PARTICIPATION IN A STUDY-ABROAD PROGRAM AND PERSISTENCE AT A
LIBERAL ARTS UNIVERSITY

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Dissertation Prepared for the Degree of
DOCTOR OF PHILOSOPHY

UNIVERSITY OF NORTH TEXAS

December 2003

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Young, Denise York. Participation in a study-abroad program and persistence at a liberal arts university. Doctor of Philosophy (Higher Education), December 2003, 81 pp., 11 tables, references, 60 titles.

This study used a quasi-experimental design with 1,237 students to investigate the association between participation in a study-abroad program and persistence at a liberal arts university. The theoretical basis for the study was Tinto’s Theory of Individual Departure.

The independent variable of interest, also known as the treatment, was participation in the University of Dallas Rome Program during the sophomore year. The control group consisted of students who were qualified to participate in the Rome Program, but chose not to do so. The dependent variable was the number of fall and spring semesters enrolled as an undergraduate at the University of Dallas post-treatment through spring 2003.

Nine variables that measured background characteristics, academic integration, and social integration explained 3.8% of the variation in number of semesters enrolled post-treatment. Participation in the Rome Program explained an additional 4.2%. In all of the statistical measures examined in this study (incremental increase in $R^2$, $b$ weights, adjusted $\beta$ weights, and structure coefficients), there was evidence of an important positive association between participation in the Rome Program and persistence. Based on the $b$ weight in the regression equation, holding all other variables constant, students who participated in the Rome Program persisted on average .83 semesters longer post-treatment at the University of Dallas than those who did not go to Rome.
Of the 1,007 students in this study who went to Rome, 96% were enrolled at the University of Dallas one semester after Rome participation and 91% were still enrolled after two semesters. This compared to 80% and 72%, respectively, for the 230 students in the control group. Of the 674 students in the study who went to Rome and had the opportunity to graduate within 4 years, 79% graduated within 4 years. This compared to 51% for the 123 students in the control group.

Persistence during and after the sophomore year was not associated to the same extent with pre-entry background characteristics, academic integration, and social integration as was persistence from freshman to sophomore year.
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ACKNOWLEDGMENTS

There are many people who contributed to the completion of this dissertation. Appreciation is expressed to Dr. Barry Lumsden, major professor; Dr. Robin Henson, minor professor; and Dr. Ron Newsom, committee member, for their helpful criticisms and suggestions. Special thanks is extended to Dr. Tom Lindsay, Provost and Vice President of Academic Affairs at the University of Dallas, for granting permission to use the data in this study and for allowing flexibility in my work schedule during this process. Acknowledgement is given to fellow doctoral students for their support and interest.

Gratitude is extended to my husband, Roger, for his patience and encouragement throughout my doctoral program and to my parents for instilling in me at an early age an appreciation for the value of education.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGMENTS</td>
<td>iii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>vi</td>
</tr>
<tr>
<td>1. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>- Statement of the Problem</td>
<td></td>
</tr>
<tr>
<td>- Purpose of the Study</td>
<td></td>
</tr>
<tr>
<td>- Research Questions</td>
<td></td>
</tr>
<tr>
<td>- Significance of the Study</td>
<td></td>
</tr>
<tr>
<td>- Delimitations</td>
<td></td>
</tr>
<tr>
<td>2. REVIEW OF RELATED LITERATURE</td>
<td>5</td>
</tr>
<tr>
<td>- Summary of Research on Persistence Prior to 1962</td>
<td></td>
</tr>
<tr>
<td>- Tinto’s Model</td>
<td></td>
</tr>
<tr>
<td>- Initial Validation Studies of Tinto’s Model</td>
<td></td>
</tr>
<tr>
<td>- Other Validation Studies Based on Tinto’s Model</td>
<td></td>
</tr>
<tr>
<td>- Association Between Background Characteristics and Persistence</td>
<td></td>
</tr>
<tr>
<td>- The Construct of Academic Integration</td>
<td></td>
</tr>
<tr>
<td>- The Construct of Social Integration</td>
<td></td>
</tr>
<tr>
<td>- Study-Abroad Programs</td>
<td></td>
</tr>
<tr>
<td>- Relationship Between Participation in Study-Abroad Programs and Persistence</td>
<td></td>
</tr>
<tr>
<td>3. METHODOLOGY</td>
<td>30</td>
</tr>
<tr>
<td>- Data Elements</td>
<td></td>
</tr>
<tr>
<td>- Data Extraction and Preparation</td>
<td></td>
</tr>
<tr>
<td>- Data Analysis—Research Question 1</td>
<td></td>
</tr>
<tr>
<td>- Sequential Regression Analysis</td>
<td></td>
</tr>
<tr>
<td>- Unstandardized Regression Coefficient for Treatment</td>
<td></td>
</tr>
<tr>
<td>- Standardized Regression Coefficients</td>
<td></td>
</tr>
<tr>
<td>- Structure Coefficients</td>
<td></td>
</tr>
<tr>
<td>- Data Analysis—Research Questions 2 and 3</td>
<td></td>
</tr>
<tr>
<td>- Data Analysis—Research Question 4</td>
<td></td>
</tr>
<tr>
<td>- Statistical Significance Testing and Effect Size</td>
<td></td>
</tr>
<tr>
<td>- Means and Standard Deviations of Variables</td>
<td></td>
</tr>
</tbody>
</table>
4. RESULTS ........................................................................................................................................ 49

   Findings Related to Research Question 1
   Sequential Regression Analysis
   Unstandardized Regression Coefficient for Treatment
   Standardized Regression Coefficients
   Structure Coefficients
   Findings Related to Research Questions 2 and 3
   Findings Related to Research Question 4

5. DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS........................................... 64

   Discussion
   Association Between Treatment and Persistence—Sequential Regression Analysis
   Association Between Treatment and Persistence—Other Measures
   Assessment of Significance of Participation in Rome Program
   Understanding Persistence Beyond Freshman-to-Sophomore Retention
   Summary of Findings
   Conclusions
   Recommendations
   Continuation of Rome Program in Present Format
   More Research on Persistence Beyond the Sophomore Year
   Model That More Fully Operationalizes Tinto’s Model
   Dummy Variables Should Not be Standardized

REFERENCE LIST ......................................................................................................................... 77
<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Means (standard deviations) of variables</td>
<td>44</td>
</tr>
<tr>
<td>2. Means (standard deviations) of variables used in regression</td>
<td>46</td>
</tr>
<tr>
<td>3A. Summary of sequential regression analysis (set 1) for predicting number of semesters of post-treatment enrollment (n=988)</td>
<td>50</td>
</tr>
<tr>
<td>3B. Summary of sequential regression analysis (set 2) for predicting number of semesters of post-treatment enrollment (n=988)</td>
<td>51</td>
</tr>
<tr>
<td>3C. Summary of sequential regression analysis (set 3) for predicting number of semesters of post-treatment enrollment (n=988)</td>
<td>52</td>
</tr>
<tr>
<td>4A. Summary of sequential regression analysis (set 1) for predicting number of semesters of post-treatment enrollment – independent continuous variables standardized (n=988)</td>
<td>55</td>
</tr>
<tr>
<td>4B. Summary of sequential regression analysis (set 2) for predicting number of semesters of post-treatment enrollment – independent continuous variables standardized (n=988)</td>
<td>56</td>
</tr>
<tr>
<td>4C. Summary of sequential regression analysis (set 3) for predicting number of semesters of post-treatment enrollment – independent continuous variables standardized (n=988)</td>
<td>57</td>
</tr>
<tr>
<td>5. Structure coefficients for predicting number of semesters of post-treatment enrollment (n=988)</td>
<td>59</td>
</tr>
<tr>
<td>6. Means (standard deviations) of percentage of students enrolled 1 and 2 semesters post-treatment (n=1,237)</td>
<td>62</td>
</tr>
<tr>
<td>7. Means (standard deviations) of percentage of students graduating within 4 years of initial entry (n=797)</td>
<td>62</td>
</tr>
</tbody>
</table>
CHAPTER 1

INTRODUCTION

Retention and persistence of students is an important issue in contemporary American higher education. Tinto (1993) stated that 60% of students entering higher education for the first time in 1993 will leave their first institution and that about 46% will leave higher education without receiving a 2- or 4-year degree. McLaughlin, Brozovsky and McLaughlin (1998) urged institutional researchers and other senior administrators to view student retention as a strategic issue that can have serious long-term effects on the future of their institutions.

Much of the early research on persistence and attrition was descriptive, in which characteristics of students who persisted in higher education were summarized and compared with those who left (Summerskill, 1962). Theory-based studies on student departure have become more common since the 1970s. Tinto (1986) grouped theories of student departure into five categories: psychological, societal, economic, organizational, and interactional. Hossler (1984) viewed Tinto’s Theory of Individual Departure (Tinto, 1975), an interactional theory, as one of the most promising in explaining the process of student attrition. Yorke (1999) stated that Tinto had been the greatest influence on retention studies during the past 20 years. In brief, Tinto’s theory considers the college experience to be comprised of academic and social systems. Higher degrees of integration into these systems by students lead to greater commitment to the educational institution and to the goal of degree completion.

Tinto (1975) proposed a model that views dropping out from college as a longitudinal process of interactions between students and the academic and social subsystems of the institution. In his model, the experiences of individual students, as measured by the amount of
their academic and social integration into these subsystems, modify their commitment to continued enrollment at that institution and higher education in ways that lead to persistence or some form of attrition. Tinto’s original conception of the model was that family background (e.g., social status, values, expectations), individual attributes (e.g., gender, race, ability,) and pre-college schooling (e.g., grade point average, academic and social attainments) have an impact on goal commitment and institutional commitment. These commitments are inputs to the academic and social subsystems. Grade performance and intellectual development, which Tinto referred to as the academic subsystem, are measures of academic integration. Peer-group interactions and interactions with faculty and staff, which Tinto referred to as the social subsystem, are measures of social integration. Goal and institutional commitments are modified by the amount of academic and social integration, and impact the persistence decision (Tinto, 1975).

Although Tinto (1975) placed informal interaction with faculty and staff in the realm of social integration, he acknowledged its impact on academic integration. In a revision of his theory, he changed informal interaction with faculty and staff to a measure of the construct of academic integration, rather than social integration (Tinto, 1993). Terenzini and Pascarella (1977) found that informal interaction with faculty affected both academic and social integration.

Astin (1977, p. 21) defines the construct of involvement as “the time and effort expended by the student in the activities that relate directly to the institution and its programs.” He states that attrition can be decreased by increased student involvement, including special academic programs. The Rome Program at the University of Dallas is an example of a special academic program. Students who participate in this program spend one semester (typically during the sophomore year) at the Rome campus of the University of Dallas. This is a 12-acre campus that
includes classrooms, dormitory accommodations, housing for faculty, a small chapel, library, and student lounges. The Rome campus is open only to students from the University of Dallas campus in Irving, TX. Students can spend only one semester in Rome. All students study essentially the same courses in Rome (i.e., art and architecture, literary traditions, western civilization, philosophy, theology, Italian) and live on the same campus with faculty and staff and their families. The Rome Program provides an opportunity for students to more intensely experience the University of Dallas core curriculum, which focuses on the great deeds, ideas, and works of western civilization (University of Dallas General Bulletin, 2002). Informal interaction between students and faculty are an integral part of the Rome experience.

Statement of the Problem

This study addressed the problem of identifying the relationship between participation in the University of Dallas Rome Program and persistence at the University of Dallas in Irving, TX.

Purpose of the Study

The purpose of this study was to explore the association between participation in the Rome Program and persistence at the University of Dallas.

Research Questions

1. After adjusting for background characteristics, academic integration, and social integration, what was the association between participation in the Rome Program and the number of semesters of persistence at the University of Dallas after the Rome Program experience?

2. What percentage of participants in the Rome Program persisted at the University of Dallas one semester after their participation?

3. What percentage of participants in the Rome Program persisted at the University of Dallas two semesters after their participation?
4. What percentage of participants in the Rome Program graduated from the University of Dallas within 4 years of initial entry?

Significance of the Study

This study is significant because it was the first research study to analyze the relationship between participation in the University of Dallas Rome Program and persistence at the University of Dallas. Prior to this study the university had only limited descriptive statistics and anecdotal data about this issue. Furthermore, this study adds to the body of knowledge about persistence beyond the second year of college. Most of the research reported in the literature is based on first-to-second year retention studies.

Delimitations

The data for this study were drawn from only one institution and are not generalizable to other institutions. The constructs of academic and social integration were each operationalized by only one measure—first-year grade point average for academic integration and commuter status for social integration.

The Rome Program was designed for participation during the sophomore year; however, there were 45 students from the incoming freshman classes of 1995 through 2000 who went to Rome at some time other than the sophomore year associated with their entering cohort. These students were excluded from this study. Had they been included, the number of semesters of enrollment after Rome would have been expected to be lower for these 45 students simply because they went to Rome later in their undergraduate career.

Students who did not return for the sophomore year associated with their entering cohort were not included in the study.
CHAPTER 2

REVIEW OF RELATED LITERATURE

Summary of Research on Persistence Prior to 1962

There is extensive literature on student persistence and attrition in higher education. Forty years ago, Summerskill stated that research on college student attrition had a history of at least 40 years at that time (Summerskill, 1962). He concluded that attrition rates had not changed much during that 40-year period. Approximately 50% of incoming students left their matriculating institution by the fourth year; 40% graduated on schedule, with an additional 20% eventually obtaining a degree from somewhere. In reviewing the literature to date, Summerskill (1962) categorized factors associated with dropping out of college into six areas: (a) biological and social (age at matriculation, gender, socio-economic factors, hometown location and size); (b) academic (secondary school preparation, scholastic aptitude, academic performance in college); (c) motivation; (d) adjustment; (e) illness and injury, and (f) finances.

Summerskill (1962) reported that age did not specifically affect attrition, but older students may encounter more obstacles to graduation. Withdrawal rates for men and women were similar, although reasons for withdrawal differed. Findings were ambiguous regarding the influences of students’ economic and social background on attrition. Summerskill (1962) spoke of the need to explore educational and cultural characteristics of communities and identify disparities between the hometown and college environments.

Studies reviewed by Summerskill (1962) showed that students with higher high school grades and higher class standings were less likely to drop out of college. Higher scores on scholastic aptitude tests showed a positive relationship to retention and persistence. Summerskill
(1962) reported that low grades accounted for up to one-third of college dropouts; however, he urged further exploration as to the contributing factors to poor academic performance in college.

A recurring theme among the early studies on persistence was that students who dropped out of college had various motives for attending college, but lacked the desire to study that true intellectual development requires. Motivational psychology of college students was in its infancy, but Summerskill (1962) suggested that it could be that dropouts experienced changing or conflicting motivations. The research literature at the time suggested more than one-third of college attrition was due to motivational causes (Summerskill, 1962).

Summerskill (1962) reported that personal and social maladjustment, as indicated by various feelings of dissatisfaction and unhappiness, occurred on average in 10% of college dropouts. There was no evidence to suggest that dropouts experienced more illness and injury than retained students; however, he identified financial difficulty as an important factor in attrition.

