

ABSTRACT

MCLAUGHLIN, JACQUELINE ELAINE. An Examination of the Influence of Institutional Context on Academic Progress Rates at Division I Institutions: A Multilevel Approach. (Under the direction of Dr. Tamara V. Young).

The growing attention given to intercollegiate athletics in recent years amid ongoing controversies highlights the importance of closely examining the implementation and impact of sports policy on college campuses. In an attempt to improve the academic performance and retention of student-athletes, the Academic Progress Rate (APR) was implemented by the National Collegiate Athletic Association (NCAA) in 2003. Previous research has shown that a wide range of factors can impact the educational attainment of student-athletes yet little is known about the APR and its relationship to team characteristics and institutional context. Using hierarchical linear modeling, this study examined the variance associated with APRs using predictors of team gender, sport type, squad size, institutional control, conference affiliation, institutional spending, enrollment, residence hall capacity, financial aid, school demographics, and selectivity.

The sample consisted of 5,422 APR scores from 331 Division I institutions. Thirty-nine percent of the variance in APRs was explained by institutional effects when there were no predictors entered into the model. Entering team characteristics into the model accounted for 24% of the explainable variance at level-1. When controlling for all other variables, female teams were positively associated with APRs while teams from high profile sports and teams with larger squad sizes were negatively associated with APRs. These predictors helped explain variance in APRs, however they did not fully explain differences between institutions.

Adding institutional characteristics to the model explained an additional 33% of the variance between schools. Controlling for team and institutional characteristics accounted for 72% of the between-group variability in APRs. Institutional control, enrollment, institutional expenditures, and residence hall capacity were positively related to APRs. Percent of student body receiving Pell grants and ethnicity were negatively associated with APR. Conference affiliation, selectivity, and institutional gender were not significant in the final model.

This study demonstrates that a significant relationship exists between institutional characteristics and the APR and that institutions are differentially equipped to handle APR requirements. The findings extend our current understanding of the relationship between institutional characteristics and student-athlete outcomes and provide the first step towards (a) understanding student-athlete retention and academic progress in a hierarchical framework and (b) analyzing the APR—an understudied index that involves significant sanctions for schools that fail to meet the NCAA's APR standard. It also establishes the groundwork for further investigation of the APR and provides stakeholders with valuable information for facilitating an environment of informed decision making.

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An Examination of the Influence of Institutional Context on Academic Progress Rates at
Division I Institutions: A Multilevel Approach

by
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DEDICATION

This doctoral dissertation is dedicated to my family, who has provided endless support and encouragement, and to the memory of my beloved grandmother, Virginia Adkerson McLaughlin. Thank you for your patience, prayers, and support. I could not have done this without you.

BIOGRAPHY

Jacqueline Elaine McLaughlin is a native of Blacksburg, VA. She is the only daughter of Drs. Gerald and Joretta McLaughlin and the youngest of three siblings: Joseph and George. After graduating from Blacksburg High School in 1995, Jacqueline obtained her Bachelor of Science degree in biological engineering in 1999 from North Carolina State University and her Master of Science degree in biomedical engineering in 2002 from the University of Memphis. Following the completion of her Master of Science degree, Ms. McLaughlin coached swimming and diving for Davidson College from 2002-2004 and North Carolina State University from 2004-2011.

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Chapter I: Introduction

The educational attainment and achievement of student-athletes has undergone considerable scrutiny in recent years, prompting higher education policy makers to examine ways to improve student outcomes for this group. In 2003, the National Collegiate Athletic Association (NCAA) implemented the Academic Progress Rate (APR), which is a real-time measure of retention and academic eligibility for each team competing in Division I athletics. The development of the APR was driven by college presidents, who mandated that a system of campus accountability be implemented to reform the academic performance of student-athletes in Division I colleges and universities. While the initial results of the APR are promising, the relationship between the APR and team and institutional contexts is not fully understood.

In 1978, Snyder and Spreitzer noted that, “Valid comparisons between collegiate athletes are difficult because of the variations in institutional quality, degree programs, type of sport, and other potentially contaminating factors” (p. 76). Due to methodological limitations and lack of accessible data, the schools sampled in athletics research to date simply do not represent the large variation found among Division I institutions. Most institutions studied in the literature are uniquely selective (e.g., Shulman & Bowen, 2001; Schroeder, 2000) or home to prominent athletic programs (e.g., Hildenbrand, Sanders, Leslie-Toogood, & Benton, 2009; Heydorn, 2009), making it difficult to get a clear picture of how varying institutional environments impact student-athlete outcomes. In addition, the vast majority of research in college athletics has been limited to student-level data (e.g., Gayles, 2004; Pascarella & Smart, 1991; Petrie & Stoeber, 1997; Ryan, 1989, Sedlacek & Adams-

Gaston, 1992), leaving the impact of team-specific traits and institutional environments unexamined. While many student attributes like personality, motivation, and academic preparedness are largely beyond an institution's control, the conditions within an institution and its athletic programs are not. As such, understanding how environmental contexts affect educational outcomes can equip colleges and universities to develop strategies and implement policies geared towards the retention and academic progress of student-athletes. To fully understand how these contexts are associated with student-athlete outcomes among a wide range of schools, this study examined the effects of team-level and institution-level variables on APR scores at all Division I institutions.

NCAA and Student-Athlete Outcomes

The NCAA has grown significantly since it was founded in 1906 with 38 member institutions. By 1942 the NCAA was comprised of 314 schools, including “nearly every college or university of importance in the country” (Stagg, 1946, p. 81). In 1973, the NCAA attempted to address the wide range of fiscal disparities associated with its large and diverse membership of more than 600 institutions by restructuring into three divisions: Division I, Division II, and Division III. During the 1980s, college sports experienced notable financial and membership growth, which led to increased television exposure and lucrative contracts. In 1983, for example, sixteen NCAA division I football games generated more than \$27 million for participating schools and conferences. The Fiesta Bowl alone distributed \$380,000 to its participants in 1981, \$687,000 in 1982, and \$1.7 million in 1983 (Shropshire, 1997). Today, college athletics is a multibillion dollar industry with the NCAA boasting more than 1,000 institutions and nearly 400,000 student-athletes.

Since its inception, the NCAA has experienced ongoing criticism concerning the academic performance of its participants. In its earliest years, the NCAA lacked both the legislative authority and manpower to preserve academic integrity across institutions. Critics watched in frustration as schools established their own admissions, matriculation, and grading standards (Carter, 2006) and courted student-athletes with enticements such as all-expense-paid vacations (Waller, 2003). Nearly 100 years later, despite extensive legislation to regulate recruiting, competition, and financial aid, the NCAA continues to face significant criticism. Popular descriptions of intercollegiate sports and its participants, such as jock majors, counterfeit amateurs, and overscheduled and overcommitted emphasize the apparent imbalance between academics and athletics seen on today's college campuses (Harmon, 2010; Sack, 2008; Suggs, 2003). College sports scandals during the 2010-2011 year at University of Connecticut, Ohio State University, Auburn University, and University of Tennessee (Marshall, 2011) highlight the persistent compliance problems in athletic departments across the country.

In response to these and other concerns, the NCAA has implemented a variety of academic reform efforts over the years. The Sanity Code, which attempted to refocus the role of athletics on college campuses, banned all athletic scholarships and limited financial aid to need-based only in 1951 (Ratliff, 1951). It also held student-athletes to the same academic standards as the student body and prohibited coaches from recruiting any prospective student-athlete with an offer of financial aid or an equivalent inducement (Falla, 1981). Despite strong support for the code initially (Rasmuson, 1968), the restrictions in the Sanity Code were so severe that the majority of institutions simply refused to adhere to it, prompting

the NCAA to repeal the legislation after three years. The 1.6 Rule, which relied on a complex forecasting formula that predicted an incoming student's ability to maintain a 1.6 grade point average (GPA) during the first year of college, was the first effort by the NCAA to establish uniform eligibility requirements for all institutions (Waller, 2003). It was expanded with the 2.0 Rule in 1973, which raised the GPA requirement to 2.0, and Proposition 48 in 1986. Proposition 48 revised the 2.0 Rule by establishing a minimum SAT score, removing the use of high school rank, and identifying specific high school coursework required for eligibility (Edwards, 1984). The NCAA continued to use Proposition 48 until it toughened its academic requirements with Proposition 16 in 1996 (Waller, 2003).

Despite the more stringent eligibility standards established by Proposition 16, research continues to reveal alarming trends in student-athlete outcomes, such as poor academic performance, attrition, lack of academic integrity, and underdeveloped career skills (Hamilton, 2005; Hodge, Harrison, Burden, & Dixon, 1998; Martens & Cox, 2000). Statistics concerning high profile and minority student-athletes have drawn significant attention to these trends. For instance, in 1997, 62% of the student-athletes who participated in Division I men's basketball were African American males. Yet, 58 of the 328 Division I men's basketball teams failed to graduate a single African American player from 1997-2003 (Wilstein, 2003). In the 1990s and 2000s, men's basketball programs like University of Nevada-Las Vegas and the University of Cincinnati became notorious for recruiting, but rarely graduating, elite-level athletes. For a four-year period in the early 2000s, the NCAA reported that the University of Cincinnati men's basketball graduation rate was 0.0% (Yost, 2008).

Academic Progress Rate

Media outlets, academicians, sports fans, and other constituents grew outraged by the apparent exploitation of minority athletes, the ongoing abuses of student-athlete education, and the growing commercialization of college athletics. Calls for reforms (e.g., Bowen & Levin, 2003) became widespread and, in 2003, the NCAA implemented its newest academic reform initiative for Division I athletics. The centerpiece of the reform effort was a new measure called the APR. According to the NCAA codebook,

The APR includes student-athlete eligibility, retention and graduation as factors in a formula that yields a single number, providing a much clearer picture of the current academic culture on each Division I sports team in the country. Over the last five years, the APR has become an important measure of student-athlete academic success. For high APR scores, the NCAA recognizes member institutions for ensuring that student-athletes succeed in the classroom. If, however, low APR scores are earned consistently, member institutions can be subjected to penalties including scholarship reductions and the loss of eligibility to compete in championships. (p. iii)

Developed as a real-time assessment (i.e., computed each term) of teams' academic performance, the APR is comprised of two measures: academic eligibility and retention (NCAA, 2011a). Each term, a scholarship student-athlete that meets academic eligibility standards and remains at the institution is awarded two points. Failure of a student-athlete to maintain academic eligibility or to stay at the institution results in the loss of one point. A

team's APR is the total points earned by the scholarship student-athletes on that team during a single term divided by the total points possible multiplied by 1,000.

$$\text{APR} = \frac{\Sigma(\text{retention} + \text{eligibility})_{\text{earned}}}{\Sigma(\text{retention} + \text{eligibility})_{\text{possible}}} \times 1000$$

Barring special circumstances, a student-athlete must return to the institution for the following regular term or transfer and enroll full-time in another four-year institution to earn the retention point (NCAA, 2011b). However, several scenarios can warrant waiving the retention point. Student-athletes that leave the institution to pursue a professional sports career can be granted a retention waiver if they leave eligible, document a declaration of intent to compete as a professional athlete, and sign a professional contract. Student-athletes that leave the institution in pursuit of the Olympics can also be granted a legislated Olympic waiver, which waives the retention point. When a retention point is waived, it is removed from the denominator of the APR calculation. For example, when a student-athlete is awarded a retention waiver, he or she can earn 1 out of 1 point for remaining academically eligible or 0 out of 1 point for failing to remain academically eligible (NCAA, 2011a).

To earn the academic eligibility point, a student-athlete must meet the NCAA's standard for *progress towards degree* in addition to conference and institutional requirements for *academic good standing* (NCAA, 2011b). In 2005 the NCAA introduced the progress toward degree requirement in an effort to encourage student-athlete retention and increase overall academic achievement. These standards are more stringent than the academic good standing requirements at most colleges and universities. To meet NCAA standards for academic eligibility, student-athletes must complete at least 40% of their degree at the

conclusion of two years of school, 60% at the conclusion of the third year, and 80% at the conclusion of the fourth year of school. Additionally, a student-athlete must complete 24 semester hours or 36 quarter hours of academic credit prior to the second year of collegiate enrollment. With few exceptions a student-athlete must be enrolled in 12 semester hours each term and pass 6 of those hours to be academically eligible for the following term. Also, an average of 12 semester hours must be completed during each of the previous academic terms that the student-athlete was enrolled full-time or 24 semester hours of academic credit must be completed since the beginning of the previous fall term. When an eligibility waiver is granted for any reason, the student-athlete still earns an eligibility point (NCAA, 2011a).

Any former student-athlete that returns to the institution and graduates can earn a bonus point for the term in which the degree is officially posted (NCAA, 2011a). In the first six years of the APR, more than 7,000 former Division I student-athletes returned to college to earn their degrees. In the process, they earned a bonus point in the APR calculation for their former team. Almost half of those students were athletes from men's basketball, football, and baseball.

Teams with running four year APR scores that fall below NCAA standards are subject to sanctions. Teams that score below 925 can lose up to 10 percent of their scholarships each year if one or more of their athletically funded student-athletes failed to earn a point for their team during the current term (NCAA, 2011b). Moreover, the NCAA reserves the right to limit practice time, postseason competition, and membership privileges for teams that score under 900 and repeatedly fail to meet APR standards.

Schools with teams that struggle to meet the APR standards set by the NCAA are encouraged or required to propose plans that will improve their academic standings in a timely manner. The NCAA takes into account the schools resource levels when determining APR penalties and gives special consideration to schools that show improvement with their academic missions (NCAA, 2011c). However, after six years APR figures reveal ongoing challenges. Low academic progress for transfer students, attrition of men's basketball players, eligibility shortcomings of football players, and the performance of men's basketball teams at some low-resource institutions continue to trouble policymakers (NCAA, 2011d).

The APR currently applies only to Division I, which contains the major collegiate athletic powers, with larger budgets, more elaborate facilities, and more athletic scholarships than the NCAA's other two divisions (NCAA, 2011c). All Division I schools must field at least 14 teams: seven men and seven women or six men and eight women. In 2010 there were 335 Division I institutions fielding a total of more than 6,000 teams.

The NCAA promotes the APR as a direct measure of the academic culture within each team and places primary responsibility for APR performance at the team and institution level. However, APR scores from the first few years of the program suggest that institutions with higher economic status have generally reported higher APRs (Smith, 2011). At this point, the relationship between team and organizational attributes and this measure of student-outcomes is unclear. The purpose of this study was to examine this relationship. Specifically, hierarchical linear modeling (HLM) was used to model the relationship between team characteristics and institutional environments and APR scores.

Framework

The framework for this study draws from two higher education models. Pascarella's (1985) Model for Assessing Change attributes student change to institutional environment, student engagement, institutional structure, student background, and student effort. Unlike other frequently cited student outcome models, Pascarella's model includes explicit consideration for the impact of organizational structure and context on student outcomes. Structural and organizational features of an institution can directly and indirectly influence student change as a student interacts with various socializing agents on campus. Volkwein and Szelest's (1995) five structural dimensions of higher education institutions is used to organize and operationalize the institutional variables used in this study. According to this model, an institution's mission, size, wealth, diversity, and quality influence student outcomes.

Purpose

The primary focus of this study is to examine the association between institutional context and team characteristics and the APR. This work extends the literature on collegiate student-athletes by considering the impact of the organizational and team environment on student outcomes for this group. This study also provides the groundwork for further exploration and analysis of the APR.

Research Questions

Drawing on Pascarella's (1985) Model of Assessing Change framework, this study addresses the following research questions:

1. Do institutional characteristics influence APR scores at Division I institutions?

2. What team characteristics contribute to the variance in APR scores at Division I institutions?
3. After taking into account team characteristics, which aspects of the institutional context explain differences between Division I institution APR scores?

Variable Selection

Research consistently shows that a wide range of variables measuring institutional mission, size, wealth, diversity, and quality are related to student outcomes (Volkwein & Szelest, 1995). This study draws from many of these institutional variables, specifically, institutional expenditures per full-time-equivalent (FTE), percent African American, percent male, full-time enrollment, percent of student body receiving financial aid in the form of Pell grants, residence hall capacity, conference affiliation, institutional control, and selectivity. In brief, institutional expenditures per FTE, percent of student body receiving financial aid, private affiliation, percent of students living on-campus, and institutional selectivity are generally positively related to student outcomes (Astin, 1984; Heller, 2001; Pascarella & Terenzini, 2005; Smart, 1986; Toutkoushian & Smart, 2001). Because women and non-minority students are more likely to persist (Berger & Millem, 1999; Peltier, Laden, & Matranga, 1999; Trawick, 1994), institutions with greater percentages of women and non-minorities have more positive student outcomes. Students from schools with lower full-time enrollment are also more likely to persist (Stoecker, Pascarella, & Wolfle, 1991).

The team-level variables used in this study are team gender, sport type, and squad size. Several studies have shown that female student-athletes outperform their male peers in academics, especially those in high profile sports (Pascarella, 1995; Pascarella, et al., 1999;

Shulman & Bowen, 2001; Simons, Van Rheenan, & Covington, 1999). Student-athletes in high profile sports also underperform their non-athlete counterparts. Football and men's basketball players, for example, report reading fewer texts or assigned books than male non-athletes (Pascarella et al., 1999) and are more likely than non-athletes to lack motivation to succeed in the classroom (Simons et al., 1999). High profile student-athletes are often a topic of debate due to their unique experiences in higher education (Shulman & Bowen, 2001). This subset of the student body often faces public scrutiny and extensive time demands on top of their academic commitments. High profile student-athletes report frequent to occasional feelings of isolation (Gerdy, 1997) and experience physically grueling workouts, demanding expectations, and a high profile existence (Hood, Craig, & Ferguson, 1992). Thus, for the purpose of this study, sport type was dichotomized into two categories, the Big Four sports of football, men's basketball, men's ice hockey, and baseball; and all other sports.

In addition to accounting for team gender and sport type, this study also controlled for squad size. Bolstering or reducing squad sizes to influence APR scores, Title IX statistics, and graduation rates is becoming an increasingly common practice (LaForge & Hodge, 2011). To control for the disparity in team sizes, this study included squad size in the analysis.

