

UNIVERSITY FITNESS CENTER PARTICIPATION AND COLLEGE STUDENT
ACADEMIC SUCCESS

By

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ABSTRACT

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University recreational sports departments are charged with promoting physical activity (PA) to college students. However, funding is necessary for the upkeep of equipment, quality programming, and continued promotion of PA through recreational sports. Although PA is important to university administrators, it is likely secondary to student academic success. Therefore, the purpose of this investigation was to identify relationships between recreational sports participation and college student academic success.

Study participants included all first time degree seeking freshmen students who graduated from high school in Spring, 2010, were in their first semester at the university in the Fall 2010, not student athletes, and had no prior college class experience. Academic variables were compared between recreational sports members (students who purchased at least one fitness center membership) and nonmembers (students who did not purchase a membership). Differences among levels (determined via identification card swipes) of recreational sports use were also compared (never used, low, medium, high).

Means \pm SD and percentages were calculated for all variables of interest. Differences between members and nonmembers in cumulative GPA (cGPA) and cumulative credits completed (CCC) after four consecutive semesters were assessed via analysis of covariance (ANCOVA). Odds ratios (OR) and adjusted odds ratios (aOR) with 95% confidence intervals (CI) were calculated via logistic regression for reaching one-year retention, two-year retention,

and sophomore status according to recreational sports member status (ref=nonmember). Differences among recreational sports use groups in four-year cGPA were calculated via ANCOVA. OR and aOR ratios with 95% CI were calculated via logistic regression for reaching one-year retention, two-year retention, and five-year graduation according to recreational sports use level (ref=never used). A repeated measures analysis was utilized to assess a possible interaction between year in school and yearly recreational sports use on yearly GPA.

After adjusting for covariates, members earned higher cGPA (3.17 ± 0.48) and completed more credits (57.6 ± 7.1) than nonmembers (3.01 ± 0.55 and 55.7 ± 9.0 respectively). Members were also more likely to enroll in a second (aOR=1.42, 95%CI: 1.10-1.85) and third (aOR=1.39, 95%CI: 1.10-1.75) year and achieve sophomore status (aOR=1.59, 95%CI: 1.14-2.22) within two consecutive semesters than nonmembers. Medium (3.26 ± 0.41) and high users (3.27 ± 0.45) of recreational sports earned higher four-year cGPAs than low users (3.20 ± 0.42) and never used (3.08 ± 0.47). Medium/high users were more likely to reach one-year retention than never used (aOR=1.94, 95%CI: 1.11-3.38). No differences were found among recreational sports use levels in two-year retention or five-year Bachelor's degree attainment. Yearly recreational sports use positively related to yearly GPA, but the relationship did not differ by year in school.

Results of this study indicate a positive relationship between recreational sports and college student academic success and should be shared with campus administrators so that they appreciate the benefits of this department and fund it sufficiently. Further, students should participate in recreational sports early and often in their academic careers. Future researchers should investigate these relationships, and their mechanisms, within other components of recreational sports (e.g., club/intramural sports) and should collaborate with campus departments to identify additional areas of student success that relate to recreational sports participation.

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CHAPTER 1

INTRODUCTION

Previous literature indicates a strong relationship among regular participation in physical activity (PA), current health, and chronic disease prevention.¹ In 2008, the United States Department of Health and Human Services (DHHS) issued PA guidelines indicating adults should participate in at least 150 minutes a week of moderate- or 75 minutes a week of vigorous-intensity aerobic PA, or an equivalent combination.² Adults should also participate in “...muscle strengthening activities that are moderate or high intensity and involve all major muscle groups on two or more days a week...”² Approximately 50% of adults do not meet aerobic guidelines and 76% do not meet strength training guidelines.³ Public health programming is necessary to increase the percentage of adults meeting PA guidelines. Previously, PA programming has targeted various populations including children, adolescents, college students, and adults.^{4,5} However, the most appropriate population to address has not been established.

