) 11.0</td>
</tr>
</tbody>
</table>
Looking in the column that records mean ACT composite score for each subgroup, one observes that the mean scores for all minority (experimental) males [16.3] and females [15.5] are substantially lower than those for all non-minority (control) males [22.7] and females [21.4]. Similarly, taken as whole groups respectively, minority males achieved a lower mean actual percentile rank [40.3] and a lower mean actual grade-point-average [2.26] than non-minority males, [50.9] and [2.46]. The same pattern holds for minority females' mean actual percentile rank [42.3] and mean actual grade-point-average [2.30] when they are compared to non-minority females, [58.1] and 2.61].

However, comparing minority and non-minority males and females at similar ACT composite score levels, one sees that mean actual percentile ranks and mean grade-point-averages of minority and non-minority males and minority and non-minority females are quite similar in most cases. For example, minority males with composite scores in the lowest range (Range I, [1-14]) earned a mean percentile rank and grade-point-average of 30.2 and 2.06, respectively. Non-minority males in this lowest composite score range obtained a mean percentile rank of 32.2 and a mean grade-point-average of 2.09. Similar comparisons
between minority and non-minority males and between minority and non-minority females demonstrate that, in general, little difference exists in actual academic performance for minority and non-minority students who have similar composite scores. Several exceptions can be observed, though. Range IV minority males earned a mean percentile rank [74.3] that was almost nine per cent higher than that of Range IV non-minority males. Range II minority males earned better grades than Range II non-minority males. Range II non-minority females achieved substantially better grades than Range II minority females. Also, it is obvious from Table 43 that minority and non-minority females generally earn slightly higher grades than their male counterparts having similar test scores.

Most important, Table 43 clearly shows that both minority and non-minority students in the two lower ranges of composite scores (Ranges I and II) earn much better grades than predicted. For instance, Range I minority males and females are predicted to fall in the bottom 10 per cent of the freshman class while they actually ranked in the 30th and 36th percentiles, respectively. In terms of grade-point-averages, the test predicted a mean grade-point-average for minority males of 1.27; for minority
females, 1.36. These predictions are far below the actual cumulative Autumn and Winter Quarter mean grade-point-averages of 2.06 for minority males and 2.18 for minority females. Put another way, minority males and females with a composite score of 14 and under were predicted to achieve, on the average, in the low "D" range. Since most institutions require a 2.00 or "C" average to remain in good standing, the predictions for Range I minority males and females would imply that these students could not succeed in college. The fact that the mean actual performance of Range I minority males and females is above the 2.00 or "C" level indicates how erroneous the prediction was for these students.

This phenomenon of underprediction was even more marked for non-minority students. From Table 43, we see that non-minority males and females with composite scores of 14 or below were predicted to earn no better than .77 and .79 mean grade-point-averages, respectively. As a group, Range I males and females each were expected to be in the lowest three per cent of their freshman class. On the basis of these predictions, these particular students would not, on the average, be expected to succeed in college. In contrast to their predicted performance,
Range I non-minority males and females obtained mean actual percentile ranks of 32 and 38 per cent. Translated to mean grade-point-average; non-minority males earned a 2.09 mean average; non-minority females, a 2.21 mean average. In short, after two quarters of college work, these students, despite predictions to the contrary, were earning a mean grade-point-average above the minimum required to remain in good academic standing.

With exception of Range IV minority males, those with an ACT composite score in the highest range, 25-33, actually performed significantly under predicted levels. A glance at Table 43 will confirm that while low scorers' performance was substantially underpredicted, high scorers' performance was definitely overpredicted.