Research Design

The sample in this study is composed of all single gender teams from NCAA Division I institutions that competed in the 2009-2010 season. All variables for this study were drawn from the NCAA's APR database (NCAA, 2011e) and the National Center for Education

Statistics' Integrated Postsecondary Education Data System (IPEDS; NCESa, 2011).

Descriptive statistics and bivariate analyses are used to explore the data before HLM is used to model the team and institution effects on APRs.

HLM allows researchers to explore predictor variables that are measured at more than one level (Raudenbush, 2010; Raudenbush & Bryk, 2002). HLM is appropriate for this study because teams are nested within institutions, violating the assumption of independence (i.e., observations are unrelated) associated with general linear models like ordinary least squares regression. HLM can also handle correlated error terms within schools (i.e., the nonindependence of observations).

Recent advancements in statistical methodology, data accessibility, and data quality have enabled a handful of researchers to tackle prior limitations in research on student-athletes. Umbach, Palmer, Kuh, and Hannah (2006), for example, used hierarchical linear modeling of student-level data to compare student-athletes to their non-athlete counterparts in effective educational practices across all three NCAA Divisions and the National Association for Intercollegiate Athletics (NAIA). Oseguera (2005) studied the impact of institutional characteristics on baccalaureate attainment at more than 300 institutions and Mangold, Bean, and Adams (2003) examined the relationship between football and men's basketball success and graduation rates at 97 high profile Division I institutions. This study aims to extend prior research and overcome the data and methodological limitations of previous studies by using a multilevel approach to study collegiate athletics.

Significance of Study

In 2009 Heydorn asserted that “researchers must...take into account a wide array of variation in academics and athletics across universities.” The purpose of this study is to determine if institutional and team characteristics, as commonly operationalized in the literature, are related to APRs for a nationally representative sample. Understanding how the combination of intercollegiate athletics and academics influence student-athlete outcomes benefits universities, athletics, and researchers in several ways.

First, the results from this study can facilitate informed decision making. The results from this study speak directly to how eligibility and retention are related to the environment that student-athletes experience at Division I institutions. NCAA policymakers, institution administrators, and other stakeholders can use the findings from this study to develop appropriate strategies and policies to improve the academic progress and retention of these students. While some institutional characteristics are beyond administrators’ control, such as public versus private status, they can influence other institutional characteristics such as enrollment, selectivity, student-faculty ratio, and level of expenditures.

Second, this study contributes to the literature addressing the current state of the academic performance and retention of student-athletes. Not only does it add to the small body of literature pertaining to the APR, but it also examines the influence of institution-level characteristics while controlling for team traits – an undeveloped area of study – providing researchers with new insights about the role of contexts in the academic performance of student-athletes.

Limitations

This study has several limitations. First, the sample is not comprehensive. The APR is not currently measured for teams outside of NCAA Division I athletics, which limits our ability to generalize findings to Division II and III and NAIA institutions and teams. Furthermore, this study only investigates the relationship between institutional and team and APR scores, but does not uncover how the APR actually impacts academic progress—the ultimate goal of enacting the APR. Finally, the data used in this study are team and institution-level. Further information may be gleaned from student-level data. However, this data is currently not publicly available. Despite these limitations, this study provides valuable insight into the relationship between athletics and academic achievement on college campuses.

Key Definitions

Academic Progress Rate: The ratio of academically eligible scholarship student-athletes retained on a team in a given term.

Big-Four: Baseball, football, men’s ice hockey, and men’s basketball

Division I: The highest level of intercollegiate athletics sanctioned by the NCAA.

National Collegiate Athletic Association: The governing body of intercollegiate athletics for 1,281 institutions in the United States.

Student-Athlete: A student that participates on a sanctioned varsity athletic team at the institution in which he or she is enrolled.

Squad Size: The number of scholarship student-athletes on a team accounted for in that team’s APR score.

Chapter Summary

Although the APR is used to assess and sanction Division I teams based on the academic progress and retention of student-athletes, minimal concerted attention has been given to its study. This study examines the association between environmental context and the APR and addresses three questions that warrant consideration (a) Do institutional characteristics influence APR scores at Division I institutions? (b) What team characteristics contribute to the variance in APR scores at Division I institutions? (c) After taking into account team characteristics, which aspects of the institutional context explain differences between Division I institution APR scores?

Chapter II reviews the theoretical and empirical literature relevant to the research questions, conceptual framework, and variables selected. The literature is organized into four basic sections: (a) conceptual framework, (b) team variables, (c) institution variables, and (d) methodological advancements and data access. Each section includes an examination of the relevant research literature across higher education and intercollegiate athletics. In light of the discussion of existing literature, this chapter introduces a model that explains the relationship of the study's twelve variables with the APR. For each of the variables used in the study, this chapter also presents a hypothesis concerning the bivariate relationship between the variable and the APR. Chapter II concludes with a synopsis of research that addresses recent methodological and data access advancements that help make this study feasible and significant for higher education and intercollegiate athletics.

Chapter III summarizes the research methodology used to answer the research questions and hypotheses. The data sources and variables are described in more detail and the

multilevel statistical procedures used to test the proposed hypotheses and answer the research questions are specified.

Chapter IV presents the findings of the study. It addresses each of the research questions and hypotheses developed in Chapter II and describes the fully specified multilevel model in detail. The concluding section, Chapter V discusses the main findings and addresses some of the limitations of the study. Chapter V concludes with promising avenues for future research.

Chapter II: Literature Review

This literature review begins with a description of the research questions and the conceptual framework used to guide this study. After presenting the framework, a comprehensive review of literature on the academic performance and persistence of collegiate student-athletes is presented. The literature review is then extended to encompass studies that examine the relationship between institutional characteristics and student-outcomes. Recent improvements in data accessibility and computational methods are reviewed and exemplified with higher education research that examines student-outcomes for nationally-representative samples. This chapter concludes with a brief summary and an overview of the methodology chapter.

Research Questions

The primary research question for this study is: what team characteristics and institutional attributes influence APR scores at Division I institutions? Data on the general characteristics of higher education institutions come from IPEDS (NCESa, 2011). Data describing athletic teams and their respective APR scores come from the NCAA's APR database (NCAA, 2011e). The study's dependent variable is the APR, a measure developed by the NCAA to assess the academic progress and retention of scholarship student-athletes participating in Division I athletics.

Conceptual Framework

A number of theoretical frameworks are used to model student outcomes in higher education. Tinto's Interactionalist Model (1974), Bean's Attrition Theory (1990), and Astin's Theory of Student Involvement (1984) are all widely applied in the literature. While these

frameworks offer valuable insight into modeling student outcomes, they primarily focus on student attributes, whereas this study focuses on retention and academic progress from an institutional perspective. Pascarella argued that, “expanding our understanding of conditional effects in an effort to determine how different institutional/environmental characteristics influence achievement for different kinds of students is a potentially important future research direction which has been largely ignored in existing investigations” (1985, p. 22). His subsequent model, Model for Assessing Change, accounts for the influence of institutional structure and organizational context on student outcomes.

Pascarella (1985) based the change model on the work of Astin (1970) and Burstein (1980), which suggested that it may be possible to distinguish how institutions foster or impede various student outcomes. In particular, Astin (1970) showed that students were not randomly distributed across different higher education institutions and consequently achievement outcomes associated with different characteristics of institutions were likely to be confounded by differences in the general student body. Similarly, Burstein (1980) showed that after controlling for pre-college characteristics, institutional characteristics and environmental dimensions were related to achievement outcomes. Pascarella’s (1985) causal model includes explicit consideration of an institution’s structural characteristics and general environment. In his model, student change is seen as a function of student characteristics interacting with socializing agents that are influenced directly and indirectly by the structural and organizational features of an institution. Student growth is seen as a function of the direct and indirect effects of student background, structural features of an institution, institutional environment, student engagement, and student effort.

Pascarella's (1985) Model for Assessing Change contributes to the study of student outcomes in three important ways. First, the model explains how the institutional environment influences student development. Institutions, for example, offer different programs, financial aid packages, student-faculty ratios, and residence life opportunities. Similarly, the structures of institutions vary on several dimensions, such as size and location. Further, students enter college with particular abilities and characteristics and exposure to specific institutional environments can impact their achievement outcomes. Second, Pascarella's change model is useful in guiding researchers in their investigation of student growth. Pascarella posited that the interaction between the student, the socializing agents of the institution, and the organizational environment can impact student outcomes. Therefore, the involvement of a student in an institutionally-sanctioned group that fosters student relationships and interactions with institution staff, such as a varsity athletic team, can clearly impact student outcomes. Third, by studying the influence of an institution's environmental context on student outcomes, policy makers and educators can become better equipped for achieving desired educational outcomes like retention and academic progress. Specifically, understanding the environmental context can help administrators understand how to allocate resources and structure student programs to facilitate the achievement of desired outcomes. As it relates to this study, modeling the retention and academic progress of varsity sports teams from an institutional perspective can help colleges and universities understand how to modify institutional traits to promote academic success of athletes.

This study drew on Volkwein and Szelest's (1995) five structural dimensions of higher education institutions to organize and operationalize the institutional variables used.

According to Volkwein and Szelest, an institution's mission, size, wealth, diversity, and quality influence student outcomes.

Team Characteristics (Level-1)

Understanding student outcomes in intercollegiate athletics has been a topic of research for nearly 100 years (Miller & Kerr, 2002). However, research exploring the relationship between athletics and academics rose sharply in the early 1980's following highly publicized reports of SAT falsification, grade fraud, underprepared admits, and the graduation of functionally-illiterate student-athletes from numerous colleges and universities (Shapiro, 1984). During this time, research about intercollegiate athletics generally compared the academic performance of student-athletes with their non-athlete counterparts (Figler, 1987; Henschen & Fry, 1984; Pascarella & Smart, 1991; Shapiro, 1984) and focused on the academic achievements of student-athletes in high profile sports (Adler & Adler, 1985; Lang, Dunham, & Alpert, 1988; Simons et al., 1999). The findings from early research on student-athletes suggested that the athletic and academic lives of student-athletes were interwoven with each other, prompting contemporary researchers to expand the scope and complexity of their studies by exploring the influence of several factors on student-athlete achievement and retention, such as SAT scores (Purdy, Eitzen, & Hufnagel, 1985), ethnicity (Eitzen & Purdy, 1986; Lawrence, 2001; Melnick, Sabo, & Vanfossen, 1992; Sellers, 1992; Young & Sowa, 1992), gender (Blinde, 1989; Pascarella, 1995), motivation (Gayles, 2004; Simons et al., 1999) and competitive level (Horton, 2009; Knapp & Raney, 1988; Umbach et al., 2006).

Astin (1994) claimed that "the single most important source of influence" in the lives of college students is their peers (p. 398). Other researchers (e.g. Spady, 1971; Tinto, 1993)

agree that campus subcultures and peer groups are considered one of the most influential factors in higher education persistence. Increased extracurricular activity, peer interaction, and social life satisfaction are positively related to degree completion (Astin, 1993b; Braxton, Vesper, & Hossler, 1995; House, 1996; Pascarella & Terenzini, 2005; Tinto, 1993).

Pascarella's (1985) Model for Assessing Change also accounts for peer influence by including student background characteristics and student engagement with socializing agents at the institution. Intercollegiate athletics provides opportunities for student-athletes to engage with students, student-athletes, administrators, and other institutional staff. The benefits of peer interaction and student engagement, however, may vary based sport type, gender, and squad size because the environment within varsity athletic teams may cause student-athletes to experience student integration in a unique way (Jolly, 2008).

Sport Type

Scrutiny of student outcomes for student-athletes in certain sports has intensified in recent years. In 2008, the NCAA launched a major strategic branding initiative entitled, "Going Pro in Something Other than Sports." The advertising campaign is an effort to counteract the perceived imbalance between academic and athletics on college campuses, particularly in sports that are highly associated with professional leagues. In 2010, the National Basketball Association (NBA), National Football League (NFL), National Hockey League (NHL), and Major League Baseball (MLB) drafted nearly 1,500 individuals directly from college. The NHL and MLB drafted an additional 515 high school seniors with the option to delay entry into the league by attending college (Wong, Zola, & Deubert, 2011). Increased exposure and revenue from these four professional organizations, known also as

the Big Four, has created a new global market in professional sports, enabling professional leagues overseas to offer competitive salaries for athletes in these four sports as well (Klein, 2010; Smith, 2008). The opportunities for student-athletes to participate in professional sports and the potential impact that the high profile nature of these sports can have on student-athletes has prompted some stakeholders to investigate academic outcomes by sport type.

Purdy, Eitzen, and Hufnagel's (1982) ten year study of student-athletes revealed that student-athletes in revenue sports, or sports that generate enough revenue to meet their operating budgets, have a low probability of receiving an education when compared to non-athletes or athletes in other sports. According to their study, student athletes who are involved in non-revenue sports or sports that need subsidies to meet their operating budgets received better grades, graduated at a higher rate, and mirrored the general student population more than student-athletes in revenue sports. In what many consider a groundbreaking study in the area of intercollegiate athletics, Adler and Adler's (1985) four-year qualitative study with nearly 40 members of a big-time Division I men's basketball program found that numerous factors, such as fatigue from training, pressures from alumni, and differential treatment from faculty negatively impacted the educational attainment of the study's student-athletes.

Since Adler and Adler's (1985) landmark study, researchers have found that teams from high profile sports can experience a campus sub-culture that attaches less value to academic achievement than other sports. Pascarella, Bohr, Noral, and Terenzini (1995) found that differences in the cognitive skills of revenue sport athletes and non-athletes were found

their freshman year, and Pascarella et al., (1999) showed that these differences increase over the course of college. In addition, football and men's basketball players report reading fewer texts or assigned books than male non-athletes (Pascarella et al., 1995) and are more likely to underperform academically than athletes in other sports (Shulman & Bowen, 2001). In a study of sports in the Big Ten Conference, Heydon (2009) reported that the graduation rates of men's basketball and football teams in that conference are significantly lower than the rest of the universities' non-athletes.

Recent attention has been placed on how the motivation and student engagement of the student-athlete from specific sports impacts student outcomes. In the NCAA's 2008 GOALS and SCORE study, 59% of Division I football players reported that athletics were the primary reason for attending college while only 24% reported that academics were the primary reason. In men's basketball and baseball, the number of players enrolling in college primarily for athletic reasons rose over the past five years to 68% and 79% respectively (NCAA, 2011f). In addition, student-athletes in high-profile sports are engaged with the campus environment differently from student-athletes in low-profile sports (Gayles & Hu, 2010) and football and men's basketball players are more likely to lack motivation to succeed in the classroom (Simons et al., 1999). Given these differences between student-athletes from high profile sports and student-athletes from low-profile sports, it is likely that:

H_{1a}: Big Four sports will have a negative relationship with the APR.

Gender

In general, researchers have reported that women are more likely to persist in higher education (Astin, 1984; Peltier et al., 1999; Tinto, 1975; Trawick, 1994). The findings are

similar in athletics, where the literature consistently shows that female student-athletes have higher high school GPAs, entrance exam scores, and college GPAs than male student-athletes (Purdy et al., 1985; Simons et al., 1999). In addition, researchers have shown that female student-athletes are better prepared for college (Purdy et al., 1982) and traditionally graduate at a higher rate than their male counterparts (Benson, 1991). Females also show less cognitive underperformance (Pascarella et al., 1995, 1999) and perform better academically than their male counterparts (Shulman & Bowen, 2001; Simons et al., 1999).

In a follow-up to Adler and Adler's (1985) seminal work in athletics, Meyer (1990) conducted a qualitative study exploring the academic, social, and athletic experiences of female student-athletes. In contrast to the academic disengagement reported in male basketball players (Adler & Adler, 1985), the Division I female basketball and volleyball players participating in Meyer's study exhibited an increased commitment to academic fulfillment over their four years in school. Similarly, researchers report that female student-athletes balance the academic and athletic role in college better than their male counterparts and are less likely to attend college for the main purpose of playing sports (Simons et al., 1999). Given these differences between male and female student-athletes, it is likely that:

H_{1b}: Being a female team will have a positive relationship with APR.

Squad Size

Squad list or roster management is becoming increasingly common in college athletics. This practice involves bolstering or reducing squad sizes to influence APR scores, Title IX statistics, and graduation rates (LaForge & Hodge, 2011). In the APR metric, the number of student-athletes used to calculate a team's APR score is not accounted for within

the metric. As such, the APR score for a team with 85 scholarship student-athletes is calculated in the same manner as a team with 12 student-athletes, with no account made for varying sample sizes. When controlling for squad size, this study posits that:

H_{1c}: Larger teams will have a negative relationship with the APR.

Research examining the relationship between athletics and academics has clearly progressed in scope and complexity over the past 20 years. This study used squad size, team gender, and sport type to further expand the literature addressing that relationship.

Institutional Variables (Level-2)

In light of Pascarella's (1985) Model for Assessing Change, student outcome models that neglect to consider the institution as a fundamental unit of analysis are incomplete. Although few multi-institutional studies have considered the role of institutional attributes on student outcomes (e.g., Berger, 2000; Berger & Braxton, 1998), organizational effects are well documented (Astin, 1993a; Berger & Milem, 2000). For this analysis, college and university characteristics that are regarded as strong predictors of student outcomes are selected.

A wide range of institutional variables have been examined in higher education literature. Building on organizational literature that shows organizational size, wealth, and environment can influence the behavior of an organization's members (Hall, 1991), higher education literature has further expanded those attributes to include institutional size, source of financial aid, place of student residence, selectivity, control, student body composition, and institutional expenditures per student (Astin, 1993b; Gansemer-Topf & Schuh, 2006; Kamens, 1971; Marcus, 1989; Oseguera, 2006). In addition, the attributes of colleges and

institutions may mediate the influence of student engagement on persistence (Braxton, Vesper, & Hossler, 1995). Institutional variables like these are important to examine in athletics research because they can provide a more robust explanation of student-athlete outcomes than studies that exclude institutional characteristics.

Interest in understanding the organizational effects of colleges and universities at a macro level is growing (Eimers & Pike, 1997; Mangold et al., 2003; Oseguera, 2006; Umbach et al., 2006). In a study of baccalaureate attainment in more than 300 institutions, Oseguera (2006) found that degree completion is affected by structural, contextual, and environmental variables, prompting her to conclude that, “expanding individual retention theories to include structural dimensions and college environments is crucial to understanding student departure from an institutional perspective” (p. 48). Recent developments in statistics, changes in institutional and federal policies, and enhancements in publicly available data have improved the feasibility of a study focusing on the institutional and team effects on the educational attainment of Division I scholarship student-athletes.