Tinto’s Model

Despite decades of studies on college attrition, Tinto (1975) acknowledged that much was still unknown about the nature of this complex process. He attributed this lack of understanding to two factors. First, there are various types of dropout behavior (e.g., involuntary, voluntary, temporary, permanent), and previous research generally did not distinguish among these. Second, most research efforts were focused on describing the process of dropping out from higher education, rather than developing theoretical models to explain why students drop out. Prior to Tinto (1975) and validation studies of his model (Pascarella & Terenzini, 1977, 1979a, 1979b, 1980; Terenzini & Pascarella, 1977, 1978), most research on attrition focused on either univariate statistics to describe students as persisters or dropouts or on
discriminant analysis to classify students as persisters or dropouts. Stork and Berger (1978) summarized a number of such studies.

Tinto (1975) proposed a model that viewed leaving college as a longitudinal process of interactions between the student and the academic and social subsystems of the institution. The experiences of individual students, as measured by the amount of their academic and social integration into these subsystems, modify their commitments to continued enrollment at that institution and to higher education in ways that lead to persistence or some form of attrition.

Tinto’s original conception of his model was that family background (e.g., social status, values, expectations), individual attributes (e.g., gender, race, ability,) and pre-college schooling (e.g., grade point average, academic and social attainments) have an impact on goal commitment and institutional commitment. These commitments are inputs to the academic and social subsystems. Grade performance and intellectual development, which Tinto referred to as the academic subsystem, are measures of academic integration. Peer-group interactions and interactions with faculty and staff, which Tinto referred to as the social subsystem, are measures of social integration. Commitments to goals and to the institution are modified by the amount of academic and social integration, and impact the persistence decision (Tinto, 1975).

In his review of the literature, Tinto (1975) reported that students who persist in college were more likely to come from families that were more educated and more affluent, and who expressed greater expectations for their children’s education; however, individual ability of the student was more important than family background in determining educational performance. Both high school academic performance and performance on standardized tests are measures of academic ability, but Tinto (1975) reported that previous educational experience, as measured by either grade point average or rank in class, was a better predictor of college success. Earlier
research found personality and attitudinal differences between persisters and dropouts, and that a
greater proportion of men finished degree programs than women. Many studies have reported
grades to be the most important factor in predicting persistence.

Tinto (1982) acknowledged that his theory was still in need of development because studies have shown that it explains only a portion of dropout behavior. One area of weakness is that his model may not sufficiently account for role of finances in persistence. However, he argued that finances is a background variable and is involved in college choice, but not necessarily in the decision to drop out. Also, it was his intent to explain differences within, not among, institutions. His model may inadequately distinguish between transfers and permanent dropouts. This is difficult to research because institutions do not usually know in which of these two categories to classify non-returning students. As of 1982, Tinto believed that not enough attention had been given to how attrition differs among students of different gender, race, and social status. He acknowledged that academic and social integration may not adequately describe the attrition process at community colleges. In a later revision, Tinto (1993) viewed the academic and social systems as surrounded by an external environment, which exerts influence on the persistence/withdrawal decision.

A brief summary of the development and testing of Tinto’s model can be found in Boyle (1989). Tinto developed his model of college departure by combining ideas put forth by Arnold Van Gennep, a Dutch anthropologist in the early 20th century, and Emil Durkheim, who published research on suicide in 1897. Van Gennep explained movement from one life stage to another as a process consisting of three phases: (a) separation, (b) transition, and (c) incorporation. Durkheim classified suicides into four types: (a) altruistic, which occurs when society sees sufficient moral justification such as the 19th century Japanese ritual suicides; (b)
anomic, which occurs when there is complete disruption of social conditions such as in times of war, religious upheaval, or revolution; (c) fatalistic, which occurs when individuals are under excessive control by society; (d) egotistical, which occurs when a person is unable to become socially and intellectually integrated into society. Tinto viewed these four categories as applicable to types of college attrition, e.g., leaving college in the 1960s to protest the Vietnam War and/or support the civil rights movement (altruistic departure), leaving college in the 1960s because the conditions on campus were so tumultuous that normal student life was disrupted (anomic departure), leaving college because of feeling oppressed by the structure and bureaucratic red tape (fatalistic departure), and leaving college because unsuccessful in the incorporation phase of the passage from high school to college (egotistical departure). Tinto’s model addresses egotistical departure, which occurs when students fail to become integrated into the intellectual and social aspects of the educational institution, and is related to unsuccessful movement through Van Gennep’s three stages.

Initial Validation Studies of Tinto’s Model

Six studies conducted by Patrick Terenzini and Ernest Pascarella provide initial validation of Tinto’s model by assessing the constructs of academic and social integration and evaluating the predictive validity of Tinto’s model. Terenzini and Pascarella (1980) reviewed these six studies (Pascarella & Terenzini, 1977, 1979a, 1979b, 1980; Terenzini & Pascarella, 1977, 1978), which used three independent data sets of randomly selected freshmen entering Syracuse University (a private university of about 10,000 undergraduates) in fall 1974, fall 1975, and fall 1976. Terenzini and Pascarella (1980) concluded that the conceptual framework of Tinto’s model is useful for both researchers and administrators. Academic and social integration were able to be operationally defined, and had modest associations with persistence or
withdrawal decisions of freshmen. They determined that background characteristics of students did not have a significant impact on withdrawal decisions, but that background characteristics were important because of interactions with college environment (i.e., aspects of the college experience had a differential impact on withdrawal decisions, depending on background characteristics of the student). They also concluded that the amount of student contact with faculty had a positive association with persistence, and the form of that contact was important. A closer look at these six studies follows.

Study 1

Terenzini and Pascarella (1977) surveyed a simple random sample of 500 freshmen who entered the College of Arts and Sciences at Syracuse University in fall 1974. The instrument, primarily an adjective rating scale, was mailed in late March 1975, and usable responses were obtained from 379 students (76% response rate). Academic integration was measured by self-reports of student perceptions of their academic programs and cumulative grade point average at end of freshman year from the university’s records. Social integration was measured by self-reports of student perceptions of their nonacademic lives, number of extracurricular activities participated in, number of informal contacts of 10 minutes or more with faculty outside of class. University records showed that 66 of 379 respondents were not enrolled in September 1975. Six of the 66 non-returnees were denied permission to register because of academic reasons, and were excluded from remainder of study.

Multivariate analysis of variance indicated that either academic or social integration alone could differentiate between the students who returned in September 1975 for their second year (persisters) and those who did not (leavers). Step-wise discriminant analysis was used to
determine the relative contributions of academic and social integration; the results supported Tinto’s assertion of approximately equal contribution of academic and social integration.

Persisters had more interest in their academic program than did leavers; however, grade point average at the end of the freshman year did not discriminate between the two groups. Persisters had significantly more informal contacts with faculty and found their nonacademic lives to be significantly more demanding and challenging than did leavers; however, persisters were not more active in extracurricular activities than leavers. There were no significant differences between leavers and persisters as to gender, SAT verbal and quantitative scores, or pre-registration expectations of college environment.

Terenzini and Pascarella (1977, p.39) concluded that “the findings of this study largely tend to support the predictive validity of the principal elements of Tinto’s theoretical conception of student attrition.” Furthermore, the results suggested that informal contacts with faculty also contribute to academic integration. Since the academic and social variables were independently related to persistence and were only minimally correlated themselves, Terenzini and Pascarella (1977) also concluded that actions that affect both academic and social systems will have the most impact on student persistence.

Several shortcomings of this first validation study by Terenzini and Pascarella were overcome in their subsequent work. For example, later studies consisted of larger samples that were selected from the entire university (rather than a single college within the university) and used longitudinal rather than cross-sectional surveys.

**Studies 2, 3, and 4**

The studies reported by Pascarella and Terenzini (1977; 1979b) and Terenzini and Pascarella (1978) were based on 1,000 randomly selected entering freshman (out of about 2,400)
at Syracuse University. In the summer before enrolling in fall 1975, these students received a questionnaire that contained items relating to background and expectations of various aspects of the college experience. The response rate was 76%. In late spring of the freshman year (spring 1976), a second questionnaire was mailed to the respondents, which requested perceptions of the reality of their college experience. Usable responses were obtained from 536 students. By fall 1976, 8 of these students had been dismissed for academic reasons and 90 had voluntarily withdrawn.

Background characteristics that were controlled for included gender, ethnicity (minority or non-minority), major (liberal arts or professional), academic aptitude (combined SAT score), high school achievement (rank in high school/class size), personality (scores from Stern’s Activities Index on achievement orientation, dependency needs, emotional expression, educability), mother’s level of education, father’s level of education, expectations of academic program (based on the Adjective Rating Scale dimensions of affective appeal, practical value, dullness, and challenge), expectations of nonacademic life (based on the same four dimensions of the Adjective Rating Scale), expected number of informal contacts of 10 minutes or more per month with faculty outside the classroom, and expected number of extracurricular activities of 2 hours or more per week.

The variables that comprised the academic integration set were perceptions of the academic program on the four dimensions of the Adjective Rating Scale, cumulative grade point average, and score on the intellectual development progress scale (how much progress students thought they had made since matriculation).

The variables that comprised the social integration set were perceptions of nonacademic programs on the four dimensions of Adjective Rating Scale, actual number of informal contacts
of 10 minutes or more per month with faculty outside the classroom, actual number of extracurricular activities of 2 hours or more per week, and score from the personal development progress scale (how much progress students thought they had made since matriculation).

It is worth noting that Terenzini and Pascarella (1977) found that informal student contacts with faculty affected both academic and social integration. This was acknowledged by Tinto (1975), but he placed it within social integration. However in a revision of his theory (Tinto, 1993), he moved informal contacts with faculty and staff to academic integration, rather than social integration.

Among the limitations of these three studies (Pascarella & Terenzini, 1977, 1979b; Terenzini & Pascarella, 1978) are that they are based on data from a single institution and the variables do not represent the full complexity of Tinto’s model (e.g., they do not contain any socio-economic variables nor any measures of pre-college commitment to degree attainment).

Studies 2 and 4. Pascarella and Terenzini (1977) focused on informal student contact with faculty. After controlling for gender, academic aptitude, and personality, persisters had a higher number of contacts with faculty. However, not all types of student-faculty contacts were equal in their impact on persistence. They investigated six categories of student contact with faculty: (a) obtaining information about courses and academic programs, (b) discussion of career concerns, (c) help in resolving a disturbing personal problem, (d) discussion of intellectual or course-related matters, (e) discussion of campus issue or problem, and (f) socializing informally. Student-faculty contacts that focused on intellectual or course-related matters discriminated the most between persisters and voluntary leavers. A re-analysis of this data was reported by Pascarella and Terenzini (1979b), in which the authors explored if the impact of informal student contact with faculty on persistence status differed by gender of the student. After controlling for
background and measures of academic and social integration, contacts relating to intellectual or
course-related matters had the largest partial correlations with the persist/withdraw decision for
both genders. However, partial correlations for the categories of obtaining information about
courses and academic programs and discussing career concerns were much higher for men than
women. Also, partial correlations for the categories discussing a campus issue or problem and
socializing informally were much higher for women than for men. Caution should be used in
interpreting the results of Pascarella and Terenzini (1979b) because of the use of linear
regression, rather than logistic regression, since the dependent variable was dichotomous
(persister or leaver).

Study 3. Terenzini and Pascarella (1978) used stepwise multiple regression to determine
the impact of background characteristics and freshman year experiences on persistence. The
dependent variable was dichotomous (whether or not students returned in the fall of their second
year). The model contained 34 independent variables (21 measures of background, 6 measures
of academic integration, and 7 measures of social integration) and 42 interaction terms (the
interaction of gender, ethnicity, and major with each of the 13 measures of academic and social
integration and with SAT score). Background characteristics accounted for 3.7% of variance in
persistence status; social integration variables, after controlling for background and academic
integration, accounted for 3.0%; academic integration variables, after controlling for background
and social integration, accounted for 5.6%; and the interaction terms, after controlling for
background, social integration, and academic integration, accounted for 10.6%. The variable
with the largest unique contribution to persistence status was number of informal faculty
contacts. If informal faculty contacts had been included as an academic measure, then the
academic set would have been even more important. Perhaps the most important finding in this
study is the contribution by the interaction terms, indicating that the impact of academic and
social integration on persistence status differed by gender, major, and ethnicity. A criticism of
this study is that logistic regression, rather than linear regression, would have been more
appropriate since the dependent variable was dichotomous. It is unknown if the results of the
study would have been the similar with logistic regression.

*Studies 5 and 6*

Pascarella and Terenzini (1979a; 1980) surveyed a random sample of 1,905 incoming
freshman of the fall 1976 class at Syracuse University. In the summer before enrolling in fall
1976, these students received a questionnaire that contained items relating to background and
expectations of various aspects of the college experience. The response rate was 77%. In late
spring of the freshman year (spring 1977), a second questionnaire was mailed to the respondents,
which requested perceptions of the reality of their college experience. Usable responses were
obtained from 773 students. Respondents were representative of the freshman class in terms of
gender, ethnicity, college, SAT scores and freshman grade point average. By fall 1977, 10 of
these students had been dismissed for academic reasons and 90 had voluntarily withdrawn.

Background characteristics included gender, ethnicity (minority or non-minority), major
(liberal arts or professional), academic aptitude (combined SAT score), high school achievement
(percentile rank in high school class), parents’ level of education, parents’ income, expected
number of informal contacts of 10 minutes or more per month with faculty outside the
classroom, expected number of extracurricular activities of 2 hours or more per week, highest
expected academic degree, importance of graduating from college, rank of this university as
college choice, and pre-enrollment confidence that choosing to attend this university was the
right decision.
The variables that comprised the academic integration set were freshman year grade point average; score on academic and intellectual development scale; score on faculty concern for teaching and student development scale; and number of informal contacts with faculty to provide advice and information about academic programs, to discuss intellectual matters, or to discuss career concerns.

The variables that comprised the social integration set were involvement in extracurricular activities; score on peer-group relations scale; score on informal relations with faculty scale; and the number of informal contacts with faculty to discuss campus issues, socialize informally, or to resolve a personal problem.

Contact with faculty could be in either the academic or social integration set, depending upon the reason and nature of the contact. Grade point average was obtained from official university records; all other measures of academic and social integration were obtained from the follow-up questionnaire.

Study 5. Pascarella and Terenzini (1980) controlled for the background measures plus freshman year grade point average and extent of involvement in extracurricular activities during the freshman year. The dependent variable was persistence status (persister or voluntary leaver). An instrument with 34 Likert items was developed that was intended to represent five dimensions: (a) intellectual development, (b) peer-group interactions, (c) interactions with faculty, (d) institutional commitment, and (e) goal commitment. The instrument was administered as part of the follow-up in the spring semester of the freshman year. Factor analysis demonstrated that the five dimensions were generally consistent with Tinto’s model. However, items designed to measure the quality of student interactions with faculty ended up in two factors. The first factor, interactions with faculty, contained items relating to accessibility to
students and the impact of informal contacts. The second factor focused more on the perceptions of faculty concern for student development and teaching. Items measuring goal and institutional commitments clustered into a single factor. Multivariate analysis of covariance and discriminant analysis were used to determine predictive validity of the five institutional integration scales. Student-faculty relationships were strong contributors to discriminating between persisters and voluntary leavers.

Study 6. Pascarella and Terenzini (1979a) explored statistical interactions reported in study 5 (Pascarella & Terenzini, 1980) and other interactions of interest. In predicting the group membership of a student (persister or voluntary leaver), Pascarella and Terenzini (1980) found significant interactions between gender of student and peer group relations and gender of student and institutional/goal commitment.