Investigation of Statistical Differences of Between-Group Correlations

The preceding pages analyzed within-group correlations and compared means and standard deviations for 20 subgroups between two American College Test (ACT) prediction variables and the criterion variable of college grade-point-average expressed in terms of percentile class rank. Also of interest in this study was the between-group variance of the within-group correlations obtained for experimental and control group males and females undifferentiated
by range of ACT composite score (whole-group correlations). Therefore, the differences in within-group correlation coefficients were tested for statistical significance between the following groups:

1. Experimental group males and females
2. Control group males and females
3. Experimental group males and control group males
4. Experimental group females and control group females

These between-group comparisons were stated in Chapter I in terms of the following null hypotheses:

\[ H_0^9: \text{The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) experimental group males will not be significantly different from the same correlation obtained for all (1-33) experimental group females.} \]

\[ H_0^{10}: \text{The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) experimental group males will not be significantly different from the same correlation obtained for all (1-33) experimental group females.} \]

\[ H_0^{11}: \text{The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) control group males will not be significantly different from the same correlation obtained for all (1-33) control group females.} \]
12: The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) control group males will not be significantly different from the same correlation obtained for all (1-33) control group females.

13: The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) experimental group males will not be significantly different from the same correlation obtained for all (1-33) control group males.

14: The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) experimental group males will not be significantly different from the same correlation obtained for all (1-33) control group males.

15: The correlation between ACT composite score and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) experimental group females will not be significantly different from the same correlation obtained for all (1-33) control group females.
16: The correlation between ACT predicted percentile freshman class rank and actual cumulative Autumn and Winter Quarter percentile freshman class rank for all (1-33) experimental group females will not be significantly different from the same correlation obtained for control group females.

Testing for the significance of difference of correlation coefficients between the groups involved converting the Pearson $r$ computed for each group being compared into a Fisher's $z$ coefficient. Significance of difference, then, was determined by employing the following formula:

$$SE = \frac{Z_1 - Z_2}{\sqrt{\frac{1}{N_1 - 3} + \frac{1}{N_2 - 3}}}$$

The obtained value was compared to the critical value required to establish significance at the .05 level under the normal probability curve. Since this critical value is 1.96, any value obtained from the formula equal to or higher than 1.96 shows significant difference in correlation coefficients between the groups being compared. If the value obtained is lower than 1.96, it is concluded that no significant difference exists between the correlation coefficients of the groups being compared.
As Table 44 illustrates, each of the null hypotheses concerning between-group difference must be accepted since no significant difference was found in correlation coefficients between groups in any of the comparisons.

**TABLE 44**

**SUMMARY OF z-TESTS OF BETWEEN-GROUP DIFFERENCE**

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>z</th>
<th>CR Value&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 9</td>
<td>1.27</td>
<td>1.96</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Hypothesis 10</td>
<td>1.18</td>
<td>1.96</td>
<td>&quot;</td>
</tr>
<tr>
<td>Hypothesis 11</td>
<td>.09</td>
<td>1.96</td>
<td>&quot;</td>
</tr>
<tr>
<td>Hypothesis 12</td>
<td>.36</td>
<td>1.96</td>
<td>&quot;</td>
</tr>
<tr>
<td>Hypothesis 13</td>
<td>.08</td>
<td>1.96</td>
<td>&quot;</td>
</tr>
<tr>
<td>Hypothesis 14</td>
<td>.17</td>
<td>1.96</td>
<td>&quot;</td>
</tr>
<tr>
<td>Hypothesis 15</td>
<td>1.40</td>
<td>1.96</td>
<td>&quot;</td>
</tr>
<tr>
<td>Hypothesis 16</td>
<td>.60</td>
<td>1.96</td>
<td>&quot;</td>
</tr>
</tbody>
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<sup>a</sup>Critical value for significance at .05 level

**Summary of Results**

Chapter IV records the findings in testing 40 hypotheses concerning within-group Pearson product-moment correlation coefficients (r) computed for minority (experimental) and non-minority (control) group males and females (as four whole groups, respectively) and for four subgroups of each whole group. Correlations obtained reflected the association of 1) ACT composite score with actual percentile freshman
class rank and 2) ACT predicted percentile freshman class rank with actual percentile freshman class rank.

Pearson r's of 1 and 2 above were moderately good for minority and non-minority group males and females undifferentiated by ACT composite score. For each whole group, the two American College Test (ACT) prediction variables (composite score and predicted percentile class rank) correlated significantly with actual cumulative Autumn and Winter Quarter percentile rank. However, when each whole group was divided into four subgroups by range of ACT composite score, very different results were recorded. A significant relationship between ACT composite score and actual percentile freshman class rank was observed only for those minority males whose ACT scores ranged from 20-24, inclusive.