This study focused on the five structural dimensions of higher education institutions specified by Volkwein and Szelest’s (1995). According to their model, characteristics of institutions are categorized into mission, size, wealth, complexity/diversity, and selectivity/quality.

Institutional Control

Attending a private college or university has a positive influence on bachelor’s degree attainment and overall level of educational attainment (Smart, 1986). It is difficult to isolate the underlying causal mechanism, but research points to student commitment due to

financial investment, high levels of personal loyalty to distinguished privates, and high percentages of on-campus residential populations (Pascarella & Terenzini, 1991). Graduates of private four-year institutions also take less time to complete their bachelor's degrees than graduates of public four-year institutions (NCES, 1997a). In an analysis of ten year graduation rates from 1993-2002, Ferris, Finster, and McDonald (2004) reported that both students and student-athletes graduate at a higher rate from private institutions. Private institutions accounted for the top four and top eight of ten graduation rates for both students and student-athletes. Given the differences between educational outcomes in private and public institutions, it is likely that:

H_{2a}: Privately controlled institutions will have a positive relationship with APR.

Conference Affiliation

Institutions from conferences with big-time sports programs can benefit from lucrative television contracts, heightened reputations, and improved social capital. NCAA Division I institutions are grouped into conferences which are established based on various criteria such as location and competitive level. There are 120 institutions in the eleven Football Bowl Subdivision (FBS) conferences, which are allowed to award full scholarships to 85 football players at the institution. Six of those conferences receive an automatic bid into a Bowl Championship Series (BCS) football game, which is accompanied with a television contract and lucrative payout. The ACC, Big Ten, Big East, Big Twelve, PAC-10, and SEC encompass the wealthiest athletic programs in the country. In the Forbes 2009 ranking of college football's 20 most valuable teams, all 20 came from BCS conferences, with Texas valued as the most valuable team at \$119 million (Schwartz, 2009). When the Big 8

expanded to the Big Twelve, it signed a \$100 million contract with ABC and Liberty networks to broadcast its football games (Smith, 2011).

In addition to the financial rewards associated with big-time programs, these institutions benefit from favorable selection effects. In a look at the selection effect at big-time sports schools, Clotfelter (2011) found that private institutions with big-time sports programs, or schools in the FBS, enrolled freshmen with an average family income that is more than 25% higher than freshmen at private institutions without big-time programs. At public institutions, freshmen at institutions with big-time sports programs have an average family income that is 30% higher than those at other public institutions.

While institutions might benefit from membership to a specific conference, the educational outcomes for student-athletes at these institutions may be inhibited. In a comparison study of institutions in the Big Ten and Missouri Valley conferences, Heydorn (2009) found significant differences in student-athlete outcomes. The graduation gap between student-athletes and non-athletes was 11.14% at Big Ten schools but -2.14% at Missouri Valley schools, meaning that student-athletes from schools in the non-BCS conference actually graduated at a higher rate than their non-athlete counterparts. The graduation gap between student-athletes and non-athletes grew even larger for Big Ten schools when looking solely at high profile sports. Given these findings, it is likely that:

H_{2b}: BCS schools will have a negative relationship with APR.

Size

Although the evidence pertaining to the direct effect of institutional size on educational attainment is inconsistent, there is evidence that enrollment impacts persistence

and attainment. Attending a large school can influence social involvement (Stoecker, Pascarella, & Wolfe, 1988), which can subsequently affect persistence. Pascarella and Taranzini (1991) theorized that smaller schools generally engage students more effectively since opportunities for social involvement and integration may be reduced as institution size increases. However, Baldrige, Curtis, Ecker, and Riley (1977) found that large universities are more likely to be divided into specialized, autonomous units and departments, which can improve opportunities for students to interact with socializing agents on campus.

Kamens (1971) attributes the status-allocating ability of large schools to a positive association between size and retention. In a study of 64 major universities, Tucker (1992) found a positive relationship between enrollment and graduation rates while Mangold, Bean, and Adams (2003) reported a positive relationship in 97 Division I institutions with big-time sports programs. Based on these findings, it is posited that:

H_{2c}: Institutional enrollment will have a positive relationship with APR.

Institutional Expenditures

From an organizational perspective, colleges and universities can exhibit patterns of behavior, like resource allocation, that can have important ramifications for the educational attainment of students. The resource theory approach to learning and development suggests that adequate physical, human, and financial resources enhance student outcomes (Astin, 1984). Toutkoushian and Smart (2001) showed that the level of institutional spending can have a direct impact on student gains in learning and Astin (1993b) and Hossler, Kim, & Ziskin (2010) found that degree completion was positively related to resources invested in student services and instruction. In a study of baccalaureate institutions, Gansemer-Topf and

Schuh (2006) showed that institutional expenditures, specifically those that directly contributed to students' academic integration, contributed to retention.

Spending on academic support for tutoring, study groups, supplemental instruction, advising, summer bridge programs, and developmental education courses have been linked to improved student success in college (Blanc, DeBuhr, & Martin, 1983; Blanc & Martin, 1994; Congos & Schoeps, 1997; Peterfreund, Rath, Xenos, & Bayliss, 2008; Ryan & Glenn, 2003). In athletics, higher resource institutions are more likely to boast qualified academic support programs equipped with personnel and specialists that can explicitly address APR issues, such as lost eligibility points (LaForger, 2011). Given these findings, it is likely that:

H_{2d}: Institutional Expenditures per FTE will have a positive relationship with APR.

Financial Aid

Although the research evidence is somewhat mixed, findings generally show that greater amounts of financial aid are associated with higher rates of student retention (Heller, 2001; Hossler, Kim, & Ziskin, 2010; Pascarella & Terenzini, 2005; Perna, 1998). One explanation for this relationship is that financial aid influences students' commitment to stay in college (Cabrera, Nora, & Castaneda, 1992). Based on these findings, it is posited that:

H_{2e}: Supporting a higher percent of the student body with financial aid will have a positive relationship with APR.

Residence Hall Capacity

Independent of school size, campus living is positively related to retention in part because of the social involvement associated with residence hall living (Hossler, Kim, & Ziskin, 2010; Velez, 1995). At an institutional-level, the percentage living on campus

indicates an increased likelihood that students will develop a stronger sense of community and engage with others. Early research supports the assumption that residence hall students perform better academically than their non-residence hall counterparts (Chickering, 1975). Living in a residence hall on campus is positively related to retention in all types of institutions and among all type of students regardless of gender, ethnicity, ability, or family background (Astin, 1984, 1985). African American commuters had the lowest persistence rate (45%) while African American residents persisted at a 70% rate (MeEwen & Galicki, 1989). Further, living on campus also enhances four- and six-year degree completion among Asian, White, African American, and Mexican students (Oseguera, 2006). Given the apparent impact of campus residence, it is likely that:

H_{2f}: On-campus residence capacity will have a positive relationship with APR.

Student Body Demographics

Student ethnicity and gender have also been linked to student-outcomes. Minority retention in higher education has been widely studied (e.g., Fleming, 1984; Mayo, Murguia, & Padilla, 1995; Nora, Cabrera, Hagedorn, & Pascarella, 1996; Washington & Schwartz, 1999). Berger and Milem (1999) and Allen (1999) found that minorities are more likely to have lower persistence rates than non-minorities. However, African American women persist at a higher rate than African American men (Peltier, Laden, & Matranga, 1999), consistent with gender studies that show that women are more likely to persist than men (Peltier, Laden, & Matranga, 1999; Trawick, 1994). Marcus (1989) showed that a higher percentage of females in the student body positively influences college completion. Given the differences

between African American and non African American students and men and women in the student body, it is likely that:

H_{2g}: Percent of African American students at the institution will have a negative relationship with APR.

H_{2h}: Percent of male students at the institution will have a negative relationship with APR.

Selectivity

Institutional selectivity is a measure of admissions competitiveness that is widely used to determine institutional quality. More selective institutions admit students with higher standardized test scores, high school grade point averages, and high school ranks. According to Pascarella's model of assessing change, student growth is impacted by the interaction between the student and the agents within that environment (Pascarella, 1985; Pascarella & Terenzini, 1991). Institutions that select more academically prepared students improve the likelihood that students will be intellectually stimulated in and out of the classroom by peers.

Numerous studies have demonstrated a strong positive association between student ability, as reflected by selective admission standards, and graduation rates (Blanc, DeBuhr, & Martin, 1983; Caldas & Bankston, 1997; Gilmore, 1990; Marcus, 1989; McGrath & Braunstein, 1997; Perna, 1998). Institutions with higher selectivity rates tend to have higher retention and graduation rates even after controlling for student background characteristics (Gansemer & Schuh, 2006; Mayer-Foulker, 2002; McClelland, 1990; Stoecker, Pascarella, & Wolfle, 1988).

Highly selective institutions are also more likely to retain student-athletes at the end of their first year of enrollment and more likely to graduate student-athletes than less selective schools (Emerson, Brooks, Youakin, McKenzie, & Mueggenburg, 2010; Ferris, Finster, & McDonald, 2004). In a study of ten year graduation rates at Division I institutions, Ferris, Finster, and McDonald (2004) found that between 35% and 58% of the variation in student-athlete graduation rates is explained by admissions selectivity. Given the impact of selectivity on student outcomes, it is likely that:

H_{2i}: There is a positive correlation between selectivity and APR.

Methodological Advancement and Data Access

Recent advancements in statistical methodology, data accessibility, and higher education transparency enable researchers to tackle prior limitations in research on student-athletes in higher education. In 2009, Heydorn asserted that, “researchers must...take into account a wide array of variation in academics and athletics across universities” (p. 31). Prior to recent advancements in statistics, evaluating the relationship between athletics and academics for thousands of student-athletes at hundreds of institutions was difficult and tenuous. Generally, research on Division I schools is limited to uniquely selective schools, institutions that house prominent athletic programs, or homogenous populations. As such, these studies lack generalizability and more inclusive samples are necessary to fully understand the relationship between Division I schools and student-athlete outcomes.

Using a comprehensive approach to evaluating student-athlete outcomes means accounting for the variation across Division I institutions, which differ greatly in structure, campus engagement, admissions, and athletic administration. For instance, Division I schools

range in size from approximately 1,600 to 60,000 students. About 66 percent of the schools in Division I are public and the number of teams sponsored within each school ranges from fourteen to thirty-five. Division I sports teams are located in all 50 states and can be found in urban, suburban, and rural settings. The wealth, selectivity, and diversity of these institutions can also vary greatly.

Unit of Analysis

Several researchers have recently applied quantitative methods to studies of multiple, diverse institutions. Oseguera (2006), for example, used step-wise regression to study the effects of student background characteristics, college contexts, and institutional structure on baccalaureate attainment of students at 303 institutions. Ethnicity, gender, academic preparedness, institution type, expenditures, size, student integration, and selectivity were among the variables explored. In a study investigating the impact of sport success on institutional graduation rates, Mangold, Adams, and Bean (2003) tested the hypothesis that intercollegiate sports facilitate and sustain the development of student communities. Using ordinary least squares regression (OLS), the investigators used institutional variables (i.e., courses taught by teaching assistants, size, residence hall living, first-time undergraduates, and selectivity) from IPEDS and *US News & World Report* to model graduation rates at high profile Division I schools that sponsored both men's basketball and football teams.

The unit of analysis is an important factor when conducting multi-institution studies. Building a model at the institutional-level can mask individual differences, an effect called "ecological fallacy" (Hu & Kuh, 2003; Kreft & deLeeuw, 1998). Attaching institution-level characteristic to an individual or group violates the OLS assumption that observations are

independent of one another (Ethington, 1997). Including group-level variables in an OLS regression equation can increase the likelihood of committing a Type II error (i.e., failing to reject a false null hypothesis). Since it is geared towards identifying the impact of institutions on the academic progress and retention of student athletes within a team, this study is using a nested data structure which accounts for these limitations of a single-level model.

Raudenbush and Bryk (2002) argue that HLM is the only accurate method for estimating organizational and individual effects for nested data.

Accounting for background characteristics at level-1 is important for two reasons (Raudenbush & Bryk, 2002). First, since people are not typically assigned at random to organizations, failing to control for level-1 predictors can bias level-2 estimates. Second, controlling for level-1 predictors can increase the power of hypothesis tests and the precision of institutional effects estimates.

HLM is increasingly used to study intercollegiate athletics. Using hierarchical linear modeling, for example, Umbach et al. (2006) studied self-report data from more than 57,000 first-time freshmen enrolled in 395 institutions representing each of the NCAA's three divisions and the NAIA. They found that student-athletes do not differ greatly from their non-athlete counterparts in their participation in effective educational practices.

Data Quality

In addition to limitations associated with the institutions sampled, data quality has also been an ongoing issue in research on collegiate athletics. Many of the landmark studies cited in the literature draw from data collected between the 1960s and 1980s. College athletics, however, have changed drastically in recent years (Sack, 2008; Smith, 2011) and

relying on outdated data has limited our understanding of the academic success and retention of contemporary student-athletes. Studies using more recent data include Hildenbrand, et al. (2009), who studied the persistence of 13,970 students at a large, Division I land grant institution and found that student-athletes were more likely to graduate than non-athletes. Additionally, Gayles (2004) used stepwise regression to study 211 student-athletes at a single Division I institution and found that academic motivation is related to semester GPA.

Another limitation often plaguing student-athlete research is the use of self-reported data. Gayles (2004), Oseguera (2005), and Umbach et al. (2006), for example, rely on self-reported data from students concerning motivation, satisfaction, and engagement. While self-reported data provide valuable information for the study of educational attainment in higher education, it may be considered less accurate than official records (Hildenbrand et al., 2009). Social desirability bias, for example, can impact the reliability and validity of self-report data.

Although the body of literature associated with student-athlete outcomes has experienced significant growth in scope and complexity over the past 30 years, the new measure of academic progress and retention, the APR, has not been examined. There also remains a gap in the literature concerning team and institution impacts on student-athlete outcomes in general, and on this contemporary measure. The APR was implemented without fully understanding the influence that environmental contexts can have on student-athlete outcomes. Given the potential ramifications of failing to meet NCAA-established benchmarks, the role of institutional and team characteristics on APR warrants examination. Overall, recent advancements in hierarchical analyses and data quality provide the resources

necessary to tackle prior limitations in research identified by Snyder and Spreitzer (1978). Understanding the influence of institution and team factors on the educational attainment of students enables stakeholders to better formulate policies and practices to improve their academic performance.

Chapter Summary

This chapter introduced the study's conceptual framework, Pascarella's (1985) Model for Assessing Change and Volkwein and Szelest's (1995) five structural dimensions. It reviewed literature related to student-athlete outcomes and findings associated with the institution and team variables proposed for the HLM model. Based on the reviewed literature, this chapter also presented the hypotheses that were tested. The feasibility of this study as a result of methodological advancement and data access was also discussed. Chapter III describes the data sources and specifies statistical procedures to answer the research questions and test the proposed hypotheses.

Chapter III: Methodology

The purpose of this study was to determine the relationship between team and institutional characteristics and APRs for Division I institutions. This chapter describes the research design by delineating data sources, explaining the operationalization of the variables, and specifying the statistical model. The multilevel model developed in this study accounts for team characteristics at level-1 and institutional characteristics at level-2 to illustrate the relationship between these variables and APRs. After describing the sample and selection criteria, this chapter discusses the appropriateness of HLM and how this technique was used to determine how much variance in APRs was attributable to institutional characteristics and team attributes. Chapter III concludes with a discussion of methodological limitations.

Research Questions

1. Do institutional characteristics influence APR scores at Division I institutions?
2. What team characteristics contribute to the variance in APR scores at Division I institutions?
3. After taking into account team characteristics, which aspects of the institutional context explain differences between Division I institution APR scores?

Data Set

The data analyzed in this study was from a secondary dataset, derived from two primary data sources, NCAA and IPEDS. The following section describes the data sets that were used in this study.

Academic Progress Rates (NCAA)

The APR database was created and released by the NCAA in the Inter-university Consortium for Political and Social Research to provide public access to the APRs, eligibility rates, and retention rates of Division I student athletes. In addition to APR, school name, sport played, squad size, and school division were selected for this study (NCAA, 2011e).

Integrated Postsecondary Education Data System (NCES)

Integrated Postsecondary Education Data System (IPEDS) is a system of interrelated surveys conducted annually by the U.S. Department's NCES. IPEDS gathers information from every college, university, and technical and vocational institution that participates in or applies for any federal student financial aid program (e.g., Pell grants and federal student loans) authorized by Title IV of the Higher Education Act of 1965, as amended (20 USC 1094, Section 487(a)(17) and 34 CFR 668.14(b)(19)). More than 6,700 institutions complete IPEDS surveys each year, including research universities, state colleges and universities, private religious and liberal arts colleges, for-profit institutions, community and technical colleges, and various non-degree-granting-institutions. IPEDS collects data on postsecondary education in the United States in seven areas: institutional characteristics, institutional prices, enrollment, student financial aid, degrees and certificates conferred, student persistence and success, and institutional human and fiscal resources. IPEDS offers a strong record of operational validity and reliability, with well supported current national norms, standardized for the primary variety of the university and college settings and types (NCES, 2005).

Sample

The sample in this study consisted of all single gender teams from NCAA Division I institutions that competed in the 2009-2010 season (NCAA, 2011e). The 21 co-ed teams from the sport of rifle and the 218 teams from Division II and III institutions were removed from the study, leaving 6,172 single gender teams from 331 Division I institutions. Of the 6,172 teams, 45% (2,807) were men's teams and 55% (3,365) were women's teams. Of the 2,807 men's teams, 32% come from the big four sports of football, ice hockey, baseball, and men's basketball. Squad sizes for all teams ranged from 4 to 122 student-athletes. All four years of enrollment (freshman, sophomore, junior, senior) are captured within the single season.

A statistically derived margin of error set at a confidence level of 84 percent is applied by the NCAA to low-performing teams with fewer than 30 student-athletes in the four-year cohort and/or less than four years worth of APR available for the team. The squad-size adjustment no longer applies to most teams; however, any team benefiting from the APR squad size adjustment was removed from the dataset (NCAA, 2011c).