Researchers consistently find an inverse relationship between age and PA participation.⁶ The decline in PA participation from childhood to adulthood largely occurs between 13 and 18 years of age.⁷ The decline in PA participation results in fewer adults meeting PA guidelines, including those who are college aged (18-24 years). In 2011, 56.8 percent of college aged adults met aerobic PA guidelines, 44.1 met strength, and 30.0 met both.³ College is a critical time for development of healthy lifestyle behaviors, including regular participation in PA, with the hope of carryover into later adult life.^{8,9} Therefore PA programming directed towards college students has the potential to be of great public health benefit.

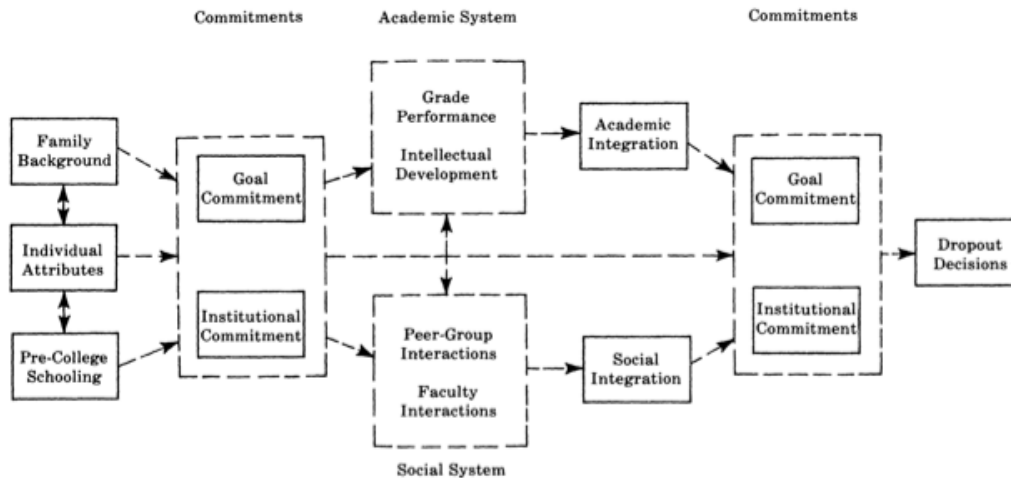
University recreational sports departments are designed to promote PA and provide ample opportunities for college students to develop healthy lifestyle behaviors.¹⁰ Recreational sports departments often include amenities and facilities such as, personal training, relaxation rooms, pools, gyms, courts, and fitness centers including weight lifting and cardio equipment. Previous literature indicates that over 85% of students nationwide participate in recreational sports on college campuses.¹¹ The frequency of participation in recreational sports during college is directly related to PA levels post-college.¹² Funding is necessary to ensure the upkeep of equipment, quality programming, and the continued promotion of PA through recreational sports. To obtain adequate funding, university departments must provide academic administrators with data that illustrate the departmental worth in student success. Participation in recreational sports may have a direct relationship with PA participation, student health, and academic success. Further, participation in recreational sports may indirectly impact academic success through the mediator of student health. University administrators may view student health as beneficial yet ancillary to college student academic success. Therefore, recreational sports departments should prove their contribution towards student success by identifying the relationships between participation in recreational sports and college student academic success.

Previous studies investigating the relationships between participation in recreational sports and college student academic success are grounded in two well-established higher education theories, Alexander Astin's Theory of Involvement¹³ and Vincent Tinto's Theory of Departure^{14,15}. Astin's¹³ theory suggests that the more a student is involved at an institution, the more likely the student is to learn and succeed. In his theory, involvement is defined as, "... the amount of physical and psychological energy that the student devotes to the academic experience."¹³ Astin¹³ notes that uninvolved students are more likely to drop out of college than

involved students. Similarly, Tinto's Theory of Departure^{14,15} focuses on student integration. His theory suggests that student pre-entry attributes (family background, skills and abilities, prior schooling) influence student goals and his/her commitment to the institution prior to attending college, which in turn impact institutional experiences and academic/social integration while attending college. The level of academic/social integration in college influences student goals and institutional commitment during college and ultimately affects the decision to continue attending the institution (Figure 1.1). Recreational sports researchers hypothesize that college students engage with recreational sports facilities and programming, thus directly impacting student involvement. Therefore, based on the theories of Astin¹³ and Tinto^{14,15}, increased involvement in recreational sports may positively impact college student academic success.