Similarly, a significant relationship between ACT predicted percentile freshman class rank and actual cumulative percentile freshman class rank was observed for the following cases only:

1. Minority males with ACT composite scores between 20-24, inclusive
2. Minority females with ACT composite scores between 1-19, inclusive
3. Non-minority males with ACT composite scores between 25-33, inclusive
Comparison of means and standard deviations of the two prediction variables and the actual cumulative percentile rank (criterion variable) demonstrated unequivocally that correlational analysis alone does not answer whether or not certain types of test predictions are valid. Analysis of means of the prediction and criterion variables revealed the following:

1. The mean ACT composite scores of minority males and females were substantially lower than the mean composite scores of non-minority males and females. A similar pattern resulted in the mean scores on the criterion variable.

2. However, in general, minority males with composite scores similar to non-minority males achieved at about the same level after two quarters of college work. This was also true for minority females when compared with non-minority females.

3. A most important finding was that the performance of minority and non-minority students with a composite score of 14 or below was greatly underpredicted while those with composite scores of 25 or above were significantly overpredicted with the exception of minority males. In every case, students scoring in the lowest range of composite scores earned a mean grade-point-average after two quarters of above a 2.00 or "C" average.

Finally, correlations between the two prediction variables and the criterion variable for each whole group--minority (experimental) males, females; non-minority (control) males, females--were compared between the groups. In each between-group comparison of correlation coefficients, no significant difference was found.
CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

This study investigated the predictive validity of the American College Test (ACT) for samples of 359 minority group students and 361 non-minority group students who enrolled as freshmen at Ohio State University Autumn Quarter, 1971.

"Predictive validity" was tested according to four distinct types of predictions inherent in the ACT (and other standardized achievement instruments) or implied in the interpretations of test results to students desiring to attend college. The four different types of predictions examined for validity were as follows:

1. In predicting group performance, test scores and predictions forecast that high scorers, as a group, will achieve better grades than low scorers, taken as a group.

2. In predicting individual performance, test scores and predictions forecast that an individual with high scores will achieve better grades than an individual with low scores.
3. In predicting group performance, test scores and predictions forecast that low scorers, as a group, have little chance of fulfilling a given institution's minimum academic requirements.

4. In predicting individual performance, test scores and predictions forecast that an individual low scorer has little chance of fulfilling a given institution's minimum requirements.

For discussion purposes, these different types of predictions will be referred to as Type 1 Prediction, Type 2 Prediction, Type 3 Prediction and Type 4 Prediction.

The validity of Type 1 Prediction and Type 2 Prediction was examined by correlational analysis assessing the relationship between ACT composite score and ACT predicted percentile freshman class rank (the two prediction variables), respectively, and actual cumulative percentile freshman class rank for Autumn and Winter Quarters (criterion variable). First, degree of association of each prediction variable with the criterion variable was determined for minority and non-minority males and females over the entire range of ACT composite scores (1-36). Next, the correlation between prediction variables and criterion variables was computed for students in these four sub-groups grouped as follows:

1. Those whose composite scores ranged from 1-14, inclusive.

2. Those whose composite scores ranged from 15-19, inclusive.
3. Those whose composite scores ranged from 20-24, inclusive.

4. Those whose composite scores ranged from 25-33, inclusive.

The validity of Type 3 Prediction and Type 4 Prediction was investigated by comparing mean predicted percentile class rank and grade-point-average with actual earned percentile class rank and grade-point-average in each of the sub-ranges of ACT composite scores outlined above.

Conclusions

For the students in this study, the data showed that in the case of Type 1 Prediction, the ACT was as valid for minority students as for non-minority students. The findings revealed for minority and non-minority students undifferentiated by range of ACT composite score that as ACT composite score and ACT predicted percentile rank increased, respectively, actual percentile freshman class rank increased. That is, the Pearson product-moment correlation coefficients obtained for minority and non-minority males and females expressed a positive relationship at the .05 level of significance between both prediction variables and the performance criterion variable.