Due to cost and population dynamics, researchers rarely survey the entire population (Adèr, Mellenbergh, & Hand, 2008). In this case, however, the entire population of Division I teams are required to report APRs. As a result, all observations from single gender teams that did not undergo a squad size adjustment were included in the analysis.

Description of Variables

The dependent variable in this study was the APR and the independent variables of interest were team characteristics and institution characteristics. The APR is a measure of the retention and academic eligibility of student-athletes on Division I teams during the 2007-2008 season. The APR score for each team is calculated as:

$$\text{APR} = \frac{\Sigma(\text{retention} + \text{eligibility})_{\text{earned}}}{\Sigma(\text{retention} + \text{eligibility})_{\text{possible}}} \times 1000$$

If all of the scholarship student-athletes on a team are retained at the institution and meet the requirements for progress towards a degree, the team receives an APR of 1000. Failure to retain academically eligible scholarship student-athletes can result in a lower APR score. In special circumstances, student-athletes may be granted a waiver for departing the institution or failing to remain eligible (NCAA, 2011b). In addition, a former student-athlete that returns and graduates from the institution can earn a bonus point for the former team during the term in which the degree is posted.

Sanctions may be handed down for teams that fall below the 925 cutoff score established by the NCAA. If one or more athletically funded student-athletes fail to meet the retention and eligibility requirements during a single term, the NCAA can cut up to 10 percent of the scholarships available to that team. If a team repeatedly falls below 900, the NCAA reserves the right to reduce practice time, limit postseason competition, and revoke membership privileges.

Drawing on Pascarella's (1985) change framework, variables capturing group

characteristics and institutional variables are drawn from the datasets described above.

Characteristics presumed to capture relevant team qualities include: team gender, sport type, and squad size. Characteristics presumed to reflect the institutional environment are: ethnicity, selectivity, institutional expenditures, residence hall capacity, gender, institutional control, size, financial aid, and conference affiliation.

Table 1 provides information about the construct, variable description, variable source, relevant hypothesis, and the level of analysis.

Table 1

Operationalization of Variables Used to Study the Effects of Team and Institution Characteristics on APRs

Construct	Description	Hypothesis	Hypothesized Direction of Relationship	Data Source
Sport Type	Dichotomized as 1 or 0; 1 reflects Big Four sport, 0 reflects all other sports	H _{1a}	(-)	APR
Team Gender	Dichotomized as 1 or 0; 1 reflects female, 0 reflects male	H _{1b}	(+)	APR
Squad Size	The number of student-athletes on the team receiving athletically related financial aid	H _{1c}	(-)	APR
Institutional Control	Dichotomized as 1 or 0; 1 reflects private, 0 reflects public	H _{2a}	(+)	IPEDS
Conference Affiliation	Dichotomized as 1 or 0; 1 reflects member of BCS conference, 0 reflects member of non-BCS	H _{2b}	(-)	APR
Enrollment	Number of FTE enrolled	H _{2c}	(+)	IPEDS
Institutional Expenditures	Amount (in thousands dollars) of spending per FTE on academic support, student services, and instruction	H _{2d}	(+)	IPEDS
Financial Aid	Percent of student body receiving financial aid in the form of Pell grants	H _{2e}	(+)	IPEDS
Residence Hall Capacity	Percent of full time undergraduates that can be housed on campus	H _{2f}	(+)	IPEDS
Ethnicity	Percent of student body that is African American	H _{2g}	(-)	IPEDS
School Gender	Percent of student body that is male	H _{2h}	(-)	IPEDS
Selectivity	Acceptance rate of applicants	H _{2i}	(+)	IPEDS

Selection Criteria

This study accounted for 100% of the Division I institutions involved in the APR program during the 2009-2010 season. Teams from Division II and Division III institutions that compete in Division I were removed from the study. The ice hockey team from University of Alaska-Anchorage, for example, is classified as a Division I team; however, the institution itself is classified as Division II, which is the division classification for the remainder of the teams at that school.

Since the NCAA withholds some data to protect confidentiality, there was some missing data at the team-level. Because HLM does not allow for missing data at level-1, in this case the team-level, these cases were deleted and the sample size reduced from 6,099 to 6,039 teams. This sample size was very large and representative and is thus adequate for statistical reliability in HLM and OLS regression models.

In HLM, the level-2 data set size is limited to the size of the most incomplete variable. Since there are 331 institutions in this study, the model satisfies the conditions of statistical validity and reliability (Maas & Hox, 2005). Generally, this data set constitutes the most complete sample from which to derive data for this study, and with a large representative sample size, allows for external validity.

Data Analysis

To account for the team and institutional variables being examined in this study, HLM was utilized. HLM is part of a group of statistical procedures named Linear Mixed Models (LMM), which assume that observations are not independent and can correctly model correlated error terms. Studying hierarchical effects enables researchers to explore

predictor variables that are measured at more than one level. HLM is a regression-based procedure that has been typically associated with education research (Hox 2010; Raudenbush & Bryk 2002; Raudenbush, 2010; Snijders & Boskers, 1994) but is also gaining popularity in other disciplines, such as sociology, economics, and statistics (Garson, 2011a).

In this study the process for analyzing HLM data followed the basic procedures for conducting inferential statistics to test hypotheses. Univariate analyses were used to examine central tendencies and variability for each variable. Bivariate tests examined pairwise relationship between the variables. HLM analyzed the proportion of variance in APR explained within Division I institutions across teams (level-1) and between institutions (level-2). The minimum significance level for all significance tests in this study was ($\alpha = .05$). Results at more stringent significance levels were noted.

This multilevel model examined the relationship between higher education institutional attributes and team-level characteristics with APR scores. There was a between-groups effect if the institution characteristics were associated with APRs after controlling for the team variables. The residual variance in APRs not explained by the between-groups effect represented variation within the teams, or the "within-groups" effect. The total effect of the independent variables on APR scores was the sum of the between- and within-groups effect. The between- and within-groups effects were used to compute the intraclass correlation (ICC), which explained the relationship of the team and institutional variables on the APR.

This study used a null, or "unconditional," model containing no independent variables to predict the level-1 intercept of APRs as a random effect of institutions. The null model

was then be compared with a random effects model, which contained only level-1 variables, and an intercepts-as-outcomes model, which contained both level-1 and level-2 variables. Although additional models are available in multilevel analysis (i.e., intercepts-and-slopes-as-outcomes), the intercepts-as-outcomes model was used since it is the most parsimonious manner to remove the assumption of uncorrelated error terms. Each model contained the same dependent variable, APR. This variable is a measure of the retention and eligibility of Division I student-athletes. HLM was the appropriate analysis to study the given hypotheses for several reasons.

1. The institutions in this model were hypothesized to be systematically associated with APR performance. The variables used in this study violate the generalized linear models assumption of nonrandom relationships, making normal regression assumptions inappropriate for this study.
2. Variables within the dataset have different numbers of observations at each level. The HLM procedure accounts for these differences without creating threats to validity. The number of cases for the level-1 model was $N = 5,422$. The sample size of level-2 cases was $N = 331$.
3. The strength of the regression relationships was expected to vary between groups. Linear mixed models allow for different coefficients for effects, unlike OLS, which treats coefficient parameters like fixed constants. HLM's independent treatment of variables and correlated error terms provided accurate, valid hypothesis testing.
4. HLM was able to incorporate variables that use different units of analysis.

Model Specification

To explain the variance associated with the APR, this study used a two-level intercept-as-outcomes hierarchical model. The dependent variable, APR, was contained in the first order model. The intercepts in the first order model were derived from the slopes and error term from the level-2 model. The equations below illustrate the fully specified HLM model that was used to assess the impact of team-level effects and institution-level effects. The level-1 and level-2 variables and source details can be found in Table 1.

Fully Unconditional Model (Null)

$$APR_{ij} = \beta_{0j} + r_{ij}$$

Where:

$$\beta_{0j} = \gamma_{00} + u_{0j}$$

APR_{ij} : Academic Progress Rate for team i at institution j

β_{0j} : mean APR for institution j

γ_{00} : grand mean APR

u_{0j} : random effect associated with institution j (level-2 effect)

r_{ij} : random effect associated with team i at institution j (level-1 effect)

Random Effects Model (Level-1 Predictors)

$$APR_{ij} = \beta_{0j} + \beta_{1j}(\text{Team Gender})_{ij} + \beta_{2j}(\text{Sport Type})_{ij} + \beta_{3j}(\text{Squad Size})_{ij} + r_{ij}$$

Where:

$$\beta_{0j} = \gamma_{00} + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + u_{1j}$$

$$\beta_{2j} = \gamma_{20} + u_{2j}$$

$$\beta_{3j} = \gamma_{30} + u_{3j}$$

β_{1j} - β_{3j} : regression coefficients indicating how the APR is distributed in institution j as a function of the measured team characteristic

γ_{00} : average intercept across the level-2 units

γ_{10-30} : average regression slope across the level-2 units

u_{0j} : unique increment to the intercept associated with institution j

u_{1j-3j} : unique increment to the slope associated with institution j

Intercepts-As-Outcomes Model (Level-1 & Level-2 Predictors)

$$APR_{ij} = \beta_{0j} + \beta_{1j}(Team\ Gender)_{ij} + \beta_{2j}(Sport\ Type)_{ij} + \beta_{3j}(Squad\ Size)_{ij} + r_{ij}$$

Where $\beta_{0j} = \gamma_{00} + \gamma_{01}(Institutional\ Control)_j + \gamma_{02}(Conference\ Affiliation)_j + \gamma_{03}$

$(Enrollment)_j + \gamma_{04}(Institutional\ Expenditures)_j + \gamma_{05}(Financial\ Aid)_j + \gamma_{06}(Residence\ Hall)_j +$

$\gamma_{07}(Ethnicity)_j + \gamma_{08}(School\ Gender)_j + \gamma_{09}(Selectivity)_j + u_{0j}$

$$\beta_{1j} = \gamma_{10} + u_{1j}$$

$$\beta_{2j} = \gamma_{20} + u_{2j}$$

$$\beta_{3j} = \gamma_{30} + u_{3j}$$

γ_{00} : average intercept across the level-2 units

$\gamma_{01} - \gamma_{09}$: average slope across level-2 units

γ_{10-30} : average regression slope across the level-2 units

u_{0j} : unique increment to the intercept associated with institution j

u_{1j-3j} : unique increment to the slope associated with institution j

Fully Specified Model

$$\begin{aligned} APR_{ij} = & \gamma_{00} + \gamma_{01} (\text{Institutional Control})_j + \gamma_{02} (\text{Conference Affiliation})_j + \gamma_{03} (\text{Enrollment})_j + \\ & \gamma_{04} (\text{Institutional Expenditures})_j + \gamma_{05} (\text{Financial Aid})_j + \gamma_{06} (\text{Residence Hall})_j + \gamma_{07} (\text{Ethnicity})_j \\ & + \gamma_{08} (\text{School Gender})_j + \gamma_{09} (\text{Selectivity})_j + u_{0j} + (\gamma_{10} + u_{1j}) \text{Team Gender} + (\gamma_{20} + u_{2j}) \text{Sport} \\ & \text{Type} + (\gamma_{30} + u_{3j}) \text{Squad Size} + r_{ij} \end{aligned}$$

Customary to HLM, continuous variables were centered after cases with missing data were removed. In this study, grand mean centering was used to reduce collinearity and improve interpretability. Grand mean centering involves subtracting the grand mean of a variable from all of its observations, making the mean of each variable zero. The use of grand-mean centering allows consistent comparison of changes in residual variance across the dataset's indices. Thus, the phrase "controlling for other variables in the model" mirrors "holding other variables in the model at their mean." Since dichotomous variables were not centered, the phrase "holding the variable constant" is equivalent to holding the variable at the 0 value. (Garson, 2011b). Grand mean centering improves interpretability without changing the results of the model.

Methodological Limitations

There are a few limitations associated with the methodology. First, the APR data is team-level data. Although numerous surveys collect information from a sample of student-athletes, comprehensive student-level data associated with scholarship student-athletes accounted for in this study were not available. While research consistently points to the impact of student-level characteristics like socioeconomic status, SAT scores, and ethnicity on student outcomes, these variables were not included in this model. These variables may

help explain additional variance in APR scores, however, studies suggest that traditional predictors of student achievement are less indicative of student-athlete academic success (Sedlack & Adoms-Gaston, 1992). Further, intercollegiate athletics research suggests that, unlike non-athlete characteristics, student-athlete background characteristics have limited influence on engagement in educationally purposeful activities (Gayles & Hu, 2009; Pascarella & Terenzini, 2005).

In addition, this study measures institutional and team effects on the APR and not the program effect of the APR on institutional policies and subsequently student-athlete educational outcomes. Future research with longitudinal institution, team, and student-level data would be necessary to examine that relationship, and are hence beyond the scope of this study.

Chapter Summary

This chapter specified a multilevel model that explains the relationship of institutional context and team characteristics with the APR. In particular, this chapter described the surveys from which the data were drawn and explained the operationalization of the variables selected. Furthermore, this chapter explained the rationale for choosing this study's primary statistical procedure, HLM. The next chapter presents the results attained from these procedures.

Chapter IV: Results

Chapter IV begins with a description of the sample used in this study. Descriptive statistics, variable transformations, and bivariate relationships are then discussed. For each HLM model, the deviance, fixed effects, and covariance parameters are provided. Following explorations of the models, the results are described in accordance with the hypotheses.

Review of Purpose of Study

Three research questions shaped the design of this study: Do institutional characteristics influence APR scores at Division I institutions? What team characteristics contribute to the variance in APR scores at Division I institutions? and After taking into account team characteristics, which aspects of the institutional context explain differences between Division I institution APR scores? To answer these questions, a two-level intercepts-as-outcomes model was developed using twelve independent variables. Three predictors describing team characteristics were entered at level-1 and nine predictors describing institutional characteristics were entered at level-2.

Sample

The study sample was restricted to single gender teams from Division I schools that were not adjusted with a confidence interval. The NCAA reported raw APR scores for 5,433 single gender teams from Division I institutions that competed in the 2009-2010 season. After removing cases with missing APR scores (N=11), the final sample size for this study was N = 5,422 from 331 institutions. Because the missing data was relatively small, missing data analysis was not necessary.

For the sample used in this study, there was no missing data for the level-1 predictors of team gender, squad size, and sport type. However there was missing IPEDS data at level-2 for eleven institutions. Although these values were not entered into the IPEDS database, federal mandates require institutions to release this information for the public to access. The missing data for housing capacity (University of Florida), admissions rate (Utah Valley University), and acceptance rate (Idaho State University, Liberty University, Savannah State University, Tennessee State University, University of Akron, University of Toledo, Utah Valley University, Weber State University, Wright State University, and Youngstown State University) were subsequently retrieved from US News & World Report rankings (U.S. News & World Report, 2011). The mean, standard deviation, minimum, and maximum values for each variable are reported in Table 2.

Table 2

Descriptive Statistics for Model Variables

Variable	Min	Max	Mean	Standard Deviation
Academic Progress Rate	712	1000	973.17	32.79
Sport Type	0	1	.16	.37
Team Gender	0	1	.55	.50
Squad Size	4	122	20.79	15.96
Institutional Control	0	1	.33	.47
Conference Affiliation	0	1	.26	.44
Enrollment (in thousands)	1.63	61.24	17.28	12.07
Expenditures (in thousands)	4.34	146.13	18.67	18.02
Financial Aid	0	81.00	22.78	13.81
Residence Hall Capacity	0	100.00	33.03	18.67
Ethnicity	1.00	96.00	11.86	18.27
Percent Male	24.00	92.00	46.05	7.77
Percent Admitted	7.00	100.00	60.23	21.67

Variable transformations

Behavioral science data typically do not follow univariate normal distributions (Micceri, 1989). In regression analyses, severely non-normal data can cause distortion of standard error estimates which can lead to biased inferences and inaccurate hypothesis testing results. However, HLM is robust against violations of normality assumptions when the sample size is large and generally performs better with non-normal data than other methods of multilevel analysis, such as structural equation modeling (e.g., Byrd, 2009; Zhang, 2005). Specifically, HLM lacks sensitivity to violations of normality when computing parameter estimates and standard errors (Van Der Leeden & Busing, 1994). Zhang (2005) found that non-normal data do not decrease the power of HLM to detect main effects when the sample size is larger than 2,500 while Byrd (2009) reported that a sample size greater than 1,500 decreases bias in model estimates to near zero. Working with highly skewed level-2 variances, Busing (1993) showed that accurate level-1 variance components required a sample size larger than 100 and that level-2 variance estimates near normality as the number of groups reaches 300 (Busing, 1993). Furthermore, Van Der Leeden and Busing (1994) found that entering at least 100 groups at level-2 leads to highly accurate estimates of group level variance components. Since this study used a large sample size of $N = 5,422$ to detect fixed effects, the design is considered robust against violations of normality.

Since this sample was robust against violations of normality, no transformations were applied to the study variables. The appendix details the results of the models with variable transformations applied to predictors with a skew and/or kurtosis of ± 2 . All significant

predictors in the model with transformations were also significant in the model without transformations.

Level-1 Variables

Variables entered at level-1 contribute to our understanding of the variance associated with characteristics within an institution. In addition to the dependent variable APR, three predictors were entered in the model at level-1: sport type, team gender, and squad size. The following section describes level-1 variable characteristics.

APR

The dependent variable for this study was defined as the ratio of scholarship student-athletes retained with academic eligibility multiplied by 1000. This variable was continuous with a maximum possible value of 1000. The mean of the variable was 973.17, exhibiting a slight negative skew. The variable met the study's standards for normality.

Sport Type

Men's basketball, baseball, football, and men's ice hockey comprised 16.0% of the study sample. This binary variable had a skew and kurtosis within acceptable ranges.

Team Gender

Women's teams comprised 54.8% of the study sample. This binary variable was mesokurtic but meets the standards for skew and kurtosis.

Squad Size

The squad size of a team was defined as the number of scholarship student-athletes on the team. The value of this predictor ranged from 4 to 122 with a mean of 20.78. It was positively skewed with a highly leptokurtic distribution.

Level-2 Variables

Nine predictors were entered into the model at level-2. These variables helped explain the variance associated with institutional characteristics. The following section describes the nature of the level-2 predictors.