Pascarella and Terenzini (1979a) used discriminant analysis to predict group membership of a student (persister or voluntary leaver) with the following sets of independent variables: background, academic integration, social integration, and institutional/goal commitment. Institutional/goal commitment was treated as a measure representing both academic and social integration.

Two sets of interaction variables were created: (a) 13 measures of academic and social integration crossed with six background characteristics (ethnicity, initial college of enrollment, combined SAT score, highest degree expected, importance of graduating from college, and parents combined formal education) and (b) each measure of social integration crossed with each measure of academic integration. The first set of interaction variables addressed whether a specific measure of academic or social integration impacted persisting/leaving differently for students with different backgrounds. The second set addressed whether a specific measure of
academic integration impacted persisting/leaving differently for students with differing levels of social integration (and vice versa). Separate analyses were conducted for men and women.

Pascarella and Terenzini (1979a) concluded that the decision to persist or leave is a very complex psycho-social process. The sets of variables for background, academic, and social integration accounted for 37% (males) and 31% (females) of the variance in persistence status. The addition of interaction terms increased the explained variance from 37% to 48% for men and from 31% to 55% for women. In this study, student experiences during the freshman year were more important than pre-college characteristics in impacting the decision to persist at the institution. Also, there were varying influences of different dimensions of academic and social integration for different kinds of students. This may lend support to compensatory roles for academic and social integration. However, the authors caution that interactions may be hard to replicate because of the single-year, single-institution, non-experimental design.

Pascarella and Terenzini (1983) re-analyzed the data in Studies 5 and 6 using both discriminant analysis and path analysis. They concluded that the constructs in Tinto’s model had reasonable predictive power in persistence, and that the path analysis was consistent with Tinto’s model, but with differences by gender. For women, social integration had a larger direct effect on persistence than did academic integration; the opposite was true for men. Results of the path analysis suggested compensatory interaction between academic and social integration and between institutional and goal commitment.

Other Validation Studies Based on Tinto’s Model

A criticism of the six validation studies conducted by Pascarella and Terenzini is that all six were conducted at the same institution – a private, residential, comprehensive research institution. Terenzini, Lorang, and Pascarella (1981) reported on a replication study of
Pascarella and Terenzini (1980) conducted at a different university. Both studies were conducted at residential, comprehensive research institutions of approximately 10,000 undergraduates with 2,100 to 2,400 freshmen. The university in the first study was private with 25% of freshmen in the top 10% of their high school class and had recent freshman-to-sophomore voluntary attrition rates ranging from 12 to 17%. The university in the replication study was public with 40% of freshmen in the top 10% of their high school class and 8% attrition from freshman-to-sophomore year.

The instrument of 34 Likert items loaded onto the five factors of peer group interactions, interactions with faculty, faculty concern for student development and teaching, academic and intellectual development, and institutional and goal commitment almost identical as in previous study. The five factors accounted for 44.4% of variance in the 34 items in the first study and 44.6% in the replication study. In both studies the five factors made individually unique and significant contributions to discriminating between persisters and leavers. The largest single contributor to group discrimination in either study was institutional/goal commitment. Tinto (1975) theorized academic and social integration contribute to goal and institutional commitment. Although some discrepancies were noted between the results of the two studies, Terenzini, Lorang, and Pascarella (1981) concluded that the results generally supported the construct and predictive validity of Tinto’s model.

One of the first multi-institutional studies using Tinto’s model was reported by Chapman and Pascarella (1983) and Pascarella and Chapman (1983) in which a random sample of incoming freshman in fall 1978 from 11 institutions were administered a student involvement questionnaire that measured dimensions of academic and social integration in April 1979. The response rate was about 35%, yielding usable responses from over 2,300 students. Students were
identified in fall 1979 as either persister or voluntary leaver. Chapman and Pascarella (1983) categorized the 11 institutions as either (a) 4-year public or private primarily residential universities (n=4), (b) 2-year community colleges that were primarily commuter (n=3), (c) primarily commuter 4-year institutions (n=2), or (d) private liberal arts colleges with a mixture of residential and commuter students (n=2). The goal of the study was to determine predictors of academic and social integration. Personal and institutional characteristics explained more of the variance in social integration than in academic integration; however, much of the variance in both types of integration was not accounted for by either student background or institutional characteristics. Academic and social integration varied across type of institution, even after controlling for student characteristics, with higher levels of both academic and social integration reported by students at private liberal arts colleges. In concordance with Tinto’s model, high levels of social integration were associated with institutional commitment and lower levels with greater commitment to graduation. Using a slightly different classification scheme (4-year residential, 4-year commuter, and 2-year commuter), Pascarella and Chapman (1983) concluded that social integration had a stronger role in persistence at 4-year residential institutions and that academic integration was more important at 2- and 4-year commuter institutions.

Association Between Background Characteristics and Persistence

In their review of their six validation studies, Terenzini and Pascarella (1980) concluded that background characteristics (pre-enrollment variables) were not nearly as important as student experiences during college in determining persistence status. A similar finding was reported by Pascarella, Duby, Miller, and Rasher (1981) in their study of entering freshman in fall 1976 and fall 1977 at an urban commuter university with an undergraduate enrollment of approximately 17,000. Data were obtained on 19 pre-enrollment variables: age; secondary
school performance; college choice of this institution; perceived need for remediation in English, reading, or math; income of parents; gender; ethnicity; college of enrollment; ACT composite score; father’s level of education; mother’s level of education; highest expected degree; perceived likelihood of failing one or more college courses; perceived likelihood of joining a fraternity, sorority or club; perceived likelihood of needing extra time to complete a degree; perceived likelihood of working at a job while in college; perceived likelihood of dropping out temporarily; perceived likelihood of dropping out permanently; and perceived likelihood of transferring to another college. Number of credit hours earned during the first quarter and first-quarter GPA were used as indicators of academic integration. These 21 variables were used in discriminant analysis to predict membership in three mutually exclusive groups: freshman persisters, freshman stop-outs, or first-quarter freshman withdrawals. The first group (persisters) consisted of students who had continuous enrollment from the first quarter of their freshman year through the first quarter of sophomore year (n=887 and 757 for 1976 and 1977, respectively). The second group (stop-outs) consisted of students who completed the first quarter of their freshman year and re-enrolled in the first quarter of their sophomore year, but were not enrolled in the second and/or third quarter of their freshman year (n=43 and 26 for 1976 and 1977, respectively). The third group (withdrawers) enrolled during the first quarter of their freshman year but not again through first quarter of sophomore year (n=125 and 96 for 1976 and 1977, respectively). Only 9 of the 19 pre-enrollment variables entered the equation using stepwise discriminant analysis, which correctly classified 48.1% of the students (significant improvement over 33.3% by chance alone). However, the pre-enrollment variables were better at identifying stop-outs than distinguishing between persisters and withdrawers. The addition of first quarter
GPA to the equation increased the percentage of correctly classified to 58.7% and enhanced the ability to distinguish between persisters and withdrawers.

Getzlaf, Sedlacek, Kearney, and Blackwell (1984) found that individual attributes and pre-college educational experiences made unique contributions to their discriminant function in classifying persisters and leavers. They operationalized five constructs from Tinto’s (1975) model: (a) individual attributes by using scores of verbal and quantitative ability on Washington Pre-college Test; (b) past educational experiences by using time between high graduation and college entry, high school overall GPA, high school English GPA, high school Math GPA, and GPA at last high school attended; (c) goal commitment by using highest degree sought; (d) institutional commitment by comparability of the college with the type of college sought; and (e) academic integration by using GPA change from high school to college. There were no measures for the constructs of family background or social integration. Discriminant analysis was used to classify 262 undergraduate students (not just freshmen), of which 115 were leavers. The model correctly classified 65% overall.

Results reported by Stage (1989) reinforced Tinto’s hypothesis that background characteristics of students have a direct influence on persistence. Stage (1989) investigated fall-to-spring persistence of 316 students in their freshman year at major public university in 1984-1985. Tinto’s constructs were operationalized by the following measures: (a) background characteristics by age, gender, ethnicity, and educational level of parents; (b) initial commitments by scores during the second week of the semester on the goal and institutional commitment portions of the institutional integration scale (Pascarella & Terenzini, 1979a, 1980, 1983); (c) academic integration by scores at the end of semester on the academic development scale and the faculty concern scale (Pascarella & Terenzini, 1979a, 1980, 1983), grade point
average, credits earned in first semester, and hours spent in extra-curricular activities; (d) social integration by scores at the end of semester on the peer group relations scale and the informal faculty relations scale (Pascarella & Terenzini, 1979a, 1980, 1983), residency, campus employment, hours spent in social activities, and hours spent in intercollegiate athletics; (e) later commitments by scores at the end of semester on the goal and institutional commitment portions of the institutional integration scale (Pascarella & Terenzini, 1979a, 1980, 1983), and (f) persistence by whether or not a student was enrolled in spring semester. Students were classified into seven categories of motivational orientation using a 40-item educational participations scale. The three categories with the most students (certification, enrolled for practical reasons to get degree or job; cognitive, enrolled for academic reasons or for love of learning; and community service, enrolled to gain skills for helping humankind) were then subjected to path analysis to analyze relationships among constructs. The paths differed among the three groups, with the cognitive group least resembling Tinto’s model. Direct effects of background variables on persistence were evident in both the certification and community service groups.

The Construct of Academic Integration

In Tinto’s original model (Tinto, 1975), he argued that academic integration could be measured by grade performance and intellectual development while in college. Furthermore, his model specified that initial commitment to goals and to the institution, coupled with background characteristics, influence grade performance and intellectual development. In turn, these measures of academic integration, as well as measures of social integration, influence goal and institutional commitment at a later time. Ultimately, it is commitment to goals and to the institution at some time after enrollment that determines whether or not a student persists at a particular educational institution.
Tinto (1993) has slightly modified his concept of academic integration over the years. He viewed academic institutional experiences as occurring either within the formal or informal academic system, and surrounded by an external environment that exerts influences on students. Academic performance is a manifestation of the formal system, and faculty/staff interactions are categorized as the informal system. Together, these form the construct of academic integration.

In validation studies conducted by Pascarella and Terenzini on Tinto’s (1975) model, the construct of academic integration made significant contribution to the variance in persistence status of student (i.e., persister or leaver), even after controlling for background characteristics and expectations of students and for social integration (Terenzini & Pascarella, 1980). Braxton and Lien (2000) assessed empirical support for the influence of academic integration on subsequent institutional commitment and on persistence decisions by reviewing approximately 40 multi-institutional and single-institutional studies utilizing Tinto’s model. They concluded that the multi-institutional studies provided robust support, but that the single-institutional studies provided only modest support for the influence of academic integration on institutional commitment and persistence. Braxton and Lien (2000) suggested that Tinto may have misspecified academic integration. To represent the construct of academic integration, they proposed the development of measures for academic normative incongruence and intellectual isolation. Academic normative incongruence occurs when there is incompatibility between the prevailing campus attitudes, beliefs, and values relative to academics and those of the student. Intellectual isolation occurs when a student does not find a major field of interest or when a student finds courses to be lacking in intellectual stimulation.
The Construct of Social Integration

In his original model (Tinto, 1975), Tinto argued that social integration can be measured by peer-group interactions and by interactions with faculty. Furthermore, his model specified that initial commitment to goals and to the institution, coupled with background characteristics, influence peer-group interactions and interactions with faculty. In turn, these measures of social integration, as well as measures of academic integration, influence goal and institutional commitment at a later time. Ultimately, it is commitment to goals and to the institution at some time after enrollment that determines whether or not a student persists at a particular educational institution.

Tinto has slightly modified his concept of social integration over the years. In 1993, he viewed social institutional experiences as occurring either within the formal or informal social system, and surrounded by an external environment that exerts influences on students. Extracurricular activities are manifestations of the formal system, and peer-group interactions are categorized as the informal system. Together, these form the construct of social integration.

In validation studies conducted by Pascarella and Terenzini on Tinto’s (1975) model, the construct of social integration made significant contribution to the variance in persistence status of student (i.e., persister or leaver), even after controlling for background characteristics and expectations of students and for academic integration (Terenzini & Pascarella, 1980).

Study-Abroad Programs

According to the Institute of International Education, approximately 155,000 U.S. college students participated in study-abroad programs for credit during the 2000-01 academic year. Over 90% of these students were involved in a program of one semester or less (Institute of International Education, 2002). Study-abroad programs exist in many formats. A common
arrangement is for a student to spend one semester taking courses at a foreign university taught by the faculty at the foreign institution. The student may or may not be accompanied by other students from the home institution. In some situations, particularly for students studying outside of Western Europe, service learning may be part of the study-abroad experience. A less common format involves American universities that maintain an overseas campus where their students study.

**Relationship Between Participation in Study-Abroad Programs and Persistence**

Although there are many studies reported in the research literature on study-abroad experiences, few mention persistence or attrition. McEvoy (1968) studied 11 students from the University of California at Los Angeles who were involved in a study-abroad program at a European university in 1964-65. He concluded that many college-age students cannot successfully handle a study-abroad experience because they have not yet matured in their interpersonal needs such as independence and relationships. He hypothesized there is an optimum time in psychological development for students to study abroad so that they are less likely to withdraw from the program. However, his conclusions relate to persistence in the study-abroad program, not persistence at the home university.

Pfnister (1972) reviewed the literature to date on the impact of study abroad on undergraduates, and found it was primarily survey-based research on attitudes and opinions. When comparing applicants for study-abroad programs to non-applicants and rejected applicants, he reported that applicants demonstrated a stronger sense of purpose in life and were more self-reliant. It is likely that these characteristics are correlated with goal commitment, which, according to Tinto’s model, has an impact on persistence.
After studying American students over a 3-year period (1968-1970) who participated in a junior year study-abroad program in Switzerland, Morgan (1975) concluded that a different kind of learning occurs in a study-abroad program than on the home campus. At the home campus, the emphasis is on, in descending order, cognitive, affective, and psychomotor learning activities. But during the study-abroad experience, the order is affective, psychomotor, and cognitive learning. He noted that the changes occurring during study abroad are related to values, attitudes, goals, and personal philosophy. Furthermore, the process of social interaction is expanded, emphasizing the role of social integration in study-abroad experiences.

There are multiple dimensions (e.g., academic, social, cultural, and personal) of study-abroad experiences. Several studies have shown that study-abroad experiences contribute to various aspects of both academic and social integration. Billigmeier and Forman (1975) reported responses to a 1972 follow-up questionnaire from 39 of 60 students who participated in the University of California’s Education Abroad Program in Gottingen during their junior year in 1965-66. All 39 respondents returned to the University of California and completed their bachelor’s degrees there after the study-abroad experience in Europe. All but 7 of the 39 pursued some form of graduate education. The most frequently cited intellectual advantages of their study-abroad experiences were new perspectives and greater understanding of intellectual and cultural life of host country, cultivation of interests in the arts and humanities, and interaction with students and teachers on a personal level that provided new dimensions of understanding and interests in specific fields. All of these items are aspects of academic and/or social integration. The main area of personal maturation was that of growth in independence, self-reliance, and the ability to make decisions by one’s self. Personal growth could influence goal and institutional commitment, thereby impacting persistence.
Carsello and Creaser (1976) reported results from a self-evaluation instrument of 209 students (72% in their junior year) that showed study-abroad experiences contributed to various aspects of academic and social integration. Students studying in Europe reported changes in interests, attitudes, and skills in 30 areas relating academic and personal aspects of their lives. Topping the list were interests in travel (89%) arts (82%), foreign language (77%), and history (75%). Also, 64% reported positive change in self-concept, 47% in relating to fellow students, 42% in social life, 36% in relating to faculty, 16% in study habits, and 16% in reading assigned texts. Negative changes were noted in by some students: study habits (42%), reading assigned text (21%), relating to faculty (19%), social life (17%), relating to fellow students (12%), and self-concept (8%).