It would be inaccurate to conclude from these whole-group results that the ACT is a good predictor
of minority and non-minority student college performance. It is precisely this type of generalized conclusion drawn from similar data in previous studies that has helped to perpetuate the controversy over the use of test results. The whole-group correlations demonstrate only that one can use the test results with equal confidence for minority and non-minority students to select a group of students whose mean college grade-point-average would be substantially higher that that of a group of students chosen randomly. For example, if one selected only those who scored above 20 on the ACT composite score range, he could expect the overall profile of college grades to be higher than the profile of those we selected randomly. Similarly, one can safely predict that students whose ACT composite scores range from 25-33 will earn significantly higher grades, as a group, that those who score between 1-14.

The above types of predictions simulate those for which standardized achievement tests originally were developed. When achievement tests first were constructed, colleges and universities with little fear of challenge could say through their admission criteria that they wanted only the best students for their schools. Clearly, "best student" was defined, as today, as he who got the best grades. With the absence of other methods to determine "best
student," these institutions found that they could approximate this goal by establishing certain guidelines of rejection and acceptance similar to the example in the previous paragraph. Investigation showed that the chances of selecting the "best group of students" would be increased if the guidelines reflected high school grades as well as standardized achievement test scores.

Gradually, however, several social and economic pressures, in the past 20-25 years especially, made it increasingly difficult for colleges and universities to justify accepting only the "best students." Chiefly, federal and state assistance for private and public institutions has escalated, accompanied by increased demand for admitting all students with the potential to succeed in college rather than only those who will be most successful.

In responding to this mandate, colleges and universities took the same test results and simply altered the interpretation. Instead of saying, "Your test results do not fit our guidelines for selecting the 'best student,'" many institutions began saying, "From your test results, it seems unlikely that you will succeed at our institution." This is the general interpretation in vogue today. Unfortunately, many do not understand that this is
far more than a change in semantics. Worse still, many know it is far more than a change in semantics and yet pretend otherwise.

This change in interpretation raised the need for assessing the validity of Type 3 Prediction. That is, could one predict that low scorers, as a group, would show a low probability of meeting minimum grade-point-average requirements? One way to examine this question was to see if the average predicted performance of low scorers was similar to their actual performance. Not only did the findings provide a negative answer, results showed that minority and non-minority males and females, respectively, scoring 14 or below on the composite score range earned a mean grade-point-average above a 2.00 (or "C") average. Ohio State University defines academic "good standing" as obtaining a cumulative grade-point-average of 2.00 or higher. Therefore, the data from this study clearly shows that Type 3 Predictions for those studied were in serious error. While those students with composite scores of 14 or below were predicted to earn from .77 to .136 grade-point-averages, they actually earned averages ranging from a low of 2.06 for minority males to a high of 2.21 for non-minority females. Since Ohio State University is representative of many public-supported universities
across the nation, these findings have major implications for admission policies at other public-supported institutions as well as for admission policies at Ohio State University.

Regarding Type 2 Prediction and Type 4 Prediction, the data gave no support for placing confidence in predicting a given individual's performance. The histograms plotting earned percentile class rank by ranges of ACT composite score revealed that several individuals in the lowest range (1-14) performed extremely well and that several individuals in the higher ranges (20-24, 25-33) performed poorly. Correlational study showed that ACT predictions accounted for no more than 20-25 percent of the variance in actual performance. These findings are in keeping with the conclusions of Garrett (1966) who stated the following:

. . . unless r is large (larger than we often get in practice) the regression equation may offer little aid in enabling us to forecast accurately what a person can be expected to do . . . . Correlation makes a better showing in forecasting the probable performance of groups than in predicting the likely achievement of a selected individual (Italics mine).

In addition to examining the validity of four types of ACT predictions for minority and non-minority students undifferentiated by range of composite score, this study sought to answer whether or not the association between predictor and criterion
variables over the entire range of composite scores would be similarly reflected in specified sub-ranges of composite scores. In other words, could one predict from test results that students with ACT composite scores of 6 would achieve significantly lower grades than students scoring 14? Are students with composite scores of 25 going to earn significantly lower grades than students scoring 29? The correlation study by ranges of ACT composite score indicated by the uniform low correlations in the truncated ranges that test results provide little or no assistance in predicting the differences in academic performance of students in restricted segments of the composite score range.