Institutional Control

This independent variable reflected the institutional control of each school with public institutions coded 0 and private institutions coded 1. It was a binary variable with a mean of .33, meaning that private institutions constituted 33% of the sample. The skew and kurtosis for this variable were within acceptable ranges.

Conference Affiliation

Schools from BCS conferences comprised 26% of the study sample. This binary variable was slightly mesokurtic and met the standards for normality.

Enrollment

This predictor was a continuous variable measuring first-time full-time undergraduate enrollment. It was measured in thousands and ranged from 1.63 to 61.4 with a mean of 17.28. It was positively skewed with a mesokurtic distribution that fell within the acceptable range for this study.

Institutional Expenditures

This predictor was a continuous variable measuring, in thousands, the amount of money spent on student services, academic support, and instruction per FTE. It ranged from 4.34 to 146.13 with a mean of 18.67. It was positively skewed with a leptokurtic distribution.

Financial Aid

The percent of the student body receiving financial aid in the form of Pell grants was a continuous variable with a mean of 22.78. This predictor ranged from 0 to 81 and met normality assumptions.

Residence Hall Capacity

This continuous variable measured the residence hall capacity of an institution as a percentage of undergraduate FTE enrollment. At Division I institutions, this predictor had a mean of 33.03 and a range of 0 to 100. Skew and kurtosis met model assumptions for normality.

Ethnicity

This independent variable represented the percentage of the undergraduate population that was African American. It ranged from 1 to 96 with a mean of 11.86 ± 18.27 . It was positively skewed with a leptokurtic distribution.

School Gender

The percentage of males ranged from 24 to 92 with a mean of 46.05 ± 7.77 . It was positively skewed with a highly leptokurtic distribution.

Selectivity

Selectivity was a continuous variable measuring the percent of first-time undergraduate applicants admitted. This predictor had a mean of 60.23 and a range of 7 to 100. The skew and kurtosis met model assumptions for normality.

Collinearity Diagnostics

Collinearity diagnostics were used to examine the association between variables. Excessive intercorrelation of independent variables can increase the standard error of the estimates and make parameter estimates inefficient. Additionally, high collinearity makes assessment of the unique role of each predictor difficult.

A collinearity problem exists when a component associated with a high condition index contributes strongly to the variance of two or more variables. Belsley, Kuh, and Welsch (1980) propose that a condition index of 30 to 100 indicates moderate to strong collinearity. As seen in Table 3, the highest condition index in this sample was 4.92, indicating that strong collinearity was not a problem in the model.

Table 3

Collinearity Diagnostics for Model Variables

Dimension	Eigenvalue	Condition Index	Condition	Sport Type	Team Gender	Squad Size	Control	Conference
1	2.99	1.00	.01	.00	.01	.00	.02	.01
2	2.30	1.14	.02	.01	.03	.00	.00	.02
3	2.12	1.19	.00	.00	.00	.00	.02	.02
4	1.41	1.45	.00	.15	.02	.26	.00	.00
5	1.21	1.57	.00	.02	.00	.01	.01	.03
6	.77	1.98	.00	.00	.01	.00	.04	.01
7	.60	2.24	.00	.24	.13	.60	.00	.03
8	.48	2.49	.01	.07	.02	.06	.00	.22
9	.34	2.97	.00	.06	.07	.01	.04	.24
10	.26	3.42	.00	.12	.14	.03	.36	.00
11	.21	3.76	.00	.00	.01	.00	.28	.30
12	.18	4.11	.01	.02	.03	.00	.00	.05
13	.12	4.92	.94	.31	.55	.01	.22	.08

Table 3 (continued)

Enrollment	Expenditures	Financial Aid	Dorm Capacity	Ethnicity	Gender	Acceptance Rate
.00	.02	.02	.01	.01	.02	.01
.00	.02	.01	.02	.00	.02	.01
.06	.00	.01	.02	.03	.02	.01
.00	.00	.00	.00	.01	.00	.00
.04	.03	.03	.01	.07	.01	.10
.01	.08	.00	.11	.03	.33	.02
.00	.00	.00	.00	.00	.00	.00
.01	.10	.03	.19	.02	.25	.00
.08	.30	.03	.02	.01	.03	.39
.01	.40	.00	.24	.01	.26	.13
.78	.01	.04	.21	.03	.02	.22
.00	.01	.78	.15	.79	.01	.09
.00	.03	.06	.01	.01	.05	.00

Model Analysis

This section describes the three models that were developed to predict APR scores. The null model, which contains no predictors, established a baseline for comparison. The random effects model introduced level-1 variables and tested their significance when level-2 was controlled. Finally, the intercepts-as-outcomes model included predictors at level-1 and level-2 and assessed full level-2 effects on the dependent variable.

Table 4 shows the deviance, fixed effects, and covariance parameters associated with the null model, random effects model, and intercepts-as-outcomes model. Deviance, also called “model discrepancy,” is a measure of the lack of fit between the model and the data. Deviance change, resulting from adding variables to the model, has a chi-square distribution based on the number of predictors added. Since lower deviance is better, it can be used to illustrate improvements in the model as predictors are entered. The covariance parameters represent the between-group variances in APRs and the within-group variances. The fixed effect parameters represent the regression coefficients of each independent variable while the intercept is interpreted as the overall mean predicted APR when all other variables are controlled. Fixed effect represents the magnitude of change in the APR given a one-unit change in the independent variable.

Table 4

*Final Team-Level and Institution-Level Predictors of Academic Progress Rates for Teams at**Division I Institutions*

	Null		Level-1		Levels-1 & -2	
	Null	St. Error	Random Intercepts	St. Error	Intercepts-as-Outcomes	St. Error
<i>Fixed Effects</i>						
Intercept	968.65**	.86	964.90**	.95	963.22**	.86
Sport Type			-12.25**	.77	-12.03**	.77
Team Gender			10.41**	.53	10.49**	.53
Squad Size			-.12**	.02	-.12**	.02
Institutional Control					7.29**	1.47
Conference Affiliation					2.09	1.50
Enrollment					.23**	.07
Expenditures					.14**	.04
Financial Aid					-.33**	.06
Residence Hall					.19**	.04
Ethnicity					-.25**	.04
School Gender					-.16	.08
Selectivity					-.02	.06
<i>Deviance</i>	48242.30		46843.18		46559.30	
<i>Covariance Parameters</i>						
Residual	369.80**	7.34	280.82**	5.58	281.02**	5.58
Pseudo R ²			.24		.24	
Intercept	231.84**	20.07	237.32**	20.00	64.23**	6.62
Pseudo R ²					.72	

*p < .05, **p < .01

Note: Sample includes 5,422 teams from 331 institutions

Null Model

The null model, also called the *intercept-only model*, predicted the level-1 intercept of APRs as a random effect of institutions. The level-1 intercept was predicted as a function of the level-2 intercept and level-2 error term. Since there were no predictors in the null model, it controlled for all level-1 and level-2 effects.

The null model assessed the degree of between-group variance in the APR variable. In this study, the null model had an ICC of .39 ($p < .01$), which means that 39% of the model variance in APRs was explained by institutional characteristics. An ICC of this magnitude suggests institutional effects. It can also be said that APR scores clustered by institution, meaning that two teams randomly selected from the same school were more likely to have similar rates than a pair of randomly selected teams representing different schools.

The reliability estimate represents differences in outcomes between groups. It was calculated for each institution based on the number of teams within each school and was measured by $\tau / (\tau + \sigma^2 / \text{group size})$, where τ represented the between group variance and σ^2 represented the within group variance. By a common rule of thumb, reliability should be above .80 in confirmatory research (Garson, 2011b). In the null model, reliability ranged from .89 for an institution with 13 teams to .95 for an institution with 35 teams.

Random Effects Model

The random effects model fully considered all level-1 variables while controlling level-2 variables, which allowed for comparison to the null model. Pseudo R^2 was calculated according to Snijders and Bosker's (1994) metric: $(\sigma^2_{\text{null}} - \sigma^2_{\text{model}}) / \sigma^2_{\text{null}}$. The random effects model had a pseudo R-squared of .24, meaning that the team characteristics entered into the model accounted for 24% of the explainable variance at level-1. All three independent variables were significantly related to APRs in the expected direction. When controlling for all other variables, being from a female team was associated with a 10.56 point increase in APR. Teams from men's ice hockey, men's basketball, football, and baseball teams earned a predicted mean APR that is 12.23 points lower than all other sports. Similarly, increasing

squad size by one student-athlete reduced APR scores by .12 when all other variables in the model were held constant.

The between-school effect accounted for 46.04% of the total variance in APRs when team characteristics were controlled. Since the decrease in deviance was far greater than the critical value of chi-square for 3 degrees of freedom, the random-effects model was considered different from and better than the null model at a significance level of .01. Although this model explained a significant amount of the between school variance, the variance component for the residual parameter was large and significant, suggesting that considerable variance in APRs remained even after team-level predictors were controlled.

Intercepts-as-Outcomes Model

The intercepts-as-outcomes model included predictors at level-1 and level-2. The inclusion of institutional characteristics explained an additional 33% of the variance between schools, suggesting that these predictors influenced APRs. Controlling for institutional context and team characteristics reduced the between-school effect to 18.60% of the total variance in APR scores. In addition, the pseudo R-square for level-2 was .72, indicating that the model predictors accounted for 72% of the between-group variability in APRs. In the final model, institutional control, enrollment, institutional expenditures per FTE, and residence hall capacity were positively related to APRs. Percent of student body receiving Pell grants and ethnicity were negatively associated with APR. Three variables in this model were not significant: conference affiliation, selectivity, and gender. The level-1 predictors did not change significantly in magnitude and remained significant. Since the decrease in deviance was far greater than the critical value of chi-square for 12 degrees of freedom, the

intercepts-as-outcomes model was considered different from and better than the null model at a significance level better than .01.

Hypotheses Findings

Table 5 reports the study hypotheses and findings. The following section details the hypothesis and finding of each predictor in the final model.

Table 5

Hypotheses Findings for Predictors Entered into the Final Model

Predictor	Hypothesis	Hypothesized Direction	Finding
Sport Type	H _{1a}	(-)	Supported. Fixed effect of -12.03
Team Gender	H _{1b}	(+)	Supported. Fixed effect of 10.49
Squad Size	H _{1c}	(-)	Supported. Fixed effect of -.12
Institutional Control	H _{2a}	(+)	Supported. Fixed effect of 7.29
Conference Affiliation	H _{2b}	(-)	Not supported. Fixed effect not significant
Enrollment	H _{2c}	(+)	Supported. Fixed effect of .23
Expenditures	H _{2d}	(+)	Supported. Fixed effect of .14
Financial Aid	H _{2e}	(+)	Not supported. Fixed effect of -.33
Residence Hall Capacity	H _{2f}	(+)	Supported. Fixed effect of .19
Ethnicity	H _{2g}	(-)	Supported. Fixed effect of -.25
School Gender	H _{2h}	(-)	Not supported. Fixed effect not significant
Selectivity	H _{2i}	(+)	Not supported. Fixed effect not significant

Sport Type

H_{1a}: Big Four sports will have a negative relationship with the APR.

The analysis showed a negative relationship between the APR and big four sports teams. In the final model, being a men's basketball, football, baseball, or men's ice hockey team was associated with a 12.03 point drop in APR when controlling for all other model variables. These findings support research that link high profile sports to lower student outcomes, such as academic underperformance and attrition.

Gender

H_{1b}: Being a female team will have a positive relationship with APR.

As predicted, being a female team was positively related to the APR. Being from a female team was associated with a 10.49 point increase in the APR when all other variables were controlled. This finding confirms previous research that shows positive student outcomes are associated with gender.

Squad Size

H_{1c}: Larger teams will have a negative relationship with the APR.

Team size was significantly related to APR in a negative direction. When holding all other variables constant, a one-unit change in squad size resulted in a drop in predicted APR scores of .12. This finding could be due the fact that larger teams often have higher athlete-coach ratios, lower funding per student-athlete, or reduced engagement. It could also be attributed to the fact that the APR does not account for squad size within the metric, which means that a team with 85 scholarship student-athletes is calculated in the same manner as a team with 12 student-athletes, with no account made for varying sample sizes.

Institutional Control

H_{2a}: Privately controlled institutions will have a positive relationship with APR.

The analysis showed a significant positive relationship between the APR and privately controlled institutions. In the final model, being a privately controlled institution was associated with a 7.29 point increase in APR when controlling for all other model variables. This finding supports research that shows improved student-outcomes at privately controlled colleges and universities.

Conference Affiliation

H_{2b}: BCS schools will have a negative relationship with APR.

When controlling for all other variables, being from a BCS conference does not have a significant relationship with APR scores. This finding was surprising given the volume of literature that shows a significant relationship between conference affiliation and student-athlete outcomes.

Enrollment

H_{2c}: Institutional enrollment will have a positive relationship with APR.

Institutional size was significantly positively related to the APR. An increase of 1,000 fte students was associated with a .23 increase in APR scores. This result supports findings that suggest student-outcomes improve at institutions with larger enrollments, perhaps due to status-allocating ability or the specialized autonomous units at large schools that generate opportunities for student engagement.

Institutional Spending

H_{2d}: Spending per FTE will have a positive relationship with APR.

As predicted, institutional spending on academic support, student services, and instructional support per FTE was positively related to the APR. Entering the variable into the HLM model showed that a \$1,000 increase in expenditures resulted in a .14 increase in predicted APR scores when controlling for all other variables. This finding is in agreement with numerous studies that link institutional expenditures to positive student-outcomes.

Financial Aid

H_{2e}: Supporting a higher percent of the student body with financial aid will have a positive relationship with APR.

This hypothesis was not supported by the analyses. The HLM model showed that a one percent increase in the predictor was associated with a decrease of -.33 in the value of the APR. Although this finding does not support the hypothesis, it does support some research found in the literature.

Residence Hall Capacity

H_{2f}: On-campus residence capacity will have a positive relationship with APR.

Residence hall capacity had a significantly positive relationship with the APR. In the final HLM model, a one percent increase in dorm capacity resulted in a .19 increase in APR scores. This finding supports previous research that shows positive student outcomes associated with campus residence.

Student Body Demographics

H_{2g}: Percent of African American students at the institution will have a negative relationship with APR.

A one percent increase in ethnicity was associated with a .25 decrease in APR scores when controlling for all other variables in the model.

H_{2h}: Percent of male students at the institution will have a negative relationship with APR.

The hypothesis concerning gender as an institutional predictor was not supported. Contrary to the hypothesis, this predictor was not significant when controlling for all other variables.

Selectivity

H_{2i}: There is a positive correlation between selectivity and APR.

This finding was not supported in the multilevel model, where selectivity was not significant when holding all other variables constant. This is in contrast to numerous studies that have demonstrated a strong positive association between selectivity and student outcomes.

Chapter Summary

Significant institutional effects on APR scores for teams at Division I institutions were found in this study. Predictors with a positively significant relationship with APR scores when all other variables were controlled included: team gender, institutional control, institutional spending per FTE, and residence hall capacity. Predictors with a negative relationship with APR scores included sport type, squad size, percent receiving Pell grants, and ethnicity. Conference affiliation, selectivity, and institutional gender were not significant

in the final model. All covariance parameters and reductions in deviance were significant at a level of .01 or better. Chapter V provides an in-depth discussion of these findings, along with the implications, future directions, and limitations of the study.

Chapter V: Discussion and Conclusions

This study examined the relationship between institutional environments and team characteristics with the APR. Using multilevel analyses, this study analyzed variables previously identified as predictors of student outcomes and explored their relationship with team APR scores. While some of the findings support previous research, others provide new insight into the dynamics that may influence the retention and academic eligibility of intercollegiate athletes. The findings from this research may be highly useful to school personnel that are operating within this accountability system and attempting to meet the needs of student-athletes.

Chapter V begins with a review of the research questions and summary of the key findings. The implications of findings concerning institutional effects, team characteristics, and policy considerations are presented. Factors that may account for discrepancies, explain additional variance, or address policy concerns are addressed in light of existing theory. Emerging trends in intercollegiate athletics that are likely to impact research on the APR and student outcomes are also discussed. Suggestions for future research are provided before concluding with study limitations and conclusions.

Summary of Findings

Numerous scholars have commented on the need to account for institutional effects on student-athlete outcomes (e.g., Ferris, 2004; Heydorn, 2009; Snyder & Spreitzer, 1978). While building a model at the institutional-level can mask individual differences (Hu & Kuh, 2003; Kreft & deLeeuw, 1998), attaching institution-level characteristics to an individual or

group violates the OLS assumption that observations are independent of one another (Ethington, 1997). To address these limitation, this study used HLM, which partitions the variance associated with each level to determine the relationship of the APR to twelve team and institutional characteristics.

Three research questions guided this study. The first question was: *Do institutional characteristics influence APR scores at Division I institutions?* A statistically significant ICC of .39 from the null model indicated that APR scores cluster by institution and that institutional characteristics account for 39% of the variance in APR scores.

In response to the second research question: *What team characteristics contribute to the variance in APR scores at Division I institutions?* this study found that sport type, team gender, and squad size contributed to explaining 24% of the variance within institutions. As predicted, high profile sports and squad size were negatively related to APRs while women's teams were positively related to APRs. While this was statistically significant, there was still a large amount of variance remaining at level-1, suggesting that additional aspects within the institution may be contributing to within-group variability in APRs.

Research question number three asked: *After taking into account team characteristics, which aspects of the institutional context explain differences between Division I institution APR scores?* In this study, six of the nine institutional characteristics entered into the model explained differences between institutions after controlling for level-1 variables. Institutional control, enrollment, expenditures per FTE, and residence hall capacity were positively related to APRs while financial aid and ethnicity were negatively related to APR. Conference affiliation, institutional gender, and selectivity were not significantly

related to the APR when controlling for all other variables in the model. The level-2 predictors explained 74% of the variance in APR scores.

Eight hypotheses were supported by the multilevel analyses in the expected direction. Conference affiliation, institutional gender, and selectivity were not significant in the final multilevel model. Percent of student body receiving financial aid in the form of Pell grants was significantly related to APR in a negative direction.

In summary, the study demonstrated that a significant relationship existed between institutional characteristics and the APR. Numerous factors linked to student outcomes in the literature were also related to APR scores. While the covariance parameters in this model were statistically significant, some variance in the model remains unexplained, which suggests that additional factors may account for differences in APR scores within and between institutions. The following section provides the implications of these findings in light of policymaking and research in intercollegiate athletics.