It is important to note that while student involvement is critical to college student success, too much involvement can be detrimental. Astin¹³ and Tinto's^{14,15} theories are purposefully vague to fit the structure of a variety of academic institutions. However, researchers have also focused on specific factors, which occur during college, that influence college student success (e.g. hours spent working for pay¹³, living on/off campus^{13,16}, feeling a sense of belonging to the institution¹³⁻¹⁷). Specifically, authors have linked effective time management to college student success.¹⁷ Students who are under/over-involved and who do not effectively manage their time are less successful in college than students who identify time to effectively study and ways to become involved as part of a balanced lifestyle.¹⁷ Therefore, the amount of student involvement in recreational sports may be critical to the potential impact of recreational sports on college student academic success, that is, a moderate amount of recreational sports participation may have a more positive impact on academic success than a low or high level of involvement in recreational sports.

Figure 1.1. Vincent Tinto's theory of departure.



Source: Tinto, *Leaving College: Rethinking the Causes and Cures of Student Attrition* (2nd ed.), p. 114.¹⁵

Historically college student academic success has been defined by student grade point average¹⁸ (GPA), retention¹⁹, and degree attainment¹⁹. The majority of literature investigating the relationships among recreational sports participation and academic success focuses on student retention.^{20,21} Few investigators have studied the associations among participation in recreational sports, GPA, and degree attainment; however, empirical evidence of these relationships trends towards a positive association.²⁰⁻²³ Despite this trend, the contribution of recreational sports programs to college student academic success remains largely understudied and the literature available is somewhat contradictory.

RECREATIONAL SPORTS AND ACADEMIC SUCCESS

Recreational Sports and Grade Point Average

College student GPA is an excellent predictor of college student retention²⁴⁻²⁶ and degree attainment²⁵. Students with higher GPAs, particularly in the first year of college are more likely to be retained and graduate than students with lower GPAs.²⁸⁻³⁰ Researchers have investigated factors that may influence college student GPA, including race²⁸, gender^{28,29}, and high school GPA²⁸⁻³⁰. Identified variables that predict college student GPA are primarily unmodifiable (e.g. race and gender) and tend to explain little variance so there is a need to identify additional, particularly modifiable variables.

Research investigating the relationship between participation in recreational sports and GPA is scarce. Four studies have assessed this relationship.^{20,22,31,32} Three found positive associations between recreational sports and GPA^{20,22,31}, and one found no association³². Belch, Gebel, and Maas²⁰ utilized university records to compare the number of times a student entered recreational sports fitness facilities and GPA. Kampf and Teske²² also utilized university records to assess the relationship between recreational sports fitness center use and college student GPA. Further Kampf and Teske²² assessed the difference in GPA between 1) recreational sports student employees and non-employees, and 2) club sport participants and non-participants. Recently, we took a slightly different approach and assessed differences in GPA between recreational sports members and non-members.³¹ Although all three studies^{20,22,31} utilized large sample sizes, n=11,076, n=3,308, and n=4,843 respectively, and performed similar analyses, no investigative group accounted for potential confounding variables. In contrast, Frauman³² found no difference in GPA between recreational sports users and non-users using a smaller sample size (n=385).

Recreational Sports and Retention

Retention is a very important measure to academic administrators. Thousands of dollars are lost for each student who leaves an institution prior to degree attainment.³³ The risk of student attrition declines after the first year of college, thus retention research primarily focuses on the students' first to second year. One-year retention is usually defined by two consecutive fall semester enrollments.³⁴ The national retention rate for first time degree seeking students at four year public institutions is 79.9%.³⁵