Most American students participating in study-abroad programs go to a Western European country; however, there have been recent increases in the number of students studying in developing countries (Wagenaar & Subedi, 1996). In observing 18 to 27 students per summer since 1992 in Nepal, these authors believe that more social development occurs in students who study in developing countries. They argue that in this setting, students more fully experience “group life” in the form of new friendships, spirit of sharing and helpfulness, and camaraderie. Upon return to their home university, faculty members observed that students who participated in the Nepal program were more involved and enthusiastic in subsequent courses. Again, study-abroad experiences involved aspects of both academic and social integration.

Although the results of most studies indicate that the experiences students have while studying abroad make a positive contribution to academic and social integration, Bicknese (1974a; 1974b) reported some items to the contrary. When studying three groups of about 20 students each who spent their junior year abroad at the University of Marburg in Germany,
Bicknese (1974a) found that students from only one of the groups participated in more extracurricular activities than they had anticipated before leaving home. There was a considerable gap between expectations and reality in this aspect of social integration for the other two groups. Bicknese (1974b) reported that after spending a year abroad, students’ level of satisfaction with their home college was low (6 pleased, 17 satisfied, and 36 dissatisfied). The author hypothesized that the amount of academic and social freedom the students experienced while abroad may have been a factor in their dissatisfaction with the home university. Reports written by the students while abroad tended to be critical of their German educational experience. It is possible that such dissatisfaction after a study-abroad experience could lead to attrition rather than persistence.

Among the many goals of study-abroad programs are creation of multi-cultural individuals, fulfillment of a distinctive institutional mission, mastery of a foreign language, knowledge of oneself, learning from others, and improvement in international relations (Goodwin & Nacht, 1988). The University of Dallas Rome Program can be described as fulfilling the distinctive mission of the university’s commitment to the “recovery and renewal of the Western heritage of liberal education.” Most study-abroad programs are an extension of education, but the University of Dallas Rome program is a foundation for later education (Goodwin & Nacht, 1988). As such, it should not only contribute to intellectual knowledge necessary for future courses, but it should also have a positive association with student retention and persistence.
CHAPTER 3

METHODOLOGY

This study used a quasi-experimental research design. According to Kirk (1995), “quasi-experiments are similar to experiments except that the subjects are not randomly assigned to the independent variable” (p. 6). The independent variable of interest, also known as the treatment, was participation in the University of Dallas Rome Program during the sophomore year. Students who participate in this program spend one semester (typically during the sophomore year) at the Rome campus of the University of Dallas. This is a 12-acre campus that includes classrooms, dormitory accommodations, housing for faculty, a small chapel, library, and student lounges. The Rome campus is open only to students from the University of Dallas campus in Irving, TX. Students can spend only one semester in Rome. All students study essentially the same courses in Rome (i.e., art and architecture, literary traditions, western civilization, philosophy, theology, Italian) and live on the same campus with faculty and staff and their families. The Rome Program provides an opportunity for students to more intensely experience the University of Dallas core curriculum, which focuses on the great deeds, ideas, and works of western civilization (University of Dallas General Bulletin, 2002). Informal interaction between students and faculty are an integral part of the Rome experience. The control group consisted of students who were qualified to participate in the Rome Program, but chose not to do so. The dependent variable was the number of fall and spring semesters enrolled as an undergraduate at the University of Dallas post-treatment through spring 2003.

The entering freshman classes at the University of Dallas from fall 1995 through fall 2000, consisting of approximately 1,600 students, was the population of interest for this study.
Fall 1995 was chosen as the beginning date because it concurred with a change in administration and leadership at the University of Dallas. Since students could spend either the fall or spring semester of their sophomore year in Rome, this study captured students who participated in the Rome Program between fall 1996 and spring 2002. The freshman class of 2000 was chosen as the ending date because this was the most recent class for which data were available on persistence at the University of Dallas after participation in the Rome Program during their sophomore year. The minimum academic requirements for participation in the Rome Program were sophomore standing and at least a 2.0 cumulative grade point average at the University of Dallas. Other requirements included at least one semester of fulltime study at the University of Dallas and a record of good conduct.

Data elements pertinent to the research questions were extracted from the University of Dallas administrative computing system for each student in the entering freshman classes from fall 1995 through fall 2000. Permission to use data from the University of Dallas was obtained from the Provost and Vice President of Academic Affairs.

Data Elements

Data for this study were extracted from the administrative computing system (AIMS) at the University of Dallas. The following student-level data from AIMS were used: (a) year of entry to the University of Dallas, (b) gender, (c) ethnicity, (d) religion, (e) whether or not a Texas resident, (f) SAT combined score, (g) percentile of high school rank, (h) major at the end of first semester, (i) first-year grade point average (GPA) at the University of Dallas, (j) whether or not a commuter during the first semester of freshman year, (k) undergraduate degree date, and (l) semester of Rome participation. Further explanation of specific data elements follows.
Year of entry. This was the year that the student entered the University of Dallas as a freshman (i.e., 1995, 1996, 1997, 1998, 1999, 2000).

Religion. This was the religious/denominational preference expressed by a student when entering the University. This variable was of particular interest since the University of Dallas is Catholic-affiliated.

Texas resident. This dichotomous data element indicated whether or not a student was a Texas resident during the first semester of the freshman year.

SAT combined score. SAT combined score was the sum of the SAT math score and the SAT verbal score. For students with multiple SAT scores, the highest math score and the highest verbal score was summed. The University of Dallas accepts either SAT or ACT scores; however, most students submit SAT scores. For students with ACT scores but no SAT scores, the composite ACT score was converted to a SAT combined score using the conversion table provided by The College Board (Schneider & Dorans, 1999). The SAT scores for students entering the University of Dallas in fall 1996 and later were recentered SAT scores, so the SAT scores for the fall 1995 freshman class were converted to recentered scores using the conversion tables provided by The College Board (Dorans, 1999).

Percentile of high school rank. High school rank was stored in AIMS in the format of “rank in class/number in class.” For example, the high school rank appeared as “5/250” for a student who ranked fifth in a high school class of 250. Students whose rank was not reported had a value of “0/” for high school rank. The AIMS system computed percentile of high school rank by dividing the rank in class by number in class, and then multiplying by 100. Students with no high school rank had a value of 0 for percentile of high school rank. This AIMS computation was problematic because it actually represented the top X% of the class the student was in, rather
than the percentile. For example, a student with a rank of “5/250” had a value for percentile of high school rank of 2 in AIMS. It is true that this student was in the top 2% of the high school class; however, that corresponds to the 97th percentile. A percentile represents the percentage of individuals whose score falls below a particular score (Gall, Borg, & Gall, 1996). Modifications were made to the data extracted from AIMS so that students with a value for high school rank in AIMS had percentile of high school rank computed as 99 minus the AIMS value for percentile of high school rank. Furthermore, students with no high school rank in AIMS had a missing value for percentile of high school rank percentile, as opposed to the AIMS value of 0.

**Major.** This date element represented the major of the student at the end of the first semester of the freshman year.

**First-year GPA.** First-year GPA was not a data element contained in AIMS; however, the GPA for each semester was recorded in AIMS. First-year GPA was computed as the number of grade points earned in the fall, spring, and May semesters of the freshman year divided by the number of credit hours attempted in those semesters.

**Commuter.** Students with a value in the AIMS system for living in a residence hall or at the seminary during the first semester of the freshman year were assigned a value of non-commuter. All other students were designated as commuters.

**Degree date.** If a student earned a baccalaureate degree by fall 2002, this was the year and month in which the degree was awarded. Otherwise, this field was blank.

**Semester of Rome participation.** For students who participated in the Rome Program, this data element contained the year and semester spent in Rome. Non-participants had a missing value for this data element.
Data Extraction and Preparation

The data were extracted from AIMS into a delimited flat file, which was read into SAS. Programming was written with SAS® software (SAS Institute, [www.sas.com](http://www.sas.com)) to check data integrity and to correct inconsistencies. Because students in the incoming freshman classes of 1995 through 2000 had a record extracted from AIMS for each fall and spring semester for which they were enrolled in courses for undergraduate credit through spring 2003, most students had multiple data records. Programming was written with SAS software to create new variables from the extracted data elements and to create a data file in which each student had only one record.

The Rome Program was designed for participation during the sophomore year; however, there were 45 students from the incoming freshman classes of 1995 through 2000 who went to Rome at some time other than the sophomore year associated with their entering cohort. These students were excluded from this study. Had they been included, the dependent variable (number of semesters of enrollment after Rome) would have been expected to be lower for these 45 students simply because they went to Rome later in their undergraduate career.

In the context of a quasi-experimental design, the treatment was participation in the Rome Program. Students from the incoming freshman classes of 1995 through 2000 were in the treatment group if they went to Rome during the sophomore year associated with their entering cohort. The control group consisted of students from the incoming freshman classes of 1995 through 2000 who met the following criteria: (a) did not participate in the Rome Program at any time, (b) were enrolled at the University of Dallas for the sophomore year associated with their entering cohort, and (c) had a first-year GPA of 2.0 or above. The rationale for the second and third criteria was so that the control group contained students who were academically eligible to
go to Rome. Students who did not return for the sophomore year associated with their entering cohort were not included in this study. For the cohorts in this study, the retention rate from the fall of the freshman year to fall of the sophomore year averaged 82%. This meant that 18% of the students in these cohorts were excluded from this study because they were not enrolled at the time of treatment.

Students in the treatment group went to Rome in either the fall or spring semester of their sophomore year. Generally speaking, the proportion of students who went to Rome in the fall and spring were approximately equal. The largest discrepancy was the fall 1996 cohort in which 45% (70 students) went to Rome in the fall and 55% (85 students) went in the spring. The dependent variable, number of fall and spring semesters enrolled post-treatment, was computed by counting the number of records extracted from AIMS that corresponded to a fall or spring semester later than the semester of Rome participation. The number of such records was summed for each student in the study who went to Rome. This sum represented the total number of fall and spring semesters enrolled at the University of Dallas post-treatment. Before a similar computation could be made for students in the control group, each student had to be assigned to either a fall or spring control group. Within each cohort, students in the control group were randomly assigned to either a fall or spring control group in the same proportion in which students in that cohort went to Rome in fall and spring. For example, 45% of the fall 1996 cohort went to Rome in the fall and 55% went in the spring, so 45% of the control group for the fall 1996 cohort was randomly assigned to the fall control group and 55% was randomly assigned to the spring control group. For each student in the control group, the number of records extracted from AIMS for fall and spring semesters after the control semester were summed to obtain the number of semesters enrolled after the control semester.
Data Analysis—Research Question 1

Regression analysis was used to answer the first research question:

1. After adjusting for background characteristics, academic integration, and social integration, what was the association between participation in the Rome Program and the number of semesters of persistence at the University of Dallas after the Rome Program experience?

The independent variables for the regression analysis were (a) dummy variables for year of entry to the University of Dallas, (b) dummy variable for gender, (c) dummy variable for whether or not ethnic minority, (d) dummy variable for whether or not Catholic, (e) dummy variable for whether or not Texas resident, (f) SAT combined score, (g) percentile of high school rank, (h) dummy variable indicating whether or not undeclared major at the end of first semester, (i) first-year GPA at the University of Dallas, (j) dummy variable for whether or not a commuter during the first semester of freshman year, and (k) dummy variable indicating whether treatment or control group. The dependent variable was the number of fall and spring semesters enrolled post-treatment as an undergraduate at the University of Dallas through spring 2003.

Dummy variables for year of entry to the University of Dallas were needed in the regression model to adjust for differences in the dependent variable that were due to the fact that students who enrolled in later years had not had the opportunity to enroll for as many semesters as those with earlier years of entry. These differences were expected, and would have been incorrectly attributed to other variables in the regression model if the dummy variables for year of entry were not included.

Gender, ethnicity, religion, and Texas residency represented what Tinto (1993) referred to as pre-entry personal attributes. Consistent with Tinto’s model, variables representing intellectual ability (e.g., SAT score) and prior educational achievement (e.g., percentile of high
school rank) also were included as background characteristics. Although Tinto’s model does not explicitly include major field of study, others have suggested an association with student integration (Chapman & Pascarella, 1983) and have demonstrated lower retention rates for undeclared majors (Strenta, Elliott, Adair, Matier, & Scott, 1994). Some persistence studies (Pascarella & Terenzini, 1980; Terenzini & Pascarella, 1978) have characterized major field of study as a background attribute and others (Getzlaf et al., 1984) have considered it as one of several measures of academic integration. For this study, major was considered a background attribute. A component of Tinto’s construct of academic integration is academic performance, which was operationalized as first-year GPA. Commuter status served as a measure of Tinto’s construct of social integration. According to Tinto (1993), social integration is primarily a function of extracurricular activities and peer group interactions. Pascarella et al. (1981) cited several studies in which commuting students were not as involved in extracurricular activities nor had as much interaction with faculty and students as did residential students.

A dummy variable represented whether a student was a member of the treatment or control group. The primary method for ascertaining the association between participation in the Rome Program and persistence was the use of sequential regression analysis to measure the increase in $R^2$ when the dummy variable for treatment was added to the model containing all the other variables. Additional insight was gained through interpretation of unstandardized regression coefficients, standardized regression coefficients, and structure coefficients. Specific details on these methods follow.

*Sequential Regression Analysis*

In sequential regression analysis, also known as hierarchical regression analysis, independent variables, either individually or in sets, are entered in a predetermined sequence
Prior to conducting the sequential regression analysis for this study, it was determined that the regression would consist of three stages (also referred to as sets or steps). The use of the term “step” in this research should not be confused with stepwise regression, where an algorithm determines the “best” set of variables based on certain criteria. In contrast, the selection of variables for each step of sequential regression is determined by the researcher and is based on understanding of the data and knowledge of the underlying theory.

The first step of the sequential regression adjusted for year of entry. Because the dependent variable (number of semesters of enrollment post-treatment) was measured in spring 2003, students in the earlier cohorts had the opportunity to enroll in more semesters than did students in the later cohorts. By adjusting for year of entry in the first stage of the sequential regression, the incremental increases in \( R^2 \) in subsequent steps were not affected by the fact that students in earlier cohorts had the opportunity to enroll in more semesters post-treatment than did students in later cohorts.

The second step of the sequential regression added nine variables that are widely accepted throughout the literature as associated with persistence. The nine variables were (a) dummy variable for gender, (b) dummy variable for whether or not ethnic minority, (c) dummy variable for whether or not Catholic, (d) dummy variable for whether or not Texas resident, (e) SAT combined score, (f) percentile of high school rank, (g) dummy variable indicating whether or not undeclared major at the end of first semester, (h) first-year GPA at the University of Dallas, and (i) dummy variable for whether or not a commuter during the first semester of freshman year. In the context of Tinto’s model, these nine variables represented measures of background, academic integration, and social integration (Tinto, 1975, 1993). These variables
were added to the model in the second stage for two reasons. First, the collective association between these nine variables and persistence could be determined by adding them after the adjustment for year of entry. Second, the additional association between treatment and persistence could be determined after identifying the association between the variables in this step and numbers of semesters enrolled post-treatment.