Implications

This study contributes to our understanding of student-athlete outcomes and provides practical insight for shaping team, institutional, and NCAA policies that address academic progress. The growing attention given to intercollegiate athletics in recent years amid ongoing controversies demonstrates the importance of closely examining the implementation and impact of policies like the APR. While the implications of this study are far-reaching, the following discussion specifically addresses institutional effects, team characteristics, and policy considerations.

Institutional Effects

Researchers have pointed to the challenge of accounting for differences in institutional characteristics in intercollegiate athletics for more than 30 years (Snyder & Spreitzer, 1978). The descriptive statistics from this study alone illustrate the wide berth of characteristics found among Division I institutions. Size, for example, ranged from 1,630 students at Wofford College to 61,240 students at Arizona State University, while spending per FTE ranged from 4,100 dollars at Liberty University to 146,200 dollars at Yale University. Since failing to control for organizational characteristics like these can have confounding effects on student outcome measures, multi-institution athletics research should use statistical methods that can account for institutional differences. Using multilevel models is a new direction for the field and one that clearly advances our understanding of student-athlete outcome measures.

The findings from this study are consistent with prior findings from institutional effects research. Namely, the between group effect in the final model demonstrates that the APR is related to institutional characteristics that also predict general student outcomes. While some research suggests that student-athletes can experience isolation and marginalization at the institution (Simiyu, 2010), this study indicates that organizational factors known to influence student outcomes for the general student body are also related to the academic eligibility and retention of student-athletes at Division I institutions. This suggests that, although student-athletes may be subject to unique experiences and demands on college campuses (Ferrante, Etzel, & Lantz, 1996; Gayles, 2004), their academic progress is still influenced by the institutional environment that they encounter in college.

This study supports suppositions made by numerous writers concerning the relationship between the institutional environment and APR scores (e.g., Hinton, 2011, Smith, 2011). In “Bowling for Grades,” for example, journalist Matt Hinton alluded to the apparent impact of wealth and size on APR scores:

You don't have to look at the scores long to figure out that they're a much greater threat to smaller programs that can't afford the bureaucratic and academic resources than they are to the behemoths... These are the schools that are more likely to be cut off from the postseason by academics — not because they're recruiting dumber players, but because they don't have the support staff (par. 3).

During the most recent four year APR cycle, Hinton (2011) noted, only four BCS schools lost scholarships in football due to low APR scores as opposed to twenty non-BCS programs, many of whom were sanctioned on more than one occasion.

It is surprising, given statistics like these, that conference affiliation was not significantly related to APR scores when controlling for all other variables. This finding counters the literature and general beliefs about the relationship between BCS institutions and student-athlete outcomes (Clotfelter, 2011; Heydorn, 2009). Given the saliency of this issue amid recent research and conference realignments, this finding warrants further investigation.

Along the same vein, the finding that selectivity was not significantly related to the APR when controlling for all other variables contradicts the literature, which consistently shows that institutions with higher standards for admissions boast better student outcomes.

Critics often point to the admissions advantage provided to recruited student-athletes (Purdy, Eizen, & Hufnagel, 1985; Shulman & Bowen, 2001), which may help explain this finding.

Clearly, this finding is counterintuitive and warrants further examination.

Team Characteristics

The findings from this study support prior research showing that student-athlete outcomes vary based on gender and sport type (Pascarella, 1995; Pascarella, et al., 1999; Shulman & Bowen, 2001; Simons, Van Rheenan, & Covington, 1999). To the author's knowledge, however, this is the first study to report a relationship between squad size and student-athlete outcomes. Given the emphasis on Title IX and the practice of roster management currently pervading intercollegiate athletics, the lack of literature dedicated to the investigation of squad size is surprising. This study showed that there is a negative relationship between squad size and the APR yet additional investigation is necessary to determine the mechanisms behind this relationship. Possible factors may include higher athlete-coach ratios, weaker team cohesiveness, and lower fiscal resources per student-athlete, all of which could lead to reduced student engagement and support from staff, academic support, and peers. This finding may also be attributable to the fact that APR scores from smaller teams suffer more from the failure of a single student-athlete. Based on the findings in this study, athletics personnel may want to optimize squad sizes or take extra measures to provide large teams with appropriate academic support and engagement opportunities.

While team gender, sport type, and squad size accounted for nearly 25% of the variance found within institutions, a large amount of variance remains unaccounted for in the

final model. This is not surprising considering the limited amount of data available that describe team environments and characteristics. Measures capturing additional aspects of the team, such as athlete-coach ratio, team resources, access to academic support, time spent training (Thomas, 2008), relationship with faculty (Engstrom, Sedlacek, & McEwen, 1995; Unruh, 2001), and team culture (Jowett & Chaundy, 2004; Mangold, Bean, & Adams, 2003) could help explain remaining variability at level-1. Student-athletes face a unique set of challenges on college campuses (Ferrante, Etzel, & Lantz, 1996) and understanding the factors within an institution that impact student-athlete retention and academic progress is imperative for improving outcomes for this group.

Policy Considerations

The findings of this study clearly demonstrate that certain types of institutions are differentially equipped to facilitate APR success. Since the NCAA reserves the right to sanction institutions and teams failing to meet APR benchmarks, serious consideration should be given to how accountability measures may impact certain institutions and their personnel.

The APR has been lauded by some for its potential to reshape the academic priorities of underperforming Division I programs but continues to be a controversial and polarizing issue in the field of college athletics. Despite the fact that average scores rose from 948 in 2003 to 970 in 2010, the federal graduation rates for student-athletes rose just 2% during that time period (NCAA, 2011a). While the APR is designed to capture the current academic culture within Division I teams, its ability to actually impact academic outcomes is not yet

evident. In “Good PR, Bad Policy,” now-retired Wright State University Athletic Director Michael Cusack (2007) argued that:

Neither the institution nor the NCAA can prove that the APR is actually an indicator of academic health. Rather, it is an indicator of how an institution has responded to a set of arbitrary and questionable variables. For our programs to meet the benchmarks for the APR, we must ensure progress toward a degree - any degree - rather than counsel our students regarding their educational paths (par. 3).

In other words, showing that the APR is related to institutional characteristics known to predict general student outcomes does not necessarily mean that the APR is a suitable measure of student outcomes. The discrepancies that exist between these findings and those reported in similar studies for general students may be attributed to institutional responses to the policy, such as liberties taken in the calculation of the APR. Waivers for drop-outs, stop-outs, and ineligible students can be used to improve APR scores prior to their release to the NCAA and the public. Kansas University, for example, lost at least six men’s basketball players to the NBA prior to graduation between 2006 and 2010 yet reported a perfect 1000 APR score for that time period. Retention and eligibility waivers, along with roster management practices can compromise and dilute APR scores. While the APR is related to some institutional characteristics that predict general student-outcomes, the nuances of the measure may actually misrepresent apparent student-athlete achievement and benefit certain institutions.

Clearly, some inherent advantages exist for institutions with specific characteristics. Consideration should be given to how this APR advantage may trickle down to personnel as well. Qualified coaches may be inclined to avoid institutions that embody organizational dimensions associated with struggling student-athlete outcomes, which could further exasperate the subpar performance of some athletic programs. In 2010, the NCAA introduced the Head Coach APR Portfolio which is a publically available database of single season APR scores for head coaches. The portfolio was designed in an attempt to strengthen the accountability of coaches for student-athlete academic outcomes and heighten transparency (Hosick, 2010). However, the findings from this study show that a significant amount of variance found in APR scores is related to predictors that the head coach has little to no control over. This finding supports journalists like Dan Wolken (2011), who pointed to the limited control coaches have over the academic performance and retention of student-athletes in *Absolutely phoney reasoning: NCAA's use of academic rating system makes coaches scapegoats*. Further, many institutions have created an environment where coaches are discouraged from interfacing with faculty and other academic units on campus (Engstrom, Sedlacek, & McEwen, 1995), making it difficult for them to participate in the academic experiences of student-athletes. While coaches may control the athletic participation of student-athletes, they hold limited control over the academic progress of those students. Research shows that the coach-athlete dyad is dynamic and complex (e.g., Horne & Caron, 1985; Jowett & Chaundy, 2004) and while this relationship could help explain some of the level-1 variance in APR scores, it is clear that the majority of the variance rests with other model predictors. In light of these findings, the impact and value of this portfolio should be

closely examined. Specifically, consideration should be given to how this database could stigmatize institutions with characteristics related to lower APR scores and their personnel.

This study is the first to model the APR and its relationship with Division I colleges and universities. While it provides a starting point for understanding this policy, the effects and nuances of the APR remain unknown. The potential implications of APR research are far-reaching and clearly warrant further examination. Furthermore, it is incumbent upon the NCAA and its member institutions to learn more about the impact of the APR to determine whether students and institutions are benefiting in desired ways from the policy. The challenge facing policy makers and athletics personnel is to facilitate positive APR results while preventing the accumulation of unwanted effects.

Future Directions

Given the popularity of NCAA sports, it is surprising that there is little evidence at the national level about the effects of institutional environments on student-athlete outcomes. Extending this research can further reveal the dynamics on college campuses that impact student-athletes and their academic progress. Further development of this model could include adding a third level to the model with student-level data and examining conference affiliation as an interaction effect. Modeling the slopes and adding additional independent variables not currently available from IPEDS or the NCAA could also help explain additional model variance.

Although this model is an important step towards understanding the APR and its relationship with Division I institutions, additional study designs are needed to provide insight into the impact of this policy. A regression discontinuity study, for example, could

illustrate the effectiveness of the 925 cut-off score, while an examination of incoming student-athlete academic qualifications could reveal changes in institutional recruiting and admissions practices. Further, an in-depth analysis of changes in federal graduation rates for student-athletes could reveal the impact of the APR, if any, on student-athlete degree completion.

Limitations

There are several limitations to this study. First, this study was limited to the availability of data from the 2008 IPEDS and 2010 NCAA publicly available databases. While this model is built from recent and robust data, it could be augmented by student-level data and additional team-level data. The vast majority of that additional data was not currently available from the NCAA, which continues to be an ongoing problem in athletics research. In addition, APR scores are not measured or reported for teams outside of NCAA Division I athletics, which limits our ability to generalize findings to Division II and III and NAIA institutions and teams. Furthermore, this study only investigates the relationship between institutional and team and APR scores, it does not uncover how the APR actually impacts academic progress.

Finally, this study only provides a partial empirical test of Pascarella's (1985) Model for Assessing Change. While the results validate most constructs from Pascarella's (1985) model, they do not address the model's focus on the influence of student effort, which is beyond the scope of this study. Despite these limitations, this study provides valuable insight into the relationship between athletics and academic achievement on college campuses and lays the groundwork for further exploration of the APR as a measure of student outcomes.

Conclusion

Several conclusions can be drawn from this study. First, Pascarella's Model for Assessing Change (1985) helps explain APR scores at Division I institutions. The results from this study validated several constructs from Pascarella's (1985) change model and supports Pascarella's (1985) claim that student outcomes are influenced by the environment and structure of the institution. Second, even after controlling for team characteristics, differences in APR scores existed between institutions. While the team predictors help explain this variance, they do not fully explain the differences between institutions. Third, conference affiliation, institution gender, and selectivity were not significantly related to APR scores after controlling for other variables in the model. These findings are counterintuitive and in contrast to the literature and warrant further investigation. Fourth, this study demonstrated that multilevel statistical techniques should be used to identify predictors of student outcomes at the team- and institutional-level. This work demonstrates how institutional context can be explored in multi-institution athletics research using multilevel statistical techniques.

The findings from this study hold statistical and practical significance. They extend our current understanding of the relationship between institutional characteristics and student-athlete outcomes and provide the first step towards (a) understanding student-athlete retention and academic progress in a hierarchical framework and (b) analyzing the APR - an understudied index that involves significant sanctions for schools that fail to meet the NCAA's APR standard. This study addresses a gap in the literature concerning team and institution impacts on student-athlete outcomes and overcomes previous methodological

limitations in athletics research. It also establishes the groundwork for further investigation of the APR and provides stakeholders with valuable information for facilitating an environment of informed decision making.

References

- Adèr, H. J., Mellenbergh, G. J., & Hand, D. J. (2008). *Advising on research methods: A consultant's companion*. Huizen, The Netherlands: Johannes van Kessel.
- Adler, P., & Adler, P. (1985). From idealism to pragmatic detachment: The academic performance of college athletes. *Sociology of Education*, 58, 241-250.
- Allen, D. (1999). Desire to finish college: An empirical link between motivation and persistence. *Research in Higher Education*, 40, 461-485
- Astin, A. W. (1984). Student involvement: A developmental theory for higher education. *Journal of College Student Personnel*, 25(4), 297-308.
- Astin, A. W. (1985). *Achieving educational excellence: A critical assessment of priorities and practices in higher education*. San Francisco: Jossey-Bass.
- Astin, A. W. (1993a). *Assessment for Excellence*. Phoenix, AZ: American Council on Education & The Oryx Press.
- Astin, A. W. (1993b). *What matters in college: Four critical years revisited*. San Francisco: Jossey-Bass.
- Baldrige, J. V., Curtis, D. V., Ecker, G. P., & Riley, G. L. (1977). Alternative models of governance in higher education. In R. Birnbaum (Ed.), *ASHE reader in organization and governance in higher education* (pp. 11-27). Lexington, MA: Ginn Press.
- Bean, J. P. (1990). Why students leave: Insights from research. In D. Hossler & J.P. Bean (Ed.), *The strategic management of college enrollments*. San Francisco: Jossey-Bass.
- Benson, M. (1991). *A graphic display of initial eligibility rules applied to 1984 and 1985 freshman student-athletes*. Overland Park, Kansas: NCAA.

- Berger, J. B. (2000). Organizational behavior at colleges and student outcomes: A new perspective on college impact. *The Review of Higher Education, 23*, 177-198.
- Berger, J. B., & Braxton, J. M. (1998). Revisiting Tinto's interactionist theory of student departure through theory elaboration: Examining the role of organizational attributes in the persistence process. *Research in Higher Education, 39*, 103-119.
- Berger, J. B., & Milem, J. F. (1999). The role of student involvement and perceptions of integration in a causal model of student persistence. *Research in Higher Education, 40*(6), 641-64.
- Blanc, R., DeBuhr, L. E., & Martin, D. C. (1983). Breaking the attrition cycle: The effects of supplemental instruction on undergraduate performance and attrition. *Journal of Higher Education, 54*, 80-90.
- Blanc, R., & Martin, D. C. (1994). Supplemental instruction: Increasing student performance and persistence in difficult academic courses. *Academic Medicine, 69*, 452-454.
- Blinde, E. M. (1989). Female intercollegiate athletes: Changes and implications. *Journal of Physical Education, Recreation, and Dance, 60*, 33-37.
- Bowen, W. G., & Levin, S. A. (2003). Reclaim college athletics – for all. *Christian Science Monitor, 95*.
- Braxton, J. M., Vesper, N., & Hossler, D. (1995). Expectations for college and student persistence. *Research in Higher Education, 36*, 595-612.
- Burstein, L. (1980). The analysis of multilevel data in educational research and evaluation. *Review of Research in Education, 8*, 158-233.

- Busing, F. (1993). *Distribution characteristics of variance estimates in two-level models*.
Department of Psychometrica and Research Methodology, Leiden University, Leiden.
- Cabrera, A. F., Nora, A., & Castañeda, M. B. (1992). The role of finances in the persistence process: A structural model. *Research in Higher Education, 33*(5), 571-593.
- Caldas, S. J., & Bankston, C. (1997). Effect of school population socioeconomic status on individual academic achievement. *Journal of Educational Research, 90*, 269-277.
- Carter, W. B. (2006). Age of innocence: The first 25 years of the National Collegiate Athletics Association, 1906 to 1931. *Vanderbilt Journal of Entertainment and Technology Law, 8*, 211-291.
- Chickering, A. W. (1975). Developing intellectual competence at Empire State. *New Directions for Higher Education, 10*, 31-40.
- Clotfelter, C. T. (2011). *Big-time sports in American universities*. New York: Cambridge University Press.
- Congos, D. H., & Schoeps, N. (1997). A model for evaluation retention programs. *Journal of Developmental Education, 21*, 2-9.
- Curran, P. J., West, W. G., & Finch, J. (1996). The robustness of test statistics to non-normality and specification error in confirmatory factor analysis. *Psychological Methods, 1*, 16-29.
- Cusack, M. (2007). Good PR, bad policy. *The Chronicle of Higher Education*. Retrieved from <http://chronicle.com/article/The-Academic-Progress-Rate-/6318>
- Edwards, H. (1984). The collegiate arms race: Origins and implications of the “Rule 48” controversy. *Journal of Sport and Social Issues, 8*, 4-22.

- Eimers, M. T., & Pike, G. R. (1997). Minority and non-minority adjustment to college: Differences or similarities? *Research in Higher Education, 38*, 77-97.
- Eitzen, S., & Purdy, D. (1986). The academic preparation and achievement of black and white college athletes. *Journal of Sport and Social Issues, 10*, 15-20.
- Emerson, J., Brooks, R., Youakim, C., McKenzie, E., & Mueggenburg, K. (2010). Academic performance and athletic retention within NCAA Division III: Does institutional selectivity matter? Presented at *American Educational Research Association Annual Meeting*. Retrieved from http://www.collegesportsproject.org/CDCA_PDF/AERA_2010_CSP_Web.pdf
- Engstrom, C. M., Sedlacek, W. E., & McEwen, M. K. (1995). Faculty attitudes toward male revenue and non-revenue student-athletes. *Journal of College Student Development, 36*, 217-227.
- Ethington, C. A. (1997). A hierarchical linear modeling approach to studying college effects. *Higher Education Handbook of Theory and Research, 12*, 165-194.
- Falla, J. (1981). *The NCAA: The Voice of College Sports: A Diamond Anniversary History, 1906-1981*. Mission, Kans: NCAA.
- Ferrante, T. B., Etzel, J. M., & Lantz, M. J. (2003). A systems approach to understanding and counseling college student-athletes. *Journal of College Counseling, 6*.
- Ferris, E., Finster, M., & McDonald, D. (2004). Academic fit of student-athletes: An analysis of NCAA Division I-A graduation rates. *Research in Higher Education, 45*, 555-575.
- Figler, S. K. (1987). The academic performance of college athletes: Of playpens and backyards. *ARENA Review, 11*, 35-40.