Implications

Implications for College Admission Personnel

Depending on one's educational philosophy and that of the institution he represents, he can draw two very different sets of conclusions from this study. If, for example, a college admission officer believes his institution should serve only the "best" students and he seeks to compose the Freshman Class accordingly, the following interpretations seem warranted:

1. The ACT predicts equally well for minority students as for predominately middle-class white students in group prediction terms that as test score increases, actual performance, measured by grades, increases.
2. To increase the chances of getting the "best" group of students, one need only reject those whose ACT composite scores fall below an arbitrarily-defined cut-off point and who performed at a specified minimal level in high school.

3. He should expect to reject most minority student applicants since the mean ACT composite score for a given minority student population from which he recruits probably will be below his cut-off score.

4. If he makes an exception in his selection formula for minority students, he should not do so with the rationale that the test is not as predictive for these students, as a group, as for most students since he has asserted already the converse.

5. Certainly for minority and majority culture students, he can not predict with any confidence who can and can not do satisfactory college work. However, this is not the real point of his concern since his goal is to recruit the student who has the capacity to do superior work.

6. Therefore, if he is to continue to recruit significant numbers of minority students without a change in educational philosophy and, concomitantly, an alteration in his admission selection criteria, he must conclude that his institution will rely, necessarily, on "special" recruitment programs. Similarly, on the basis of the institution's stated goals, those who were granted admission by special exception will come to be viewed and view themselves as anomalies within the institution.

7. As he rejects routinely students who score below a certain score, he is obliged to stress to each that he can not accurately predict that person's passing or failing at his institution. On the other hand, he is rejecting him on the basis that if he rejects everyone with a similar score, he decreases the institution's
risk of spending money on a group of students that can be predicted to do less well than another (higher scoring) group.

8. If that same student asks the admissions officer why he admitted a minority friend with a similar score and high school record, the admission officer can not explain that, as a group (the basis on which the questioning student was rejected), the scores are not as valid for minorities as they are for the inquisitive student's group. He must explain his action in some other way just as he would if the inquisitive student's minority friend asked the same question in reverse: "Why was I accepted when my friend wasn't?"

If, on the other hand, a college admission officer believed his institution sought to compose itself of a cross-section of the total prospective student body, according to selecting those students with a reasonable chance to complete degree requirements satisfactorily, he could deduce the following conclusions from this study:

1. As a group or for subgroups defined by ACT composite score, he can conclude that those with higher scores will achieve, as a group, higher grades than a group with low scores.

2. However, he can not conclude that minority or non-minority students scoring very low can be expected in most cases to fail.

3. Therefore, if he remained committed to his original philosophy, he would not deny admission to any student on the basis that he could predict whether or not that student will fail. Similarly, he would not deny admission routinely to those scoring very low with the rationale that most of the students in this group will fail anyway.
Implications for Special Recruitment Programs

If one is recruiting minority students (or any group designated "special") he needs to consider the implications of his policies in view of the previous discussion. For example, in establishing a special recruitment program at a highly selective institution, the recruitment coordinator owes to his students a thorough analysis of the consequences of introducing to this type of campus by special exception a group of students whose mean predicted performance as a group is substantially lower than that of all other students. This study's findings predict difficulty for many of these students in such a competitively-stacked population that they may not encounter in an institution reflecting a more normal distribution of academic preparedness. More significant, it was suggested earlier that in such institutions, those students admitted by special exception will be unable to escape classification as an anomaly within a student population homogeneously-composed by design according to those with the very best credentials.

For those administering special recruitment programs at the second type of institution (minimally-selective or open admission), this study would suggest that a school professing open admission should not
deny admission on the basis of traditional selection criteria in the first place. Perhaps the special recruitment officer's major role in this case is to change institutional policy rather than perpetuate "exception" or "special" status. As a result, he then could use his energy to identify minority students already interested in attending college and endeavor to increase the motivation of others in a similar direction.