The final step of the sequential regression added a dummy variable indicating whether the student was in the treatment (Rome participant) or control group. The increase in $R^2$ for this final step was the primary method used to answer Research Question 1.

*Unstandardized Regression Coefficient for Treatment*

Although $R^2$ is usually of primary interest to researchers because it is a measure of the explanatory power of the independent variables, the unstandardized regression coefficients (b weights) should also be examined because of their role in the prediction equation (Lewis-Beck, 1980). The unstandardized regression coefficient for treatment represented the change in number of semesters of persistence post-treatment for the treatment group over the control group while all other variables were held constant. Comparison of unstandardized regression coefficients provides little information in studies such as this, where independent variables were measured in different units. However, $p$ values for each unstandardized variable can be compared and used to assess statistical significance.

*Standardized Regression Coefficients*

When independent variables are measured on different scales, as was the case in this study, then standardized regression coefficients ($\beta$ weights) should be used to evaluate the relative importance of each independent variable (Fox, 1997; Lewis-Beck, 1980; Schroeder, Sjoquist, & Stephan, 1986). A standardized regression coefficient represents the number of
standard deviations of change in the dependent variable associated with one standard deviation increase in the independent variable. However, the use of dummy variables complicates the interpretation of standardized regression coefficients.

Two approaches to standardized regression coefficients were used in this study. The first approach, which was a slight variation to the one typically seen in the literature, was to standardize all of the independent variables, and then run the regression. Although it is common practice to standardize the dependent variable, it is not required because the relative sizes of the standardized regression coefficients are not affected by the units of scale of the dependent variable (Fox, 1997). In order to keep the dependent variable in easily understandable units (number of semesters of enrollment post-treatment), it was not standardized in this study. So, a standardized regression coefficient in this equation represented the number of semesters of post-treatment enrollment associated with a one standard deviation increase in the independent variable.

Cohen, Cohen, West, and Aiken (2003) and Fox (1997) urged caution in the interpretation of standardized regression coefficients for dummy variables. Fox (1997) stated that it makes no sense to standardize dummy variables because they cannot increase by one standard deviation—they can only take on the values of 0 or 1, regardless of the size of the standard deviation. As an alternative, Fox (1997) suggested that only the dependent variable and the continuous independent variables be standardized, and that the dummy variables be left alone. This was what was done in the second approach, except that the dependent variable was not standardized. This second approach to standardized regression coefficients resulted in what was called “adjusted $\beta$ weights.”
Structure Coefficients

Several authors (Burdenski, 2000; Courville & Thompson, 2001; Thompson & Borrello, 1985) have stressed the importance of interpreting structure coefficients along with regression coefficients. Structure coefficients are the correlation coefficients between each independent variable and the predicted dependent variable. When squared, they can be interpreted as the amount of variance in the predicted dependent variable that is accounted for by each independent variable. Courville and Thompson (2001) pointed out that it is erroneous to presume that independent variables with $\beta$ weights near 0 do not add to the explanatory value of the regression equation. Two correlated independent variables share some explanatory ability, which may be arbitrarily assigned to one of the variables, causing it to have a higher $\beta$ weight. This assignment of shared variance may result in a low $\beta$ weight for the other correlated variable, appearing as though it makes little contribution (Burdenski, 2000). Structure coefficients were computed for all of the independent variables except for year of entry to the University of Dallas. Because the data contained six entering freshman cohorts, there were five dummy variables for year of entry. Interpretation of structure coefficients in such situations is not recommended (R.K. Henson, personal communication, June 3, 2003). Structure coefficients for the other independent variables were squared to determine the percentage of variance accounted for by each independent variable in the predicted number of semesters of enrollment post-treatment.

Data Analysis—Research Questions 2 and 3

Research Questions 2 and 3 asked what percentage of participants in the Rome Program persisted at the University of Dallas one and two semesters, respectively, after their participation. Unlike Research Question 1, where students with missing values for SAT score or rank of high school percentile were excluded from the regression analysis, all students who were assigned to
either treatment or control groups were included in the analysis for Research Questions 2 and 3. Because students in this study had a record extracted from AIMS for each fall and spring semester for which they were enrolled in courses for undergraduate credit through spring 2003, Programming was written with SAS software to identify whether or not each student was enrolled in the two semesters immediately after Rome/control semester. Percentages were computed for the treatment group, control group, and overall.

Data Analysis—Research Question 4

Research Question 4 asked what percentage of participants in the Rome Program graduated from the University of Dallas within 4 years of their initial entry. Undergraduate degrees were awarded in May, August and December. At the time of data extraction in spring 2003, students from the fall 1999 and fall 2000 cohorts had not yet had the full 4 years in which to graduate, so students from these two cohorts were excluded from this analysis. All students in the fall 1995, fall 1996, fall 1997, and fall 1998 cohorts who were assigned to either treatment or control groups were included in the analysis for Research Question 4. In total, 797 students (674 in the treatment group and 123 in the control group) were used to answer this research question. Programming was written with SAS software to identify whether or not each student had graduated within 4 years of initial entry. Percentages were computed for the treatment group, control group, and overall.

Statistical Significance Testing and Effect Size

Statistical significance testing has been widely used for decades to determine the probability of obtaining the results (or more extreme results) observed in the sample given that the specified null hypothesis is true for the population (Kirk, 1996). A variety of short-comings of statistical significance testing has been noted by Cohen (1994), Kirk (1996) and Thompson
Most notable is that statistical significance tests provide no information as to whether or not the results are axiologically important. Kirk (1996) defined practical significance as “concerned with whether the result is useful in the real world” (p. 746) and suggested a number of measures of effect magnitude that could be used to assess practical significance.

Several measures of effect magnitude mentioned by Kirk (1996) were examined in this study — $R^2$, $r$, $r^2$, Cohen’s (1988) $d$ and Cohen’s (1988) $h$. Both the overall $R^2$ and the increase in $R^2$ due to treatment were interpreted as part of the sequential regression analysis. Structure coefficients are correlation coefficients ($r$), and when squared can be interpreted as variance-accounted-for measures, both of which are measures of effect magnitude. Cohen’s (1988) $d$ is the standardized difference between two means, and was used to understand the pre-treatment differences in continuous variables that existed between the treatment and control groups. Cohen’s (1988) $h$ was used in a similar fashion for dichotomous variables. Additionally, Cohen’s (1988) $h$ was used to assess the differences between treatment and control groups in percentage of students enrolled one and two semesters post-treatment and in percentage of students graduating within 4 years. All of the effect sizes were interpreted in consultation with Cohen’s (1988) guidelines for small, medium, and large effects; however, it is important to note that he cautioned against using these arbitrarily. Cohen (1988) urged researchers to interpret effect sizes relative to the specific context and research method.

Means and Standard Deviations of Variables

Means and standard deviations of variables used in this study are shown in Table 1. Several of the variables were dichotomously dummy-coded using 0 and 1. In such instances, the mean is the proportion of observations in the category coded 1 (Hardy, 1993). Two of the variables—SAT score and percentile of high school rank—were missing for some students.
Table 1

*Means (Standard Deviations) of Variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>All (N=1,237)</th>
<th>Treatment Group (N=1,007)</th>
<th>Control Group (N=230)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Independent variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female (yes=1, no=0)</td>
<td>.63 (.48)</td>
<td>.66 (.48)</td>
<td>.52 (.50)</td>
</tr>
<tr>
<td>Minority (yes=1, no=0)</td>
<td>.26 (.44)</td>
<td>.23 (.42)</td>
<td>.41 (.49)</td>
</tr>
<tr>
<td>Catholic (yes=1, no=0)</td>
<td>.76 (.42)</td>
<td>.80 (.40)</td>
<td>.61 (.49)</td>
</tr>
<tr>
<td>Texas resident (yes=1, no=0)</td>
<td>.51 (.50)</td>
<td>.47 (.50)</td>
<td>.68 (.47)</td>
</tr>
<tr>
<td>Commuter (yes=1, no=0)</td>
<td>.09 (.29)</td>
<td>.06 (.23)</td>
<td>.23 (.42)</td>
</tr>
<tr>
<td>Undeclared major (yes=1, no=0)</td>
<td>.30 (.46)</td>
<td>.30 (.46)</td>
<td>.28 (.45)</td>
</tr>
<tr>
<td>SAT score&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1,210 (149)</td>
<td>1,218 (146)</td>
<td>1,175 (155)</td>
</tr>
<tr>
<td>Percentile of high school rank&lt;sup&gt;b&lt;/sup&gt;</td>
<td>82 (17)</td>
<td>82 (16)</td>
<td>82 (18)</td>
</tr>
<tr>
<td>First-year grade point average</td>
<td>3.10 (.52)</td>
<td>3.15 (0.51)</td>
<td>2.92 (0.52)</td>
</tr>
<tr>
<td><strong>Dependent variable</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semesters enrolled post-treatment</td>
<td>3.8 (1.4)</td>
<td>4.0 (1.2)</td>
<td>3.0 (1.7)</td>
</tr>
</tbody>
</table>

<sup>a</sup>Missing SAT score for 10 students in treatment group and 4 students in control group.  
<sup>b</sup>Missing high school rank for 201 students in treatment group and 40 students in control group.
Because all but 14 of the 1,237 students in the study had a SAT score, these few missing values were of negligible importance. Of greater concern was that 241 students did not have a value for percentile of high school rank because some high schools do not rank their students. Students who had missing values for any of the variables in the full regression model were excluded from the sequential regression analysis. This methodology is known as listwise deletion, casewise deletion, or complete case analysis (Allison, 2002). Allison (2002) recommended listwise deletion when the data are missing completely at random, as was presumed the case with high school rank.

Means and standard deviations of variables for the 988 students used in the regression analysis are shown in Table 2. The similarity of the data in Tables 1 and 2 indicated that the exclusion of 249 students with either missing SAT score or percentile of high school rank had little effect on the variables of interest, and confirmed the assumption that the data were missing completely at random. Because percentiles are ordinal rather than interval, problems can occur with their use in a regression equation, particularly if there is wide variation. For example, the distance between the 50th and 51st percentiles is smaller than the distance between the 98th and the 99th percentiles. After examining the mean (82) and standard deviation (17) for percentile of high school rank, it was determined that this was of minimal concern with these data (R.K. Henson, personal communication, June 3, 2003).

Because subjects were not randomly assigned to the treatment and control groups, it was not unexpected to find pre-treatment differences between the two groups for the variables used in the study (Table 2). Two measures of effect size (Cohen’s d and Cohen’s h) were computed for the variables in Tables 2 to illustrate the differences that existed between the treatment and control groups for the dependent and independent variables (Cohen, 1988). Effect size is a
Table 2

Means (Standard Deviations) of Variables Used in Regression

<table>
<thead>
<tr>
<th>Variable</th>
<th>Treatment All N=988</th>
<th>Treatment Group N=798</th>
<th>Control Group N=190</th>
<th>Effect Size(^{a})</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Independent variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female (yes=1, no=0)</td>
<td>.63 (.48)</td>
<td>.66 (.48)</td>
<td>.54 (.50)</td>
<td>0.25</td>
</tr>
<tr>
<td>Minority (yes=1, no=0)</td>
<td>.26 (.44)</td>
<td>.23 (.42)</td>
<td>.41 (.49)</td>
<td>-0.39</td>
</tr>
<tr>
<td>Catholic (yes=1, no=0)</td>
<td>.75 (.43)</td>
<td>.79 (.41)</td>
<td>.59 (.49)</td>
<td>0.44</td>
</tr>
<tr>
<td>Texas resident (yes=1, no=0)</td>
<td>.54 (.50)</td>
<td>.50 (.50)</td>
<td>.72 (.45)</td>
<td>-0.46</td>
</tr>
<tr>
<td>Commuter (yes=1, no=0)</td>
<td>.09 (.28)</td>
<td>.06 (.23)</td>
<td>.23 (.42)</td>
<td>-0.51</td>
</tr>
<tr>
<td>Undeclared major (yes=1, no=0)</td>
<td>.29 (.45)</td>
<td>.29 (.45)</td>
<td>.26 (.44)</td>
<td>0.07</td>
</tr>
<tr>
<td>SAT score</td>
<td>1,206 (148)</td>
<td>1,213 (147)</td>
<td>1,174 (149)</td>
<td>0.26</td>
</tr>
<tr>
<td>Percentile of high school rank</td>
<td>82 (17)</td>
<td>83 (16)</td>
<td>82 (17)</td>
<td>0.06</td>
</tr>
<tr>
<td>First-year grade point average</td>
<td>3.09 (0.52)</td>
<td>3.14 (0.52)</td>
<td>2.91 (0.50)</td>
<td>0.44</td>
</tr>
<tr>
<td><strong>Dependent variable</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semesters enrolled post-treatment</td>
<td>3.8 (1.5)</td>
<td>4.0 (1.3)</td>
<td>3.0 (1.8)</td>
<td>0.66</td>
</tr>
</tbody>
</table>

\(^{a}\)Effect sizes for differences between treatment and control groups were computed using Cohen’s \(d\) for continuous variables and Cohen’s \(h\) for dichotomous variables. Magnitude of effect sizes: \(0.2 = \text{small}, 0.5 = \text{medium}, 0.8 = \text{large}\) (Cohen, 1988).
measure of practical significance (Thompson, 2002). Cohen’s $d$ is the standardized difference between two means, and it was computed by subtracting the mean of the control group from the mean of the treatment group, then dividing by the pooled standard deviation. Values for Cohen’s $d$ of .2, .5 and .8 are generally considered to be small, medium, and large effect sizes, respectively (Cohen, 1988). For variables that are dummy-coded as 0 or 1, the mean is the proportion of observations in the category coded 1. Because the standard deviation of a proportion depends upon the proportion, Cohen (1988) advocated the use of an arcsine transformation to obtain the effect size for the magnitude of differences between two proportions. Each proportion $p$ was subjected to the transformation of $2\arcsin(\sqrt{p})$. The effect size $h$ was computed by subtracting the transformed value for the control group from the transformed value for the treatment group. According to Cohen (1988), values of .20, .50, and .80 should be considered small, medium, and large effect sizes, respectively, for $h$. With larger sample sizes, such as in this study, there is little difference between using $d$ and $h$ for proportions (Cohen, 1988).

In a true experimental design, the random assignment of subjects to treatment and control groups should minimize such differences as those noted. However, in a quasi-experimental design such as this study, these differences are expected and dealt with as part of the statistical analysis. The rationale for the sequential regression approach in this study was so that the association between treatment and persistence could be determined after adjusting for differences in demographic and academic characteristics. Differences between the treatment and control groups for the independent variables were not the focus of this study; however, the small-to-medium values for Cohen’s $d$ and Cohen’s $h$ in Table 2 illustrate the importance of adjusting for
these variables so that the differences between the two groups on the dependent variable can be attributed to the treatment and not to the differences in characteristics of the two groups.
CHAPTER 4

RESULTS

Findings Related to Research Question 1

*Sequential Regression Analysis*

Tables 3A, 3B, and 3C contain the results of the three stages of the sequential regression analysis. Three sets of variables were entered by stages into the regression equation so the additional increase in $R^2$ could be ascertained. The focus of Research Question 1 was on the increase in $R^2$ when treatment was added to the third set of independent variables in the sequential regression equation.