- Fleming, J. (1984). *Blacks in College*. San Francisco: Jossey-Bass Publishers.
- Gall, D., Borg, W., & Gall, J. (1996). *Educational research an introduction*. White Plains, NY: Longman.
- Gansemer-Topf, A. M., & Schuh, J. H. (2006). Institutional selectivity and institutional expenditures: Examining organizational factors that contribute to retention and graduation. *Research in Higher Education*, 47, 613-642.
- Garson, G. (2011a). Hierarchical Linear Modeling. Retrieved from <http://faculty.chass.ncsu.edu/garson/pa765/statnote.htm>.
- Garson, G. (2011b). Linear Mixed Models. Retrieved from <http://faculty.chass.ncsu.edu/garson/pa765/statnote.htm>
- Gayles, J. (2004). Examining academic and athletic motivation among student athletes at a Division I university. *Journal of College Student Development*, 45, 75-83.
- Gayles, J., and Hu, S. (2009). Athletes as students: Ensuring positive cognitive and affective outcomes. *New Directions for Higher Education*, 148, 101-107.
- Gerdy, J. R. *The Successful College Athletic Program*. Phoenix, Ariz.: Oryx Press, 1997.
- Gilmore, J. L. (1990). *Price and quality in higher education*. United States Office of Educational Research and Improvement Information Services.
- Hall, R. H. (1991). *Organizations: Structures, processes, and outcomes* (5th ed). Englewood Cliffs, NJ: Prentice-Hall.
- Hamilton, K. 2005. Putting the 'student' back into student-athlete. *Black Issues in Higher Education*, 22, 28-30.
- Harmon, N. (2010). Overscheduled and overcommitted. *About Campus*, 14, 26-29.

- Heller, D. E. (2001). *The states and public higher education policy: Affordability, access, and accountability*. Baltimore: The Johns Hopkins University Press.
- Henschen, K., & Fry, D. (1984). An archival study of the relationship of intercollegiate athletic participation and graduation. *Sociology of Sport Journal*, 1, 52-56.
- Heydorn, M. (2009). Explaining the graduation gap – athletes vs non-athletes: A study of the Big Ten and Missouri Valley Conferences. *The Park Place Economist*, 17, 25-33.
- Hildenbrand, K., Sanders, J. P., Leslie-Toogood, A., & Benton, S. (2009). Athletic status and academic performance and persistence at a NCAA Division I university. *Journal for the Study of Sports and Athletes in Education*, 3, 41-58.
- Hinton, M. (2011). Bowling for grades: NCAA adds academic minimum to qualify for bowl game. Retrieved from http://rivals.yahoo.com/ncaa/football/blog/dr_saturday/post/bowling-for-grades-ncaa-adds-academic-minimum-to-qualify-for-a-bowl-game?urn=ncaaf,wp4868
- Hodge, S. R., Harrison, L., Burden, J. W., & Dixson, A. D. (2008). Brown in black and white - then and now: A question of education or sporting African American males in America. *American Behavioral Scientist*, 51, 928-952.
- Hood, A. B., Craig, A. F., & Ferguson, B. W. (1992). The Impact of Athletics, Part-Time Employment, and Other Activities on Academic Achievement. *Journal of College Student Development*, 33, 447-453.
- Horne, T. & Carron, A. V. (1985). Compatibility in coach-athlete relationships. *Journal of Sport Psychology*, 7, 137-149.

- Horton, D., Jr. (2009). Class and cleats: Community college student athletes and academic success. In L. S. Hagedorn & D. Horton, Jr. (Eds.), *Community college student athletes and athletics. New Directions for Community Colleges, 147*, 15-27. San Francisco: Jossey-Bass.
- Hosick, M. (2007). *Head coach APR database released*. Retrieved from <http://www.ncaa.org/wps/wcm/connect/public/NCAA/Resources/Latest+News/2010+news+stories/August+latest+news/Head+coach+APR+database+released>
- Hossler, D., Kim, S., & Ziskin, M. (2010). The study of institutional practices related to student persistence. *Journal of College Student Retention, 11*, 101-201.
- Hox, J. J. (2010). *Multilevel analysis: Techniques and Applications*. New York: Routledge.
- Hu, S., & Kuh, G. D. (2003). Maximizing what students get out of college: Testing a learning productivity model. *Journal of College Student Development, 44*, 185- 203.
- Jolly, J. C. (2008). Raising the question #9: Is the student-athlete population unique? And why should we care? *Communication Education, 57*, 145-151.
- Jowett, S., & Chaundy, V. (2004). An investigation into the impact of coach leadership and coach-athlete relationship on group cohesion. *Group Dynamics: Theory, Research, and Practice, 8*, 302-311.
- Kamens, D. H. (1971). The college 'charter' and college size. Effects on occupational choice and college attrition. *Sociology of Education, 44*, 270-296.
- Knapp, T. J., & Raney, J. F. (1988). Student-athletes at two-year colleges: Transcript analysis of grades and credits. *Community Junior College Quarterly of Research and Practice, 12*, 99-105.

- Klein, J. Z. (2010). The stars of hockey play here, and there. *N.Y. Times*, Feb. 20, 2010, D4.
- Kreft, I., & de Leeuw, J. (1998). *Introducing multilevel modeling*. London: Sage.
- Krueger, A. B. (1999). Experimental estimates of education production functions. *The Quarterly Journal of Economics*, 114, 119-122.
- LaForge, L., & Hodge, J. (2011). NCAA academic performance metrics: Implications for institutional policy and practice. *Journal of Higher Education*, 2, 217-235.
- Lang, G., Dunham, R. G., & Alpert, G. P. (1988). Factors related to the academic success and failure of college football players: The case of the mental dropout. *Youth and Society*, 20, 209-222.
- Lawrence, S. M. (2001). The African American athlete's experience with race and sport: An existential-phenomenological investigation. Paper presented at the *North American Society for the Sociology of Sport* Annual Meeting in San Antonio, Texas.
- Maas, C. J. M. & Hox, J. J. (2005). Sufficient sample sizes for multilevel modeling. *Methodology* 1(3), 86-92.
- Mangold, W. D., Bean, L., & Adams, D. (2003). The impact of intercollegiate athletics on graduation rates among major NCAA Division I universities: Implications for college persistence theory and practice. *Journal of Higher Education*, 74, 540-562.
- Marcus, R. D. (1989). Freshman retention rates at U.S. private colleges: Results from aggregated data. *Journal of Economic and Social Measurement*, 15, 37-55.
- Marshall, J. (2011). College sports: Scandal floods NCAA sports. *San Angelo Standard Times*. Retrieved from <http://www.gosanangelo.com/news/2011/mar/31/scandal-floods-ncaa-sports/>

- Martens, M.P., & Cox, R. H. (2000). Career development in college varsity athletes. *Journal of College Student Development*. Retrieved from http://findarticles.com/p/articles/mi_qa3752/is_/ai_n8894446
- Mayer-Foulker, D. (2002). On the dynamics of quality student enrollment at institutions of higher education. *Economics of Education Review*, 21, 481-489.
- Mayo, J. R., Murguia, E. & Padilla, P.V. (1995). Social integration and academic-performance among minority university-students. *Journal of College Student Development*, 36, 542-552.
- McEwen, M. K., & Galicki, S. J. (1989). The relationship of residence to retention of black and white undergraduate students at a predominantly white university. *Journal of College Student Development*, 30, 389-394.
- McGrath, M., & Braunstein, A. (1997). The role of economic factors in higher education persistence. *International Advances in Economic Research*, 3, 325-326.
- Melnick, M. J., Vanfossen, B. E., & Sabo, D. F. (1988). Developmental effects of athletic participation among high school girls. *Sociology of Sport Journal*, 5, 22-36.
- Meyer, B. B. (1990). From idealism to actualization: The academic performance of female collegiate athletes. *Sociology of Sport Journal*, 7, 44-57.
- Micceri, T. (1989). The unicorn, the normal curve, and other improbable creatures. *Psychological Bulletin*, 105 (1), 156-166.
- Miller, P. S., & Kerr, G. (2002). The athletic, academic, and social experiences of intercollegiate student-athletes. *Journal of Sport Behavior*, 25, 346-367.

National Center for Education Statistics. (1997). Findings from the condition of education 1997: No. 13 postsecondary persistence and attainment: U.S. Department of Education Office of Educational Research and Improvement/NCES 97-984. Washington DC: U.S. Government Printing Office.

National Center for Education Statistics. (1998). Postsecondary financing strategies: How undergraduates combine work, borrowing, and attendance. U.S. Department of Education Office of Educational Research and Improvement/NCES 98-088. Washington DC: U.S. Government Printing Office.

National Center for Education Statistics. (2005). *Integrated Postsecondary Education Data System Data Quality Study*. Retrieved from <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2005175>

National Center for Education Statistics. (2011). *Integrated Postsecondary Educational Data System*. Retrieved from <http://nces.ed.gov/ipeds/datacenter/>

National Collegiate Athletic Association. (2011a). *Latest APR data reveal academic success*. Retrieved from http://www.ncaa.org/wps/portal/ncaahome?WCM_GLOBAL_CONTEXT=/ncaa/NCAA/NCAA+News/NCAA+News+Online/2010/Division+I/Latest_APR_data_reveal_academic_success_NCAA_News_06_09_10

National Collegiate Athletic Association. (2011b). A seamless eligibility model. Retrieved from <http://www.ncaa.org/wps/wcm/connect/public/NCAA/Academics/Division+I/Explanation+of+seamless+eligibility+model>

National Collegiate Athletic Association. (2011c). Behind the blue disk: Division I academic reform. Retrieved from

<http://www.ncaa.org/wps/wcm/connect/public/NCAA/Resources/Behind+the+Blue+Disk/Behind+the+Blue+Disk+-+Division+I+Academic+Reform>

National Collegiate Athletic Association. (2011d). NCAA estimated probability of competing in athletics beyond the high school interscholastic level. Retrieved from http://www.ncaa.org/wps/portal/ncaahome?WCM_GLOBAL_CONTEXT=/ncaa/NCAA/Academics+and+Athletes/Education+and+Research/Probability+of+Competing/Methodology+-+Prob+of+Competing

National Collegiate Athletic Association. (2011e). *NCAA Education and Research Data*. Retrieved from <http://fs.ncaa.org/Docs/newmedia/public/rates/index.html>

National Collegiate Athletic Association. (2011f). The student-athlete perspective of the college experience: Findings from the 2008 NCAA GOALS and SCORE studies. Retrieved from <http://www.ncaa.org/wps/wcm/connect/public/NCAA/Resources/Research/Student-Athlete+Experience+Research>

Nora, A., Cabrera, L., Hagedorn, S., & Pascarella, E. (1996). Differential impacts of academic and social experiences on college-related behavioral outcomes across different ethnic and gender groups at four-year institutions. *Research in Higher Education, 37*, 427-451.

Oseguera, L. (2006). Four and six-year baccalaureate degree completion by institutional characteristics and racial/ethnic groups. *Journal of College Student Retention, 7*, 19-59.

- Pascarella, E. T. (1985). College environment influence on learning and cognitive development: A critical review and synthesis. In J. Smart (Ed.), *Higher Education: Handbook of theory and Research*. (Vol 1). New York: Agathon.
- Pascarella, E. T., Bohr, L., Nora, A., & Terenzini, P. (1995). Intercollegiate athletic participation and freshman-year cognitive outcomes. *Journal of Higher Education*, 66, 369-387.
- Pascarella, E. T., & Smart, J. C. (1991). Impact of athletic participation for African American and Caucasian men: Some further evidence. *Journal of College Student Development*, 32, 123-130.
- Pascarella, E. T., & Terenzini, P. (2005). *How college affects students: Findings and insights from twenty years of research*. San Francisco: Jossey-Bass.
- Pascarella, E. T., Truckenmiller, R., Nora, A., Terenzini, P. T., Edicson, M., & Hagedorn, L. S. (1999). Cognitive impacts of intercollegiate athletic participation: Some further evidence. *Journal of Higher Education*, 70, 1-26.
- Peltier, G. L., Laden, R., & Matranga, M. (1999). Student persistence in college: a review of research. *Journal of College Student Retention*, 1, 357-376.
- Perna, L. W. (1998). The contribution of financial aid to the price of four-year institutions attended by 1989/1990 freshmen. *Review of Higher Education*, 21, 197.
- Peterfreund, A. R., Rath, K. A., Xenos, S. P., & Bayliss, F. (2008). The impact of supplemental instruction on students in STEM courses: Results from San Francisco State University. *Journal of College Student Retention*, 9, 487-503.

- Petrie, T. A., & Stoeber, S. (1997). Academic and nonacademic predictors of female student-athletes' academic performances. *Journal of College Student Development, 38*, 599-608.
- Purdy, D. A., Eitzen, D. S., & Hufnagel, R. (1982). Are athletes also students? The educational attainment of college athletes. *Social Problems, 29*, 439-498.
- Purdy, D. A., Eitzen, D. S., & Hufnagel, R. (1985). The educational achievement of student-athletes using SAT and non-cognitive variables. *Journal of Counseling & Development, 70*, 724-727.
- Rasmuson, M. R. (1968, January 11). NCAA alters 1.6 Rule, Defeats Ivies' motion. *The Harvard Crimson*.
- Ratliff, H. V. (1951, January 16). Dallas burial ground for NCAA sanity code. *The Victoria Advocate*.
- Raudenbush, S. W. (2010). *Outlines & highlights for hierarchical linear models: Applications and data analysis methods*. Ventura, CA: Academic Internet Publishers Inc.
- Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods, Second edition*. Thousand Oaks, CA: Sage Publications.
- Rossi, P. H., Freeman, M. W., & Lipsey, H. E. (1999). *Evaluation: A systematic approach*. Thousand Oaks, CA: Sage Publications.
- Ryan, F. J. (1989). Participation in intercollegiate athletics: Affective outcomes. *Journal of Student College Development, 30*, 122-28.

- Ryan, M. P., & Glenn, P. A. (2003). Increasing one-year retention rates by focusing on academic competence: An empirical odyssey. *Journal of College Student Retention*, 4, 297-324.
- Sack, A. (2008). *Counterfeit Amateurs: an athlete's journey through the sixties to the age of academic capitalism*. University Park, PA: The Pennsylvania State University Press.
- Schroeder, P. J. (2000). An assessment of student involvement among selected NCAA Division III basketball players. *Journal of College Student Development*, 41, 616-26.
- Schwartz, P. J. (2009). Most valuable college football teams. *Forbes*. Retrieved May 10, 2011 from <http://www.forbes.com/2009/12/22/most-valuable-college-football-teams-business-sports-college-football.html>
- Sedlacek, W. E., & Adams-Gaston, J. (1992). Predicting the academic success of student-athletes using SAT and noncognitive variables. *Journal of Counseling & Development*, 70, 724-727.
- Sellers, R. M. (1992). Racial differences in the predictors for academic achievement of student-athletes in Division I revenue producing sports. *Sociology of Sport Journal*, 9, 48-60.
- Shapiro, B. J. (1984). Intercollegiate athletic participation and academic achievement: A case study of Michigan State University student-athletes, 1950-1980. *Sociology of Sport Journal*, 1, 46-51.
- Shropshire, K. L. (1997). Colorblind propositions: Race, the SAT, and the NCAA. *Stanford Law & Policy Review*, 8, 141-152.

- Shulman, J. L., & Bowen, W. G. (2001). *The game of life: College sports and educational values*. Princeton, N.J.: Princeton University Press.
- Simiyu, N.W. (2010). Individual and institutional challenges facing student athletes on U.S. college campuses. *Journal of Physical Education and Sports Management, 1*, 16-24.
- Simons, H. D., Van Rheenen, D., & Covington, M. V. (1999). Academic motivation and the student athlete. *Journal of College Student Development, 40*, 151-162.
- Smart, J. C. (1986). College effects on occupational status attainment. *Research in Higher Education, 24*, 73-95.
- Smith, R. A. (2011). *Pay for play*. Chicago: University of Illinois Press.
- Smith, S. (2008, July 24). Migratory hawk: Josh Childress leaves NBA for Greece. *Atlanta Journal-Constitution*.
- Snijders, T. A. B., & Boskers, R. J. (1994). Modeled variance in two-level models. *Sociological Methods and Research, 22*, 342-363.
- Snyder, E. E. & Spreitzer, E. (1978). *Social aspects of sport*. Englewood Cliffs, N.J.: Prentice-Hall.
- Spady, W. G. (1971). Status, achievement, and motivation in the American high school. *School Review, 79*, 379-403.
- Stagg, P. (1946). The development of the NCAA in relationship to intercollegiate athletics in the United States. PhD dissertation. New York University.
- Stoecker, J. L., Pascarella, E. T., & Wolfle, L. M. (1988). Persistence in higher education: A 9-year test of a theoretical model. *Journal of College Student Development, 29*, 196-209.