**Implications for High School Counselors**

Most high school counselors' understanding of the meaning of statistical prediction is woefully inadequate. As a result of this naivete, high school counselors (principals and teachers also) regularly render inappropriate interpretation of achievement test results in individual and group academic advising. This is not an indictment of high school counselors. To the contrary, counselor education faculty bear the responsibility for providing the background necessary for prospective counselors to give their counselees accurate interpretations of achievement test results. Too often, counselors simply are given publications distributed by the various testing services upon which to formulate their philosophy and practice.
It is not enough to say that one is for or against testing. He must examine his position carefully for despite his orientation, the use of achievement tests marks a crucial determinant in being granted or denied access to college admission. Many of those who scoff at the use of tests increase rather than alleviate the problems in test abuse. For many, scoffing to the point of unbridled cynicism requires so much energy that little energy is left to explore ways to combat the abuses they decry.

Implications for Financial Aid Administrators

It is not uncommon practice at "open admission" institutions for financial aid officers to deny financial assistance to admitted students who have low test scores. On the basis of our group predictive validity findings, this seems quite fitting for those scholarship funds reserved for the more academically-able students. However, many financial aids officers employ the same traditional criteria used in the admission process for selecting recipients of federal student aid funds. A common method employed is to compute a predicted grade-point-average from high school grades and achievement test results. If the student's predicted grade-point-average is below the minimum actual average required for continued
enrollment (i.e., a 2.00 grade-point-average), he may be sent a routine letter denying any assistance including aid from the federal programs. Admittedly, this is a neat, efficient way of processing large numbers of applications. Such procedure prompts considerable objection, though, since the federal aid guidelines expressly state that recipients should be selected on the basis of financial need rather than according to his predicted scholarship.

Since most federal financial aid funds stipulate initial granting and renewal of funds to students meeting minimum requirements for continued enrollment, no applicant should be denied available funds on the basis of predicted performance unless one can confidently predict who will and will not meet minimum college academic requirements. For the students in this study, analysis of data revealed that, on the average, even those scoring 14 or below on the ACT composite score range obtained grades above the minimum required for "academic good standing." Accordingly, it is highly questionable that traditional predictive indices of academic performance (test scores and high school grades) be used in considering any student for federal direct student financial aid. This has special relevance for minority students, many of whom under
present policies receive aid only if participants in special recruitment programs where usual prediction indices are not employed. For the group of minority students in this study, for example, the mean predicted grade-point-average was 1.97 (males) and 1.96 (females), meaning that most of the students would have been denied aid if they had not been in a special program and if the financial aid officer had given assistance only to those with predicted grade-point-averages of 2.00 or higher.

The data from this study also bears on practices in granting scholarship monies on the basis of academic excellence. Students with ACT composite scores of 25 can not be predicted to achieve significantly less than students with composite scores of 29. Therefore, rather than awarding scholarships in descending order of test score or predicted grade-point-average, the financial aid officer would be on much firmer ground if he determined the minimum academic requirements for the scholarship and then chose randomly from those students with test scores or predicted averages above an established cut-off point.

Implications for Further Research

1. The validity of achievement test predictions deserves thorough study for
large samples of minority and non-minority students who fall in the lowest range of achievement test scores.

2. High school counselor's knowledge of prediction formulas and accuracy in interpreting test results to counselees should be assessed.

3. A need exists to determine the expertise with which college admission personnel establish their respective admission criteria, including assessing their grasp of statistical prediction underlying so many present selection formulas.

4. A survey should be conducted to ascertain the criteria employed by aid officers in allocating federal direct student aid to applicants.