The first set of independent variables contained the five dummy variables indicating the entering fall cohort for each student (Table 3A). Only students entering the University of Dallas as first-time college students in the fall semesters of 1995, 1996, 1997, 1998, 1999, and 2000 were included in this study. Because the dependent variable (number of semesters of enrollment post-treatment) was measured in spring 2003, students in the earlier cohorts had the opportunity to enroll in more semesters than did students in the later cohorts. The association between semester of entry and the dependent variable was measured and adjusted for by including these five dummy variables in the regression equation. The $R^2$ for the regression equation containing only the semester of entry was .0279 (Table 3A), which means that about 3% of the variation in number of semesters of enrollment post-treatment was due to the semester of entry.

The second set of independent variables contained various measures of background, academic integration, and social integration as well as the first set of variables (Table 3B). The $R^2$ for this equation was .0657, and the increase in $R^2$ from the first equation was .0378. The
Table 3A

*Summary of Sequential Regression Analysis (Set 1) for Predicting Number of Semesters of Post-Treatment Enrollment (N=988)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>b Weight</th>
<th>SE</th>
<th>P Value</th>
<th>β Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>4.03</td>
<td>0.10</td>
<td>&lt;.01</td>
<td>0</td>
</tr>
<tr>
<td>1996 cohort (yes=1, no=0)</td>
<td>-0.13</td>
<td>0.14</td>
<td>.37</td>
<td>-0.03</td>
</tr>
<tr>
<td>1997 cohort (yes=1, no=0)</td>
<td>-0.23</td>
<td>0.14</td>
<td>.11</td>
<td>-0.06</td>
</tr>
<tr>
<td>1998 cohort (yes=1, no=0)</td>
<td>-0.01</td>
<td>0.14</td>
<td>.94</td>
<td>-0.003</td>
</tr>
<tr>
<td>1999 cohort (yes=1, no=0)</td>
<td>-0.19</td>
<td>0.14</td>
<td>.17</td>
<td>-0.05</td>
</tr>
<tr>
<td>2000 cohort (yes=1, no=0)</td>
<td>0.71</td>
<td>0.14</td>
<td>&lt;.01</td>
<td>-0.19</td>
</tr>
</tbody>
</table>

*Note.* $R^2 = .0279$ for Set 1.

Nine additional variables in set 2 accounted for less than 4% of additional variance in the dependent variable.

The only difference between the second and third set of independent variables was that a dummy variable for treatment was added to set 3 (Table 3C). The $R^2$ for the regression equation containing the full complement of variables (set 3) was .1078, and the increase in $R^2$ from set 2 was .0421. The data in Table 3C provide much of the answer to the first research question. After adjusting for various measures of background, academic integration, and social integration, the treatment (participation in the Rome Program) explained an additional 4% of the variance in the number of semesters enrolled post-treatment.
Table 3B

Summary of Sequential Regression Analysis (Set 2) for Predicting Number of Semesters of Post-Treatment Enrollment (N=988)

<table>
<thead>
<tr>
<th>Variable</th>
<th>b Weight</th>
<th>SE</th>
<th>P Value</th>
<th>β Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>2.85</td>
<td>0.43</td>
<td>&lt;.01</td>
<td>0</td>
</tr>
<tr>
<td>1996 cohort (yes=1, no=0)</td>
<td>-0.11</td>
<td>0.15</td>
<td>.48</td>
<td>-0.03</td>
</tr>
<tr>
<td>1997 cohort (yes=1, no=0)</td>
<td>-0.21</td>
<td>0.16</td>
<td>.19</td>
<td>-0.05</td>
</tr>
<tr>
<td>1998 cohort (yes=1, no=0)</td>
<td>-0.05</td>
<td>0.15</td>
<td>.74</td>
<td>-0.01</td>
</tr>
<tr>
<td>1999 cohort (yes=1, no=0)</td>
<td>-0.27</td>
<td>0.15</td>
<td>.08</td>
<td>-0.07</td>
</tr>
<tr>
<td>2000 cohort (yes=1, no=0)</td>
<td>-0.75</td>
<td>0.16</td>
<td>&lt;.01</td>
<td>-0.18</td>
</tr>
<tr>
<td>Female (yes=1, no=0)</td>
<td>-0.03</td>
<td>0.10</td>
<td>.77</td>
<td>-0.01</td>
</tr>
<tr>
<td>Minority (yes=1, no=0)</td>
<td>-0.21</td>
<td>0.11</td>
<td>.06</td>
<td>-0.06</td>
</tr>
<tr>
<td>Catholic (yes=1, no=0)</td>
<td>0.26</td>
<td>0.11</td>
<td>.01</td>
<td>0.08</td>
</tr>
<tr>
<td>Texas resident (yes=1, no=0)</td>
<td>-0.04</td>
<td>0.10</td>
<td>.65</td>
<td>-0.02</td>
</tr>
<tr>
<td>Commuter (yes=1, no=0)</td>
<td>-0.15</td>
<td>0.17</td>
<td>.37</td>
<td>-0.03</td>
</tr>
<tr>
<td>Undeclared major (yes=1, no=0)</td>
<td>0.19</td>
<td>0.10</td>
<td>.05</td>
<td>0.06</td>
</tr>
<tr>
<td>SAT score</td>
<td>-0.0001</td>
<td>0.0004</td>
<td>.80</td>
<td>-0.01</td>
</tr>
<tr>
<td>Percentile of high school rank</td>
<td>-0.003</td>
<td>0.003</td>
<td>.45</td>
<td>-0.03</td>
</tr>
<tr>
<td>First-year grade point average</td>
<td>0.44</td>
<td>0.11</td>
<td>&lt;.01</td>
<td>0.16</td>
</tr>
</tbody>
</table>

Note. \( R^2 = .0657 \) for Set 2; increase in \( R^2 = .0378 \) from Set 1.
Table 3C

*Summary of Sequential Regression Analysis (Set 3) for Predicting Number of Semesters of Post-Treatment Enrollment (N=988)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>b Weight</th>
<th>SE</th>
<th>P Value</th>
<th>β Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>2.48</td>
<td>0.42</td>
<td>&lt;.01</td>
<td>0</td>
</tr>
<tr>
<td>1996 cohort (yes=1, no=0)</td>
<td>-0.06</td>
<td>0.15</td>
<td>.70</td>
<td>-0.01</td>
</tr>
<tr>
<td>1997 cohort (yes=1, no=0)</td>
<td>-0.13</td>
<td>0.16</td>
<td>.39</td>
<td>-0.03</td>
</tr>
<tr>
<td>1998 cohort (yes=1, no=0)</td>
<td>0.04</td>
<td>0.15</td>
<td>.78</td>
<td>0.01</td>
</tr>
<tr>
<td>1999 cohort (yes=1, no=0)</td>
<td>-0.15</td>
<td>0.15</td>
<td>.31</td>
<td>-0.04</td>
</tr>
<tr>
<td>2000 cohort (yes=1, no=0)</td>
<td>-0.57</td>
<td>0.16</td>
<td>&lt;.01</td>
<td>-0.14</td>
</tr>
<tr>
<td>Female (yes=1, no=0)</td>
<td>-0.09</td>
<td>0.09</td>
<td>.33</td>
<td>-0.03</td>
</tr>
<tr>
<td>Minority (yes=1, no=0)</td>
<td>-0.17</td>
<td>0.11</td>
<td>.11</td>
<td>-0.05</td>
</tr>
<tr>
<td>Catholic (yes=1, no=0)</td>
<td>-0.18</td>
<td>0.11</td>
<td>.10</td>
<td>0.05</td>
</tr>
<tr>
<td>Texas resident (yes=1, no=0)</td>
<td>-0.0004</td>
<td>0.09</td>
<td>.99</td>
<td>-0.0002</td>
</tr>
<tr>
<td>Commuter (yes=1, no=0)</td>
<td>0.08</td>
<td>0.17</td>
<td>.65</td>
<td>0.01</td>
</tr>
<tr>
<td>Undeclared major (yes=1, no=0)</td>
<td>0.18</td>
<td>0.10</td>
<td>.06</td>
<td>0.06</td>
</tr>
<tr>
<td>SAT score</td>
<td>-0.0001</td>
<td>0.0004</td>
<td>.73</td>
<td>-0.01</td>
</tr>
<tr>
<td>Percentile of high school rank</td>
<td>-0.0009</td>
<td>0.003</td>
<td>.79</td>
<td>-0.01</td>
</tr>
<tr>
<td>First-year grade point average</td>
<td>0.30</td>
<td>0.11</td>
<td>&lt;.01</td>
<td>0.11</td>
</tr>
<tr>
<td>Treatment (yes=1, no=0)</td>
<td>0.83</td>
<td>0.12</td>
<td>&lt;.01</td>
<td>0.22</td>
</tr>
</tbody>
</table>

*Note.*  $R^2 = .1078$ for Set 3; increase in $R^2 = .0421$ from Set 2.
Unstandardized Regression Coefficient for Treatment

Although the primary focus of Research Question 1 was on the increase in $R^2$ when treatment was added to the third set of independent variables in the sequential regression equation, additional insight was obtained by examining the regression coefficients in Table 3C. Although $R^2$ is usually of primary interest to researchers because it is a measure of the explanatory power of the independent variables, the unstandardized regression coefficients (b weights) should also be examined because of their role in the prediction equation (Lewis-Beck, 1980). The interpretation of the b weight of .83 for treatment was that, holding all other variables constant, students who participated in the Rome Program persisted on average .83 semesters longer post-treatment at the University of Dallas than those who did not go to Rome. Comparison of unstandardized regression coefficients provides little information in studies such as this, where independent variables were measured in different units. However, $p$ values for each unstandardized variable can be compared and used to assess statistical significance. Treatment, along with first-year GPA and the 2000 cohort year of entry, were the only variables with $p$ values <.01. The next highest $p$ value (.06) was for undeclared major.

Standardized Regression Coefficients

If all of the independent variables are measured in the same units on the same scale, the unstandardized regression coefficients can be compared and used to determine their relative importance. However, if the independent variables are measured on different scales, as was the case in this study, then standardized regression coefficients should be used to evaluate the relative importance of each independent variable (Fox, 1997; Lewis-Beck, 1980; Schroeder et al., 1986).
Only three of the standardized regression coefficients (β weights) in Table 3C were of sufficient magnitude to be of interest (-0.14, 2000 cohort; 0.11, first-year GPA; and 0.22, treatment). With the exception of the 2000 cohort, the standardized regression coefficients for the other years of entry were essentially 0. The standardized regression coefficient of -0.14 for the 2000 cohort year of entry was probably a reflection of the fact that this cohort was limited by the date of data collection (spring 2003) to a maximum of three semesters post-treatment. The standardized regression coefficient for the treatment (0.22) was twice that for first-year GPA (0.11). However Cohen, Cohen, West, and Aiken (2003) and Fox (1997) urged caution in the interpretation of standardized regression coefficients for dummy variables. A standardized regression coefficient represents the number of standard deviations of change in the dependent variable associated with a 1 standard deviation increase in the independent variable. Fox (1997) stated that it makes no sense to standardize dummy variables because they cannot increase by 1 standard deviation—they can only take on the values of 0 or 1, regardless of the size of the standard deviation. As an alternative, Fox (1997) suggested that only the dependent variable and the continuous independent variables be standardized, and that the dummy variables be left alone.

Tables 4A, 4B, and 4C contain the results of the three stages of the sequential regression analysis when the continuous independent variables were standardized, but not the dummy variables, as recommended by Fox (1997). Although it is common practice to standardize the dependent variable, it is not required because the relative sizes of the standardized regression coefficients are not affected by the units of scale of the dependent variable (Fox, 1997). In order
Table 4A

*Summary of Sequential Regression Analysis (Set 1) for Predicting Number of Semesters of Post-Treatment Enrollment – Independent Continuous Variables Standardized (N=988)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>b Weight</th>
<th>SE</th>
<th>P Value</th>
<th>β Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>4.03</td>
<td>0.10</td>
<td>&lt;.01</td>
<td>0</td>
</tr>
<tr>
<td>1996 cohort (yes=1, no=0)</td>
<td>-0.13</td>
<td>0.14</td>
<td>.37</td>
<td>-0.03</td>
</tr>
<tr>
<td>1997 cohort (yes=1, no=0)</td>
<td>-0.23</td>
<td>0.14</td>
<td>.11</td>
<td>-0.06</td>
</tr>
<tr>
<td>1998 cohort (yes=1, no=0)</td>
<td>-0.01</td>
<td>0.14</td>
<td>.94</td>
<td>-0.003</td>
</tr>
<tr>
<td>1999 cohort (yes=1, no=0)</td>
<td>-0.19</td>
<td>0.14</td>
<td>.17</td>
<td>-0.05</td>
</tr>
<tr>
<td>2000 cohort (yes=1, no=0)</td>
<td>0.71</td>
<td>0.14</td>
<td>&lt;.01</td>
<td>-0.19</td>
</tr>
</tbody>
</table>

Note. $R^2 = .0279$ for Set 1.

to keep the dependent variable in easily understandable units (number of semesters of enrollment post-treatment), it was not standardized for the regression results reported in Tables 4A, 4B, and 4C. The $R^2$ values and the $\beta$ weights in Tables 4A, 4B, and 4C are the same as those in Tables 3A, 3B, and 3C. Of particular interest in Table 4C are the b weights for treatment (.83) and first-year grade point average (.16). Because only the three continuous variables were standardized prior to the regression, the interpretations for these coefficients are not the same as when all variables are standardized. Holding all else constant, a 1 standard deviation increase in first-year grade point average was associated with a .16 increase in number of semesters enrolled post-
Table 4B

*Summary of Sequential Regression Analysis (Set 2) for Predicting Number of Semesters of Post-Treatment Enrollment – Independent Continuous Variables Standardized (N=988)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>b Weight</th>
<th>SE</th>
<th>P Value</th>
<th>β Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>3.88</td>
<td>0.16</td>
<td>&lt;.01</td>
<td>0</td>
</tr>
<tr>
<td>1996 cohort (yes=1, no=0)</td>
<td>-0.11</td>
<td>0.15</td>
<td>.48</td>
<td>-0.03</td>
</tr>
<tr>
<td>1997 cohort (yes=1, no=0)</td>
<td>-0.21</td>
<td>0.16</td>
<td>.19</td>
<td>-0.05</td>
</tr>
<tr>
<td>1998 cohort (yes=1, no=0)</td>
<td>-0.05</td>
<td>0.15</td>
<td>.74</td>
<td>-0.01</td>
</tr>
<tr>
<td>1999 cohort (yes=1, no=0)</td>
<td>-0.27</td>
<td>0.15</td>
<td>.08</td>
<td>-0.07</td>
</tr>
<tr>
<td>2000 cohort (yes=1, no=0)</td>
<td>-0.75</td>
<td>0.16</td>
<td>&lt;.01</td>
<td>-0.18</td>
</tr>
<tr>
<td>Female (yes=1, no=0)</td>
<td>-0.03</td>
<td>0.10</td>
<td>.77</td>
<td>-0.01</td>
</tr>
<tr>
<td>Minority (yes=1, no=0)</td>
<td>-0.21</td>
<td>0.11</td>
<td>.06</td>
<td>-0.06</td>
</tr>
<tr>
<td>Catholic (yes=1, no=0)</td>
<td>0.26</td>
<td>0.11</td>
<td>.01</td>
<td>0.08</td>
</tr>
<tr>
<td>Texas resident (yes=1, no=0)</td>
<td>-0.04</td>
<td>0.10</td>
<td>.65</td>
<td>-0.02</td>
</tr>
<tr>
<td>Commuter (yes=1, no=0)</td>
<td>-0.15</td>
<td>0.17</td>
<td>.37</td>
<td>-0.03</td>
</tr>
<tr>
<td>Undeclared major (yes=1, no=0)</td>
<td>0.19</td>
<td>0.10</td>
<td>.05</td>
<td>0.06</td>
</tr>
<tr>
<td>SAT score (standardized)</td>
<td>-0.02</td>
<td>0.06</td>
<td>.80</td>
<td>-0.01</td>
</tr>
<tr>
<td>Percentile of high school rank (standardized)</td>
<td>-0.04</td>
<td>0.06</td>
<td>.45</td>
<td>-0.03</td>
</tr>
<tr>
<td>First-year grade point average (standardized)</td>
<td>0.23</td>
<td>0.06</td>
<td>&lt;.01</td>
<td>0.16</td>
</tr>
</tbody>
</table>