- Suggs, W. (2003, January 17). Jock majors: Many colleges allow football players to take the easy way out. *Chronicle of Higher Education*, 49, A33.
- Thomas E (2008). A College perspective on academics and the student athlete. *Coach & Athletics Director*, 77, 29-36.
- Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research*, 45, 89-125.
- Tinto, V. (1974, 1993). *Leaving college: Rethinking the causes and cures of student attrition*. Chicago: The University of Chicago Press.
- Toutkoushian, R. K., & Smart, J. C. (2001). Do institutional characteristics affect student gains from college? *The Review of Higher Education*, 25, 39-61.
- Trawick, S. (1994). *Student persistence at a postsecondary technical institute*. Dissertation Abstracts International, 55, 3172.
- Tucker, L. B. (1992). The impact of big-time athletics on graduation rates. *Atlantic Economic Journal*, 20, 65-72.
- Umbach, P. D., Palmer, M. M., Kuh, G. D., & Hannah, S. J. (2006). Intercollegiate athletes and effective educational practices: Winning combination or losing effort? *Research in Higher Education*, 47, 709–733.
- Unruh, R. L. (2001). Athletic department practices that relate to the academic performance and persistence of student-athletes (PhD ed.). Eugene Oregon: University of Oregon.
- U.S. News and World Report. (2011). Rankings and reviews. Retrieved from <http://colleges.usnews.rankingsandreviews.com/best-colleges>

- Van der Leeden, R., & Busing, F. (1994). *First iteration versus IGLS/RIGLS estimates in two-level models: a Monte Carlo study with ML3*. Department of Psychometrica and Research Methodology, Leiden University, Leiden.
- Velez, W. (1985). Finishing college: The effect of college type. *Sociology of Education*, 58, 191-200.
- Volkwein, J. F., & Szelest, B. P. (1995). Individual and campus characteristics associated with student loan default. *Research in Higher Education*, 36, 41-72.
- Waller, J. M. (2003). A necessary evil: Proposition 16 and its impact on academics and athletics in the NCAA. *DePaul Journal of Sports, Law, and Contemporary Problems*, 1, 189-206.
- Washington, C. M., & Schwartz, R.A. (1999). Predicting academic success and retention for African American women in college. *Journal of College Student Retention*, 1, 177-191.
- Wilstein, S. (2003). Basketball players lag in graduation rates. *The Cincinnati Enquirer*. Retrieved from http://www.enquirer.com/editions/2003/03/25/spt_wwwncaa4a25.html
- Wolken, D. (2011). Absolutely phony reasoning: NCAA's use of academic rating system makes coaches scapegoats. Retrieved from <http://www.thedaily.com/page/2011/05/24/052411-sports-wolken-1-3/>
- Wong, G. M., Zola, W., & Deubert, C. (2011). Going pro in sports: Providing guidance to student-athletes in a complicated legal & regulatory environment. *Cardoze Arts & Entertainment Law Journal*, 553.

Yost, M. (2008, March 19). A cultural conversation with Nathan Tublitz: Has serious academic reform of college athletics arrived. *Wall Street Journal*, p. D.10.

Young, B. D. & Sowa, C. J. (1992). Predictors of academic success of black student athletes. *Journal of College Student Development*, 33, 31.

Zhang, D. (2005). A Monte Carlo investigation of robustness to nonnormal incomplete data of multilevel modeling. *Dissertation Abstracts International*, 67, 8A.

APPENDIX

APPENDIX

This appendix details the development of an intercepts-as-outcomes model of the APR with four transformed predictors. Although HLM is robust against violations of normality with a large sample size, the following model explored the data based normality standards of +/- 2 for skew and +/- 6 for kurtosis (Curran, West, & Finch, 1996; Garson, 2011; Zhang, 2005). To reach the standards of normality, a natural log transformation was applied to squad size, and the institutional variables of expenditures, ethnicity, and gender.

Table 1A includes the descriptive statistics for all model variables, including the four that were transformed. The maximum kurtosis value in the analysis was reduced from 17.03 to 3.29 and the maximum skew value decreased from 3.69 to 1.20. Following the transformations, all variables are within acceptable ranges.

Table 1A

Descriptive Statistics for Model Variables

Variable	Min	Max	Mean	Standard Deviation
Academic Progress Rate	712	1000	973.17	32.79
Sport Type	0	1	.16	.37
Team Gender	0	1	.55	.50
Squad Size	4	122	20.79	15.96
Squad Size Log	1.39	4.80	2.85	.56
Institutional Control	0	1	.33	.47
Conference Affiliation	0	1	.26	.44
Enrollment (in thousands)	1.63	61.24	17.28	12.07
Expenditures (in thousands)	4.34	146.13	18.67	18.02
Expenditures Log	1.41	4.98	2.69	.60
Financial Aid	0	100.00	79.12	16.16
Residence Hall Capacity	0	100.00	33.03	18.67
Ethnicity	1.00	96.00	11.86	18.27
Ethnicity Log	-2.30	4.56	1.91	.98
Percent Male	24.00	92.00	46.05	7.77
Percent Male Log	3.18	4.52	3.81	.16
Percent Admitted	7.00	100.00	60.23	21.67

Figures 1A through 8A provide histograms for variables that were transformed, showing the original variable and transformed variables. Squad size, which was a highly leptokurtic variable, and its transformation are shown in Figures 1A and 2A. The skew and kurtosis for expenditures per FTE illustrated in figures 3A and 4A, was reduced from 3.69 to 1.20 and 17.03 to 1.61, respectively. As seen in Figures 5A and 6A, a natural log transformation was used to reduce the skew and kurtosis in percent African American from 3.52 to .22 and 12.01 to 1.81, respectively. Transformation of institutional gender, seen in figures 7A and 8A reduced skew was from 1.89 to .64 and kurtosis from 7.97 to 3.29.

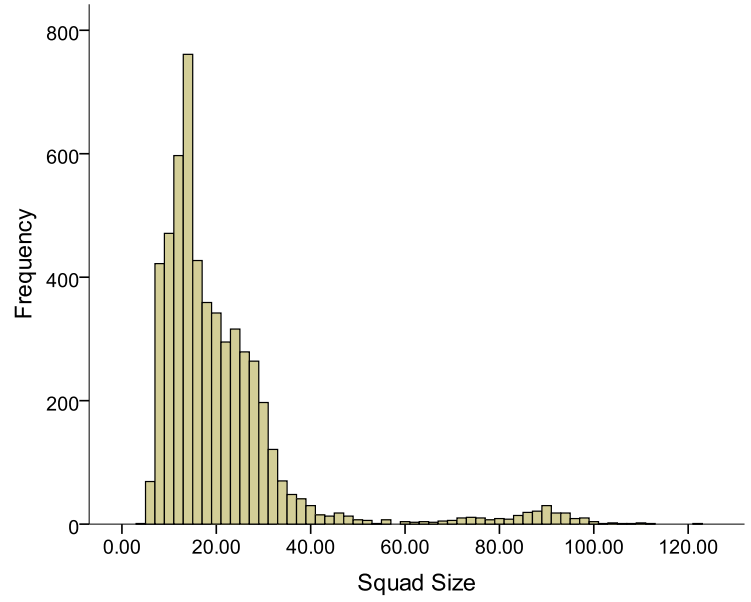


Figure 1A. Frequency distribution of “squad size” variable.

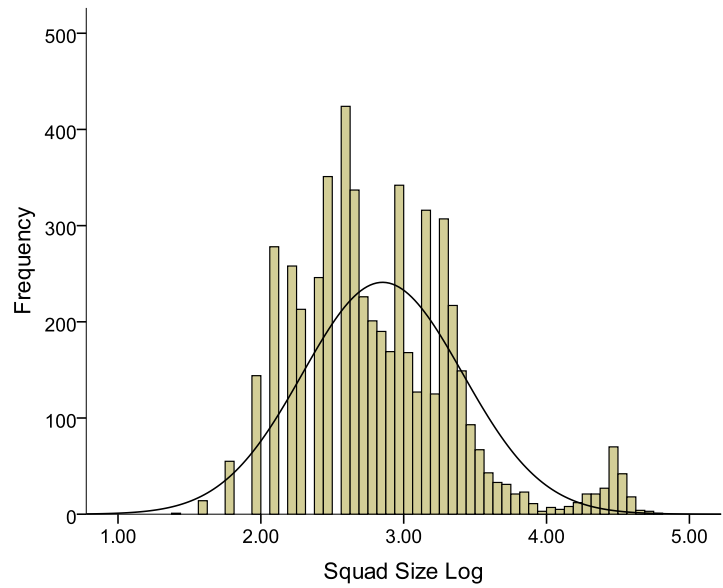


Figure 2A. Frequency distribution of transformed “squad size” variable, squad size log.

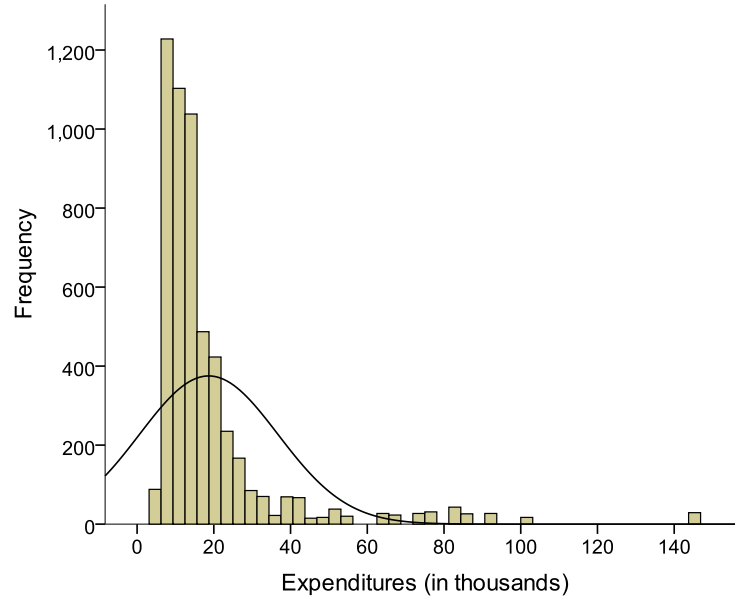


Figure 3A. Frequency distribution of expenditures.

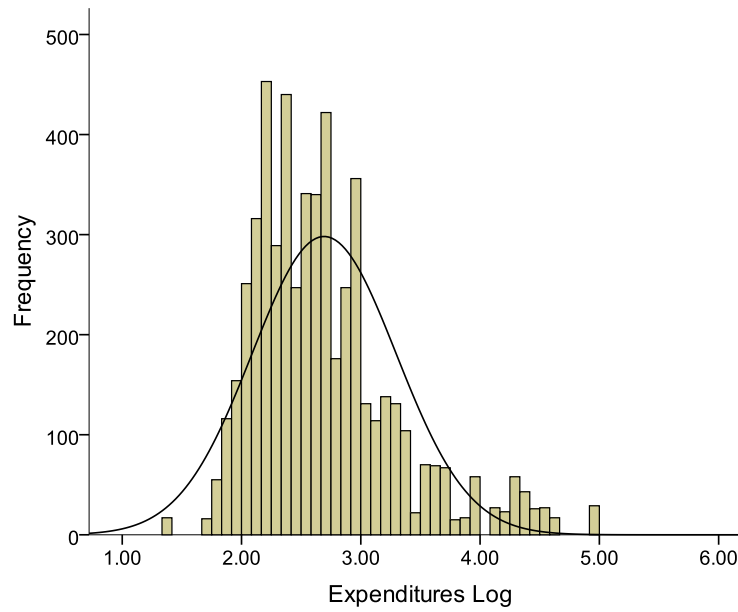


Figure 4A. Frequency distribution of expenditures transformed, expenditures log.

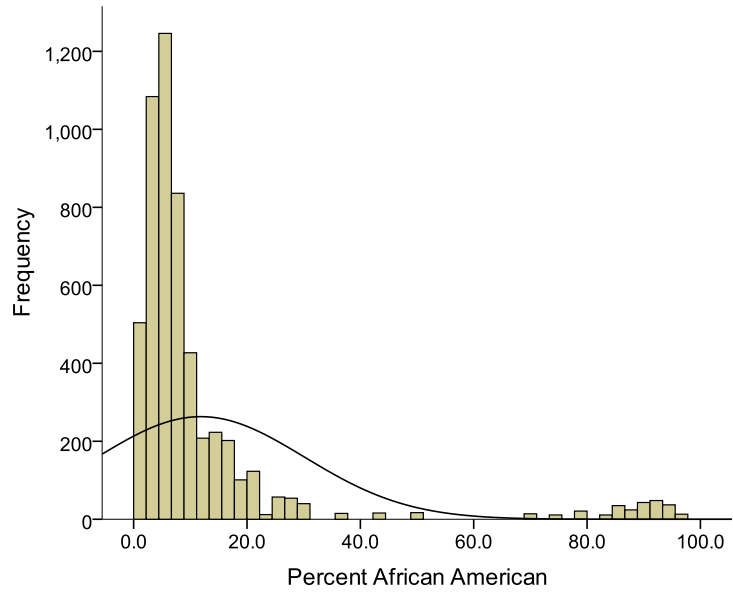


Figure 5A. Frequency distribution of ethnicity.

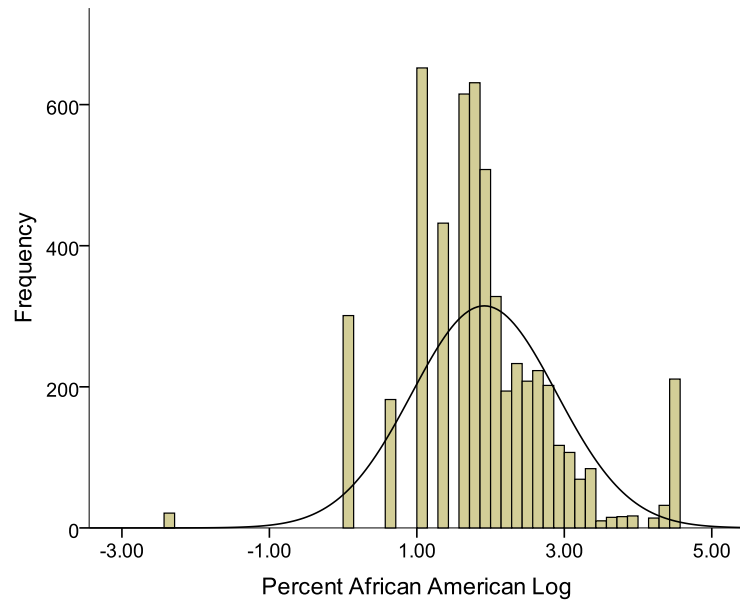


Figure 6A. Frequency distribution of ethnicity transformed.

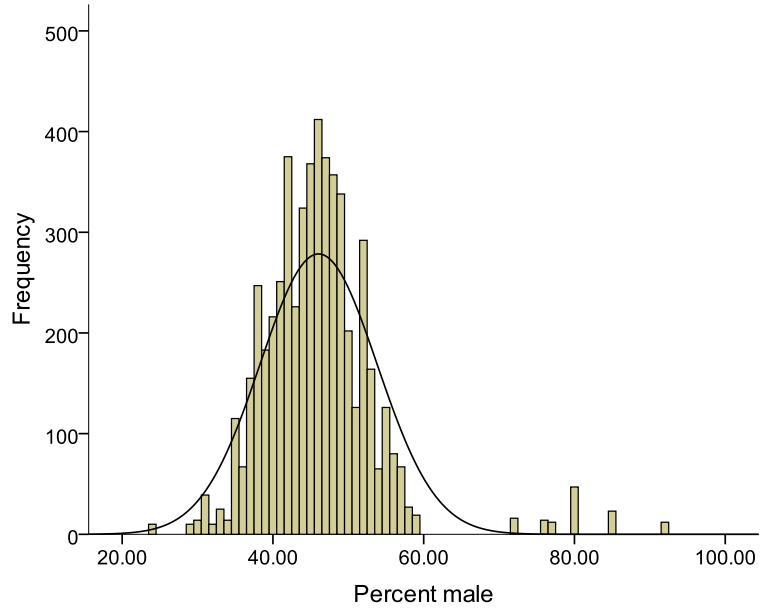


Figure 7A. Frequency distribution of gender.

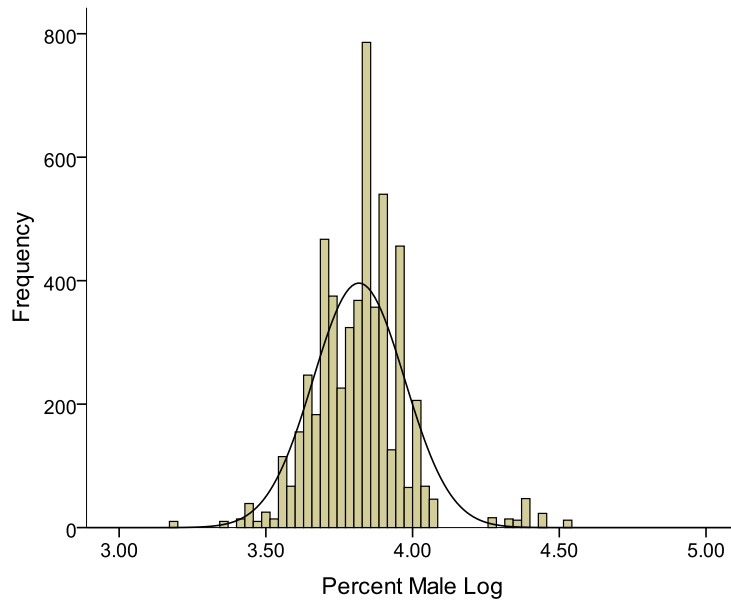


Figure 8A. Frequency distribution of gender transformed, gender log.

Table 2A shows the deviance, fixed effects, and covariance parameters associated with the null model, random effects model, and intercepts-as-outcomes model. Deviance, also called “model discrepancy,” is a measure of the lack of fit between the model and the data. The covariance parameters represent the between-group variances in APRs and the within-group variances. The fixed effect parameters represent the regression coefficients of each independent variable while the intercept is interpreted as the overall mean predicted APR when all other variables are controlled. For predictors that were not transformed, the fixed effect represents the magnitude of change in the APR given a one-unit change in the independent variable. For transformed variables, a one percent increase in the independent variable represents a coefficient/100 change in the dependent variable.

Table 2A

*Final Team-Level and Institution-Level Predictors of Academic Progress Rates for Teams at**Division I Institutions with Transformed Variables*

	Null	St. Error	Random Intercepts	St. Error	Intercepts-as- Outcomes	St. Error
<i>Fixed Effects</i>						
Intercept	968.65**	.86	964.83**	.95	961.19**	1.05
Sport Type			-12.41**	.75	-12.29**	.75
Team Gender			10.56**	.53	10.63**	.53
Squad Size (Log)			-3.57**	.45	-3.58**	.49
Institutional Control					12.98**	1.88
Conference Affiliation					2.56	1.81
Enrollment					.39**	.08
Expenditures (Log)					5.38**	1.74
Financial Aid					-.11*	.05
Resident Hall Capacity					.21**	.04
Ethnicity (Log)					-4.10**	.73
School Gender (Log)					2.75	4.88
Selectivity					.08	.04
<i>Deviance</i>	48242.30		46824.48		46559.30	
<i>Covariance</i>						
<i>Parameters</i>						
Residual	369.80**	7.34	280.00**	5.56	280.11**	5.56
Pseudo R ²			.24		.24	
Intercept	231.84**	20.07	238.94**	20.12	98.93**	9.35
Pseudo R ²					.57	

*p<.05, **p<.01