The findings of this study raise serious questions about aspects of the widespread use of achievement test results for both minority and non-minority students. Clearly, the conclusions drawn have not implied that tests are worthless. However, data has been cited that substantiates an assumption not made in much of the testing controversy which is essential to its resolution; namely, that in the validation of the predictive efficiency of achievement tests, one must always think in terms of the several distinct types of predictions inherent in the tests themselves and/or implied in the interpretations of test results. It is extremely easy to confuse the evidence even when this fact is remembered. When forgotten one
risks, at the least, establishing practical applications of test results on slim evidence. At the worst, one risks creating a Frankensteinian mutate that, instead of enhancing educational effectiveness, constitutes a prediction system that is an unmitigated evil.
APPENDIX A

SAMPLE FORM OF AMERICAN COLLEGE TESTING PROGRAM'S STUDENT PROFILE REPORT
### Sample Form, ACT Student Profile Report

**Student:** Tracy Arthur C

**Address:** 7826 W 46TH ST, WHEAT RIDGE CO 80033

**Social Security Number:** 392-11-1471

**Date of Birth:** 06/22/53

**School:** HHCAT RIDGE SR HS, 9505 W 320 AVE, WHEAT RIDGE, COLORADO 80033

**Grade:** 10

**SAT Score:** 1000

**Major:** POL SCI/GOVCRN/PUB ADM

**Degree:** LAW DEGREE

**Foreign Services:** YES

**College Housing:** NO

**Subjects:**

- **English:**
  - Freshman English: 70/1 89
  - College Algebra: 70/1 83
  - History: 70/1 83
  - Chemistry: 70/1 83
  - Psychology: 69/0 83

- **Mathematics:**
  - Freshman English: 70/1 89

- **Science:**
  - Freshman English: 70/1 89

- **Other:**
  - Freshman English: 70/1 89

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Student Profile Report 1971-72

American College Testing Program P.O. Box 142, KODA, IOWA 52246 Phone: 319-335-6470
APPENDIX B

SAMPLE CARD OF AMERICAN COLLEGE TESTING PROGRAM'S TEST AND COURSE PLACEMENT CARD
### SAMPLE, TEST AND COURSE PLACEMENT CARD

<table>
<thead>
<tr>
<th>Test And Course Placement Record Card</th>
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<tbody>
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<td><strong>Test</strong></td>
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<tr>
<td>German</td>
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The Ohio State University
APPENDIX C

SUMMARY OF INFORMATION ON COMPUTER

PUNCH CARDS FOR EXPERIMENTAL GROUP STUDENTS
SUMMARY OF INFORMATION ON COMPUTER PUNCH CARDS FOR EXPERIMENTAL GROUP STUDENTS

I. Card 1
A. Social Security number
B. Name
C. Complete address

II. Card 2
A. Date of Birth
B. High school grades
C. High school average
D. High school attended
E. ACT standard scores
F. ACT composite score
G. Test date
H. College or university preference
I. Sex code
J. Prospective educational major
K. First vocational choice
L. Second vocation choice

III. Card 3
A. Extracurricular activities in high school
   1. Athletics
   2. Work experience
   3. Practical skills
   4. Leadership
   5. Music

IV. Card 4
A. Extracurricular activities in high school (cont.)
   1. Speech
   2. Art
   3. Writing

B. Educational Needs
   1. Need for help in reading
   2. Need for help in study skills
   3. Need for help in mathematics
   4. Need for help in writing
   5. Need for help in choosing a major
C. Standard score percentiles (local norms)

D. Predicted percentile class rank
   1. Male, Columbus Campus
   2. Female, Columbus Campus

V. Card 5

A. Predicted percentile class rank (cont.)
   1. Male, branch campus
   2. Female, branch campus
   3. Summary analysis

B. Probability of a "C" or higher
   1. Male, Columbus campus
   2. Female, Columbus campus
   3. Male, branch campus
   4. Female, branch campus
   5. Summary analysis

C. Predicted overall grade-point-average
   1. Male, Columbus campus
   2. Female, Columbus campus
   3. Male, branch campus
   4. Female, branch campus
   5. Summary analysis

D. Standard score percentiles (national norms)

VI. Card 6

A. Financial aid recipient or not
B. Nelson-Denny Test of Reading results
C. Autumn Quarter GPA
D. Autumn Quarter percentile rank
E. Math 101 grades
F. English 100 grades
G. Psychology 100 grades
H. Winter Quarter GPA
I. Winter Quarter percentile rank
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