*Note.* $R^2 = .0657$ for Set 2 increase in $R^2 = .0378$ from Set 1.
Table 4C

Summary of Sequential Regression Analysis (Set 3) for Predicting Number of Semesters of Post-Treatment Enrollment – Independent Continuous Variables Standardized (N=988)

<table>
<thead>
<tr>
<th>Variable</th>
<th>b Weight</th>
<th>SE</th>
<th>P Value</th>
<th>β Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intercept</strong></td>
<td>3.18</td>
<td>0.19</td>
<td>&lt;.01</td>
<td>0</td>
</tr>
<tr>
<td>1996 cohort (yes=1, no=0)</td>
<td>-0.06</td>
<td>0.15</td>
<td>.70</td>
<td>-0.01</td>
</tr>
<tr>
<td>1997 cohort (yes=1, no=0)</td>
<td>-0.13</td>
<td>0.16</td>
<td>.39</td>
<td>-0.03</td>
</tr>
<tr>
<td>1998 cohort (yes=1, no=0)</td>
<td>0.04</td>
<td>0.15</td>
<td>.78</td>
<td>0.01</td>
</tr>
<tr>
<td>1999 cohort (yes=1, no=0)</td>
<td>-0.15</td>
<td>0.15</td>
<td>.31</td>
<td>-0.04</td>
</tr>
<tr>
<td>2000 cohort (yes=1, no=0)</td>
<td>-0.57</td>
<td>0.16</td>
<td>&lt;.01</td>
<td>-0.14</td>
</tr>
<tr>
<td>Female (yes=1, no=0)</td>
<td>-0.09</td>
<td>0.09</td>
<td>.33</td>
<td>-0.03</td>
</tr>
<tr>
<td>Minority (yes=1, no=0)</td>
<td>-0.17</td>
<td>0.11</td>
<td>.11</td>
<td>-0.05</td>
</tr>
<tr>
<td>Catholic (yes=1, no=0)</td>
<td>0.18</td>
<td>0.11</td>
<td>.10</td>
<td>0.05</td>
</tr>
<tr>
<td>Texas resident (yes=1, no=0)</td>
<td>-0.0004</td>
<td>0.09</td>
<td>.99</td>
<td>-0.0002</td>
</tr>
<tr>
<td>Commuter (yes=1, no=0)</td>
<td>0.08</td>
<td>0.17</td>
<td>.65</td>
<td>0.01</td>
</tr>
<tr>
<td>Undeclared major (yes=1, no=0)</td>
<td>0.18</td>
<td>0.10</td>
<td>.06</td>
<td>0.06</td>
</tr>
<tr>
<td>SAT score (standardized)</td>
<td>-0.02</td>
<td>0.06</td>
<td>.73</td>
<td>-0.01</td>
</tr>
<tr>
<td>Percentile of high school rank (standardized)</td>
<td>-0.01</td>
<td>0.05</td>
<td>.79</td>
<td>-0.01</td>
</tr>
<tr>
<td>First-year grade point average (standardized)</td>
<td>0.16</td>
<td>0.06</td>
<td>&lt;.01</td>
<td>0.11</td>
</tr>
<tr>
<td>Treatment (yes=1, no=0)</td>
<td>0.83</td>
<td>0.12</td>
<td>&lt;.01</td>
<td>0.22</td>
</tr>
</tbody>
</table>

Note. \( R^2 = .1078 \) for Set 3; increase in \( R^2 = .0421 \) from Set 2.
treatment. Holding all else constant, the treatment was associated with an increase of .83 semesters enrolled post-treatment over the control. The ratio of the treatment $\beta$ weight to first-year GPA $\beta$ weight was 2 in Table 3C ($0.22/0.11 = 2$). The ratio of treatment $b$ weight to first-year GPA $b$ weight was 5.2 in Table 4C ($0.83/16 = 5.2$). The problem with the interpretation of the treatment $\beta$ weight in Table 3C is that treatment cannot increase by 1 standard deviation because the standard deviation for treatment was .39 and treatment can assume only the values of 0 or 1. However, it makes sense for treatment to increase by 2.6 standard deviations because that results in the value for treatment moving from 0 (control group) to 1 (treatment group). Applying this to the ratio of $\beta$ weights from Table 3C, the relative importance of treatment to first-year GPA was $(0.22 \times 2.6)/0.11 = 5.2$, which is the same result if $b$ weights from Table 4C are used. This demonstrates that the adjusted $\beta$ weights in Table 4C, obtained by standardizing only the continuous independent variables as recommended by Fox (1997), are more appropriate interpretations of the relative importance of the independent variables than are the $\beta$ weights in Table 3C.

*Structure Coefficients*

Structure coefficients are presented in Table 5. Several authors (Burdenski, 2000; Courville & Thompson, 2001; Thompson & Borrello, 1985) have stressed the importance of interpreting structure coefficients along with regression coefficients. Structure coefficients are the correlation coefficients between each independent variable and the predicted dependent variable. When squared, they can be interpreted as the amount of variance in the predicted dependent variable that is accounted for by each independent variable. Courville and Thompson (2001) pointed out that it is erroneous to presume that independent variables with $\beta$ weights near
Table 5

*Structure Coefficients for Predicting Number of Semesters of Post-Treatment Enrollment*

(N=988)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Structure Coefficient</th>
<th>(Structure Coefficient)²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female (yes=1, no=0)</td>
<td>-.004</td>
<td>.00002</td>
</tr>
<tr>
<td>Minority (yes=1, no=0)</td>
<td>-.34</td>
<td>.12</td>
</tr>
<tr>
<td>Catholic (yes=1, no=0)</td>
<td>.29</td>
<td>.08</td>
</tr>
<tr>
<td>Texas resident (yes=1, no=0)</td>
<td>-.21</td>
<td>.04</td>
</tr>
<tr>
<td>Commuter (yes=1, no=0)</td>
<td>-.18</td>
<td>.03</td>
</tr>
<tr>
<td>Undeclared major (yes=1, no=0)</td>
<td>.18</td>
<td>.03</td>
</tr>
<tr>
<td>SAT score</td>
<td>.23</td>
<td>.05</td>
</tr>
<tr>
<td>Percentile of high school rank</td>
<td>.10</td>
<td>.01</td>
</tr>
<tr>
<td>First-year grade point average</td>
<td>.39</td>
<td>.15</td>
</tr>
<tr>
<td>Treatment (yes=1, no=0)</td>
<td>.83</td>
<td>.69</td>
</tr>
</tbody>
</table>

0 do not add to the explanatory value of the regression equation. Two correlated independent variables share some explanatory ability, which may be arbitrarily assigned to one of the variables, causing it to have a higher $\beta$ weight. This assignment of shared variance may result in a low $\beta$ weight for the other correlated variable, appearing as though it makes little contribution (Burdenski, 2000). Because structure coefficients are correlation coefficients (the correlation between the predicted dependent variable and each independent variable), their interpretation can be aided by Cohen’s (1988) guidelines on effect sizes for a correlation coefficient. He suggested
that values of .10, .30, and .50 be considered small, medium, and large effect sizes, respectively, for a correlation coefficient.

The structure coefficients in Table 5 are the correlations between each independent variable (except for year of entry) in Table 3C and the number of semesters of post-treatment enrollment predicted by the b weights in Table 3C. Because the data contained six entering freshman cohorts, there were five dummy variables for year of entry. Interpretation of structure coefficients in such situations is not recommended (R.K. Henson, personal communication, June 3, 2003). Using Cohen’s (1988) guidelines, all but three of the structure coefficients in Table 5 were in the range of small-to-medium effect size. The structure coefficient for female was essentially 0 (no effect). Structure coefficients for minority (-.34) and first-year GPA (.39) demonstrated a medium-to-large effect for each of these variables. Most importantly, the structure coefficient for treatment was .83, demonstrating a large association between Rome participation and number of semesters of enrollment post-treatment. The importance of Rome participation, as evidenced by the structure coefficient, concurred with the adjusted \( \beta \) weights in Table 4C. When the structure coefficients in Table 5 were squared, it can be seen that treatment alone accounted for 69% of the total variance accounted for by all the variables in the model. A variable with a \( \beta \) weight near 0 and a larger squared structure coefficient indicates that the variable is important in prediction but the shared predictive power of that variable was assigned to another independent variable (Courville & Thompson, 2001). A comparison of the adjusted \( \beta \) weights in Table 4C to the squared structure coefficients in Table 5 showed that the variables with the lowest adjusted \( \beta \) weights (Texas resident, -0.0004; percentile of high school rank, -0.01; SAT score, -0.02) had squared structure coefficients of .04, .01, and .05, respectively, indicating some multi-collinearity in these data. A variable with a large absolute \( \beta \) weight and
near-zero squared structure coefficient is indicative of a suppressor effect (Courville & Thompson, 2001). The largest absolute adjusted β weight was for treatment (0.83), with the next largest in the range of 0.16 to 0.18 for first-year GPA, minority, Catholic and undeclared major. Of these variables, undeclared major had the lowest squared structure coefficient (.03), and the next lowest was .08 for Catholic. Based on the guidelines given by Courville and Thompson (2001), these data showed little evidence of a suppressor effect; however the change of sign for commuter between the adjusted β weight (0.08) and the structure coefficient (-0.18) was suspicious.

Findings Related to Research Questions 2 and 3

The data in Table 6 show that 96% of the treatment group was enrolled at the University of Dallas one semester after receiving the treatment and that 91% was enrolled two semesters post-treatment. In contrast, 80% and 72% of the control group were enrolled one and two semesters post-treatment, respectively. No hypothesis tests were conducted on the differences between the treatment and control groups because the data in Table 6 are population, not sample, data. However, the practical significance of the magnitude of the differences between the treatment and control groups were evaluated using Cohen’s (1988) effect size h for differences between proportions. Each proportion p was subjected to the transformation of 2*arcsine*(square root of p). The effect size h was computed by subtracting the transformed value for the control group from the transformed value for the treatment group. According to Cohen (1988), values of .20, .50, and .80 should be considered small, medium, and large effect sizes, respectively, for h. The differences between the treatment and control groups in the proportion of students enrolled one and two semesters post-treatment were of medium effect size.
Table 6

Means (Standard Deviations) of Percentage of Students Enrolled 1 and 2 Semesters Post-Treatment (N=1,237)

<table>
<thead>
<tr>
<th>Item</th>
<th>All N=1,237</th>
<th>Treatment N=1,007</th>
<th>Control N=230</th>
<th>Effect Size a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrolled 1 semester post-treatment</td>
<td>.93 (.26)</td>
<td>.96 (.20)</td>
<td>.80 (.40)</td>
<td>.53</td>
</tr>
<tr>
<td>Enrolled 2 semesters post-treatment</td>
<td>.88 (.33)</td>
<td>.91 (.28)</td>
<td>.72 (.45)</td>
<td>.51</td>
</tr>
</tbody>
</table>

Effect sizes for the difference between treatment and control groups were computed using Cohen’s $h$. Magnitude of effect sizes: .2 = small, .5 = medium, .8 = large (Cohen, 1988).

Table 7

Means (Standard Deviations) of Percentage of Students Graduating Within 4 Years of Initial Entry (N=797)

<table>
<thead>
<tr>
<th>Item</th>
<th>All N=797</th>
<th>Treatment N=674</th>
<th>Control N=123</th>
<th>Effect Size a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduated within 4 years</td>
<td>.75 (.43)</td>
<td>.79 (.41)</td>
<td>.51 (.50)</td>
<td>.60</td>
</tr>
</tbody>
</table>

Effect size for the difference between treatment and control groups was computed using Cohen’s $h$. Magnitude of effect sizes: .2 = small, .5 = medium, .8 = large (Cohen, 1988).
Findings Related to Research Question 4

The data in Table 7 show that 79% of the treatment group graduated from the University of Dallas within 4 years of initial entry. In contrast, 51% of the control group graduated within 4 years. No hypothesis tests were conducted on the difference between the treatment and control groups because the data in Table 7 are population, not sample, data. However, the practical significance of the magnitude of the difference between the treatment and control groups was evaluated using Cohen’s (1988) effect size $h$ for differences between proportions. Each proportion $p$ was subjected to the transformation of $2 \cdot \text{arcsine} \cdot (\text{square root } p)$. The effect size $h$ was computed by subtracting the transformed value for the control group from the transformed value for the treatment group. According to Cohen (1988), values of .20, .50, and .80 should be considered small, medium, and large effect sizes, respectively, for $h$. The difference in 4-year graduation rates between the treatment and control groups was a medium-to-large effect.
CHAPTER 5
DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Discussion

Association Between Treatment and Persistence—Sequential Regression Analysis

Prior to conducting the sequential regression, it was determined that the regression would consist of three stages (also referred to as sets or steps). The use of the term “step” in this research should not be confused with stepwise regression, where an algorithm determines the “best” set of variables based on certain criteria. In contrast, the selection of variables for each step of sequential regression is determined by the researcher and is based on understanding of the data and knowledge of the underlying theory.

The first step of the sequential regression adjusted for year of entry, which resulted in $R^2 = .0279$ (Tables 3A and 4A). Because the dependent variable (number of semesters of enrollment post-treatment) was measured in spring 2003, students in the earlier cohorts had the opportunity to enroll in more semesters than did students in the later cohorts. By adjusting for year of entry in the first stage of the sequential regression, the incremental increases in $R^2$ in subsequent steps were not affected by the fact that students in earlier cohorts had the opportunity to enroll in more semesters post-treatment than did students in later cohorts.

The second step of the sequential regression added nine variables that are widely accepted throughout the literature as associated with persistence, which increased the $R^2$ by .0378 (Tables 3B and 4B). In the context of Tinto’s model, these nine variables represented measures of background, academic integration, and social integration (Tinto, 1975, 1993). These variables were added to the model in the second stage for two reasons. First, the collective
association between these nine variables and persistence could be determined by adding them after the adjustment for year of entry. Second, the additional association between treatment and persistence could be determined after identifying the association between these variables and numbers of semesters enrolled post-treatment in this step.

The final step of the sequential regression added a dummy variable indicating whether the student was in the treatment (Rome participant) or control group. The increase in $R^2$ for this final step was .0421 (Tables 3C and 4C), which was larger than the increases for either of the first two steps. The single variable indicating whether or not a student participated in Rome explained slightly more (4.21% versus 3.78%) of the variance in number of semesters enrolled post-treatment than did all nine of the variables in stage 2.

The $R^2$ for the regression equation containing the full complement of variables was .1078 (Tables 3C and 4C). Cohen (1988) suggested $R^2$ values of .0196, .13, and .26 as guidelines for small, medium, and large effect sizes in social science research. Based on these values, the overall model $R^2$ of .1078 indicated that these variables taken together had a medium effect on number of semesters enrolled post-treatment.

Association Between Treatment and Persistence—Other Measures

The importance of the treatment in explaining the number of semesters enrolled post-treatment was demonstrated not only by the increase of .0421 in $R^2$ for the final step in the sequential regression, but also by the sizes of the $b$ weight for treatment (Table 3C), adjusted $\beta$ weights (Table 4C), and structure coefficient for treatment (Table 5). The $b$ weights (Table 3C) would be used if one were interested in predicting the number of semesters of enrollment post-treatment for a particular student. The interpretation of the $b$ weight of .83 for treatment was that, holding all other variables constant, students who participated in the Rome Program persisted on
average .83 semesters longer post-treatment at the University of Dallas than those who did not go
to Rome. The interpretation of the adjusted β weights (Table 4C) was that treatment was far
more important in predicting number of semesters enrolled post-treatment than any other
variable, more than 4.5 times as important as the next highest variables (Catholic, undeclared
major, minority, and first-year GPA). The analysis of structure coefficients (Table 5) confirmed
the pre- eminent importance of treatment. The structure coefficient for treatment was more than
twice the size of the next largest structure coefficients (first-year GPA, minority, and Catholic).
Together, all of the variables in the regression model explained about 11% of the variance in
number of semesters enrolled post-treatment; however, the structure coefficient of .83 for
treatment indicated that 69% of the explained variance was due to the solitary contribution of
treatment. First-year-grade point average and minority status made the next-highest solitary
contributions at 15% and 12%, respectively.

Strong evidence of a positive association between participation in the Rome Program
and the number of semesters enrolled post-treatment was present in all of the statistical measures
examined in this study (incremental increase in R², b weights, adjusted β weights, and structure
coefficients). Why was this single variable so important? Perhaps it was because participation
in the Rome Program was associated with both academic and social integration, whereas the
other variables in the model were either background measures or contributed to only one aspect
of integration. Gender, ethnicity, religion, Texas residency, SAT score, percentile of high school
rank, and major represented pre-entry personal, intellectual, and educational attributes. First-
year GPA and commuter status represented the constructs of academic and social integration,
respectively. Tinto (1993) characterized academic and social integration as consisting of both
formal and informal components. For academic integration, he considered academic
performance as the formal subsystem and student interactions with faculty and staff as the informal subsystem. For social integration, he classified extracurricular activities as the formal subsystem and peer group interactions as the informal subsystem. Because first-year GPA was the only measure of academic integration in this study, the informal component of academic integration was not represented in the model. Similarly for social integration, the model contained commuter status as a proxy for the formal component of extracurricular activities, but it did not contain a measure for peer group interaction.

The nature of the Rome Program created an environment ripe for student interaction with each other and with faculty. The 80-to-100 students who participated in the Rome Program each semester lived in residence halls that were in close proximity to faculty and staff residences on the 12-acre University of Dallas Rome campus. All students studied essentially the same courses in Rome (i.e., art and architecture, literary traditions, western civilization, philosophy, theology, Italian). The Rome Program provided an opportunity for students to more intensely experience the University of Dallas core curriculum, which focuses on the great deeds, ideas, and works of western civilization (University of Dallas General Bulletin, 2002). Students participated in academic field trips led by faculty and went on other excursions in small groups. It is likely that the living and learning arrangements of the Rome Program created an atmosphere of enhanced interaction with faculty and peer groups that exceeded the interactions experienced by students who did not go to Rome. Thus, participation in the Rome Program was likely associated with both academic and social integration as defined by Tinto (1993), and was of pre-eminent importance in explaining number of semesters enrolled post-treatment.

In its complete form, Tinto’s model purports that initial goal and institutional commitments are modified by the amount of academic and social integration, and impact the
persistence decision. No measures of goal and institutional commitments were available for this study. However, it is likely that the Rome experience solidified commitment to the University of Dallas and to its mission. Virtually all undergraduate students at the University of Dallas believe in the importance of a liberal education. However, it may be that students emerged from the Rome Program with a new appreciation for the classical works of western civilization, which deepened their commitment to completing their undergraduate education at the University of Dallas.

Assessment of Significance of Participation in Rome Program

Statistical significance testing has been widely used for decades to determine the probability of obtaining the results (or more extreme results) observed in the sample given that the specified null hypothesis is true for the population (Kirk, 1996). A variety of short-comings of statistical significance testing have been noted by Cohen (1994), Kirk (1996) and Thompson (2002). Most notable is that statistical significance tests provide no information as to whether or not the results are axiologically important. Kirk (1996) defined practical significance as “concerned with whether the result is useful in the real world” (p. 746) and suggested a number of measures of effect magnitude that could be used to assess practical significance. Thompson (2002) argued that researchers should supplement statistical significance with practical and clinical significance. Clinical significance refers to whether a treatment makes a real difference in the quality of life of the participants. In addition to statistical, practical, and clinical significance, Leech and Onwuegbuzie (2003) proposed the use of economic significance, which they defined as the economic value of effect of a treatment, when making educational policy decisions. There was strong quantitative evidence for statistical and practical significance for the
association between participation in the Rome Program and number of semesters enrolled post-treatment. In addition, there was anecdotal evidence for clinical and economic significance.

Statistical significance was demonstrated by a $p$ value of $<.01$ for treatment (Tables 3C and 4C). Furthermore, the $F$ test for the increase in $R^2$ (Cohen et al., 2003) from .0657 to .1078 when treatment was added to the model (Tables 3C and 4C) had a $p$ value $<.01$.

Practical significance can be assessed by evaluating various measures of strength of association, such as $r$, $r^2$, $R$, and $R^2$ (Kirk, 1996). Based on Cohen’s (1988) guidelines, the $R^2$ for the overall model (.1078) was a medium effect size and the increase in $R^2$ of .0421 when treatment was added to the model represented a small-to-medium effect. Cohen (1988) stated that a medium effect size “is large enough to be visible to the naked eye” and that “in the course of normal experience, one would become aware of an average difference…between…groups” (p. 26). Because structure coefficients are correlation coefficients, they also can be used to evaluate practical significance. Based on Cohen’s (1988) guidelines, the structure coefficient for treatment (.83, Table 5) represented a large effect.

Clinical significance refers to whether a treatment makes a real difference in the quality of life of the participants (Thompson, 2002). Anecdotal data from students who participated in the Rome Program have shown that it greatly enhanced their educational experience (Heyne, 2002; Loufus, 2003). Alumni have fond memories of their semester in Rome. Furthermore, Rome participants graduated at a higher rate than non-participants (Table 7). The positive effects on a person’s life of obtaining a college degree are well documented (Alexander, 1996; Pascarella & Terenzini, 1991).

Leech and Onwuegbuzie (2003) defined economic significance as the economic value of the effect of a treatment, and advocated its use by policy makers when assessing educational
interventions. Cost-effectiveness, cost-benefit, cost-utility, cost-feasibility, and cost-sensitivity were among the measures they proposed for economic significance. The regression coefficient for treatment was .83 (Tables 3C and 4C), indicating that students who participated in the Rome Program were enrolled at the University of Dallas for almost one semester more than non-participants. At current tuition (2003-04 academic year) of $8806 per semester and an average discount rate of 43%, an additional semester of enrollment for 200 students per year yields net tuition revenue of $833,224 (8,806*.57*.83*200). For the fiscal year ending May 31, 2003, there was a net loss of $799,659 for the Rome Program; however, $356,500 of that loss was debt service for the Rome facilities, which will diminish each year and eventually reach $0 (M.P. Daly, personal communication, July 10, 2003). When the net tuition revenue associated with increased persistence by students who go to Rome is considered, the annual economic benefit of the Rome Program is approximately $33,565 ($833,224 - $799,659). The results of this study provide solid evidence for making a business case that the $800,000 annual loss on the Rome program is over-stated and should be viewed differently.

Understanding Persistence Beyond Freshman-to-Sophomore Retention

Most of the persistence research reported in the literature is based on freshman-to-sophomore retention. Studies on graduation rates do not always provide details on year-to-year retention. This study was about persistence during and after the sophomore year because students had to be enrolled during the sophomore year to be included in the study. Although the $R^2$ for the full regression model was about 11%, which was a medium effect size according to Cohen (1988), these variables were a long way from explaining the majority of the variance. In previous research with the cohorts in this study, the same independent variables were used, but the dependent variable was defined as total number of fall and spring semesters enrolled at the
University of Dallas. Also, students who completed their freshman year at the University of Dallas with a GPA of 2.0 or above, but who did not return for their sophomore year, were included in the control group. In that model, year of entry explained about 6% of the variance, with the nine variables in step 2 adding an additional 25%, and treatment adding an additional 20% for a total $R^2$ of .51. So it was surprising to find that only 11% of the variance was explained in the model in this study. A comparison of the results from these two studies indicates that persistence during and after the sophomore year was not associated to the same extent with pre-entry background characteristics, academic integration, and social integration as was persistence from freshman to sophomore year.

Summary of Findings

The four research questions and their answers follow.

1. After adjusting for background characteristics, academic integration, and social integration, what was the association between participation in the Rome Program and the number of semesters of persistence at the University of Dallas after the Rome Program experience?

Nine variables that measured background characteristics, academic integration, and social integration explained 3.8% of the variation in number of semesters enrolled post-treatment. Participation in the Rome Program explained an additional 4.2%. In all of the statistical measures examined in this study (incremental increase in $R^2$, b weights, adjusted $\beta$ weights, and structure coefficients), there was evidence of an important positive association between participation in the Rome Program and persistence. Based on the $b$ weight in the regression equation, holding all other variables constant, students who participated in the Rome Program persisted on average .83 semesters longer post-treatment at the University of Dallas than those who did not go to Rome.
2. What percentage of participants in the Rome Program persisted at the University of Dallas one semester after their participation?

Of the 1,007 students in this study who went to Rome, 96% were enrolled at the University of Dallas one semester after Rome participation. This compared to 80% for the 230 students in the control group.

3. What percentage of participants in the Rome Program persisted at the University of Dallas two semesters after their participation?

Of the 1,007 students in this study who went to Rome, 91% were enrolled at the University of Dallas two semesters after Rome participation. This compared to 72% for the 230 students in control group.

4. What percentage of participants in the Rome Program graduated from the University of Dallas within 4 years of initial entry?

Of the 674 students in the study who went to Rome and had the opportunity to graduate within 4 years, 79% graduated within 4 years. This compared to 51% for 123 students in the control group.

Conclusions

There is a statistically and practically significant positive association between participation in the Rome Program and persistence at the University of Dallas. The results of various statistical measures and the demonstration of projected additional net tuition revenue indicate a large effect size for participation in the Rome Program. It is likely that participation in this particular study-abroad program is associated with both academic and social integration as defined by Tinto (1993) because of the amount of interaction between students and faculty (one
of Tinto’s measures of academic integration) and between students themselves (one of Tinto’s measures of social integration).

Recommendations

Four recommendations emerged from this study:

1. The University of Dallas should continue the Rome Program.

2. More research is needed to gain a better understanding of the factors associated with persistence beyond the sophomore year.

3. A model that more fully operationalizes Tinto’s model would be helpful in understanding the association between participation in the Rome Program and persistence.

4. When conducting regression analysis with continuous and dummy variables and evaluating standardized regression coefficients, the dummy variables should not be standardized.

Continuation of Rome Program

The Rome Program has long been considered a vital part of the classical liberal arts education that is fundamental to the mission of the University of Dallas. Until this study, the association between participation in the Rome Program and persistence was unknown. In the past, some faculty and administrators had speculated about a retention problem for students returning from Rome. However, others thought that students who went to Rome were more likely to persist at the University of Dallas. This study provides strong quantitative evidence for statistical and practical significance for the association between participation in the Rome Program and persistence at the University of Dallas. Furthermore, clinical and economic significance are indicated from anecdotal evidence such as commentaries by students on their Rome experiences and by net tuition revenue projections. In addition to serving a pedagogical purpose in studying the Italian and Greek classics in their original environment, the Rome
Program is associated with increased persistence, graduation rates, student satisfaction, and net tuition revenue.

**More Research on Persistence Beyond the Sophomore Year**

Most of the persistence research reported in the literature is based on freshman-to-sophomore retention. Studies on graduation rates do not always provide details on year-to-year retention. This study provided information about persistence during and after the sophomore year because students had to be enrolled during the sophomore year to be included in the study. Although the \( R^2 \) for the full regression model was about 11\%, which was a medium effect size according to Cohen (1988), these variables were a long way from explaining the majority of the variance. In previous research with the cohorts in this study, freshman-to-sophomore year retention was studied by including in the control group students who completed their freshman year at the University of Dallas with a GPA of 2.0, but who did not return for their sophomore year. The same independent variables were used, but the dependent variable was defined as total number of fall and spring semesters enrolled at the University of Dallas. That \( R^2 \) for that model was .51, considerably higher than what was found in this study (.11). A comparison of the results from these two studies indicates that persistence during and after the sophomore year was not associated to the same extent with pre-entry background characteristics, academic integration, and social integration as was persistence from freshman to sophomore year. The literature needs to be augmented with more studies on the correlates with persistence beyond the sophomore year.

**Model That More Fully Operationalizes Tinto’s Model**

Not all of the constructs in Tinto’s model were operationalized in this study, and those that were operationalized had limited measures. In its complete form, Tinto’s (1993) model is
comprised of pre-entry background attributes, initial goal and institutional commitments, external commitments, academic integration, social integration, modified goal and institutional commitments, modified external commitments, and the persistence decision. No measures of initial or modified goal, institutional, and external commitments were available for this study. One can only speculate on the results if measures for these constructs had been available.

Participation in the Rome Program was associated with persistence, but it is plausible that students who participated in the Rome Program were those with high levels of institutional commitment, which also would have been associated with persistence.

Pre-entry personal attributes were represented in this study by gender, ethnicity, religion and Texas residency, and major. Tinto (1993) also included characteristics such as social status, financial resources, parental education, values, motivation, and expectations as important measures of personal background. None of these were available for this study.

Variables representing intellectual ability (SAT score) and prior educational achievement (percentile of high school rank) were included as background variables; however, the incorporation of multiple measures of these constructs (e.g., performance on other standardized tests, high school grade point average) may have enhanced this study.

The constructs of academic and social integration were each operationalized by only one measure—first-year grade point average for academic integration and commuter status for social integration. Multiple measures for these constructs would have been desirable, as would have been a more direct measure of social integration.

*Dummy Variables Should Not be Standardized*

A standardized regression coefficient represents the number of standard deviations of change in the dependent variable associated with a 1 standard deviation increase in the
independent variable. Fox (1997) stated that it makes no sense to standardize dummy variables because they cannot increase by 1 standard deviation—they can only take on the values of 0 or 1, regardless of the size of the standard deviation. As an alternative, Fox (1997) suggested that only the dependent variable and the continuous independent variables be standardized, and that the dummy variables be left alone. Results from this study verified that the adjusted $\beta$ weights, obtained by standardizing only the continuous independent variables, were more appropriate interpretations of the relative importance of the independent variables than were the $\beta$ weights, which were obtained by standardizing both the dummy and continuous variables.
REFERENCE LIST