Previous investigators have identified many variables that predict retention (age^{25,36}, sex^{24,36}, race^{24,25,36}, residency²⁵, high school GPA^{24,25,36,37}, SAT/ACT scores³⁶, first semester college GPA^{24,25,36}, socioeconomic status³⁶, sense of belonging^{16,17,38}). Race, sex, socioeconomic status, and high school GPA are the most reliable predictors of retention, however they are all unmodifiable, including high school GPA.¹⁹ Specifically, students who are white, female, of high socioeconomic status, and who earn high high school GPAs are the most likely to be retained.¹⁹ Several investigators have posited that the most important factor may be student integration into university culture.^{15-17,37,38} Recreational sports offers a means for all students to become part of the university and is a modifiable factor that may positively influence student retention. Students who participate in recreational sports facility activities can increase their self-esteem, develop social relationships, and develop communication and leadership skills. In addition to conventional programs (fitness classes, intramural sports), Recreational sports departments provide wellness programs, outdoor recreation, and a building space that appeals to a variety of clubs, and organizations, and facilitates a variety of physical activities. Recreational sports departments are versatile and offer a sense of community for a diverse group of students.

Researchers who have assessed the relationships between recreational sports participation and retention have primarily utilized self-report^{11,21,39-42}; two groups of researchers implemented the National Intramural Recreational Sports Association's (NIRSA) Quality and Importance of Recreational Sports Survey (QIRS).^{21,39} The QIRS is a battery of questions that assesses the basic benefits of participation in recreational sports. Specifically, one question relates directly to retention and is listed below:

“In deciding to continue at [insert institution], how important to you was the availability of recreational facilities and programs?”

Answer choices included not important, somewhat important, important, and very important. Investigators reported that 31-40% of students reported that the availability of recreational facilities and programs was important or very important in their decision to continue at the institution.^{21,39} However, all studies assessing the relationship between recreational sports participation and retention, including those utilizing the QIRS survey, are limited by their cross-sectional designs, self-report, simplistic statistics, and many by non-random sampling.

Four studies to date have utilized university databases to address the self-report limitation.^{20, 22,23,31} Results of this research positively enhance the findings of literature utilizing self-report. Studies utilizing self-report indicate that students believe the availability of recreational sports is important in their decision to continue at an institution^{21,39}, and research utilizing university databases indicate that recreational sports participation is positively related to retention^{10,22-23,31}. However, studies utilizing university databases differ in study design, which reduces comparability of results^{20,22,23,29}, and are limited by simplistic statistics^{20,31}. Therefore,

more research, that utilizes university databases, is needed to increase comparability, improve statistical analyses, and further understand how student beliefs relate to actual retention.

Although previous investigations are widely considered as preliminary evidence, researchers should be cautious when interpreting self-reported, convenience sampled data that fails to control for possible confounding variables. There is a need to investigate the relationship between recreational sports participation and student retention by utilizing university data, considering many potential confounders in a systematic fashion, and by implementing more sophisticated analytic techniques.

Recreational Sports and Bachelor's Degree Attainment

International graduation rates are calculated by dividing the 'number of graduates at each year of age' by the 'population at that age'; the values are then averaged. Currently, the United States' international graduation rate is 37.7%, which is ranked 13th among 30 countries participating in the Organization for Economic Co-operation and Development.⁴³ Finland's graduation rate is first in the world at 62.6% followed by the Slovak Republic at 57.1%.⁴³ President Obama has pushed for an increase in college graduates. He has set a new goal for the country, indicating, "...that by 2020, America would once again have the highest proportion of college graduates in the world."⁴⁴ Previous research indicates a number of variables that partially explain why college students do or do not graduate (e.g., AP credits⁴⁵, college major²⁷, first year GPA²⁷, race⁴⁵⁻⁴⁷, gender⁴⁵⁻⁴⁷, socioeconomic status^{45,49}). However, the accuracy of each variable in predicting Bachelor's degree attainment varies across studies.^{47,48} Scholars must continue searching for variables to better explain and predict Bachelor's degree attainment.

Despite the importance placed on Bachelor's degree attainment in the United States, only one published study²³ has assessed the relationship between participation in recreational sports and Bachelor's degree attainment. Huesman et al.²³ utilized logistic regression to assess the relationship between semester participation in recreational sports (Fall semester of Freshman year) and five-year degree attainment (n=5,211). The authors included the ratio of credits attempted to credits completed, C's received, D's received, course withdraw count, ACT/SAT score, remedial classes taken, remedial classes failed, athlete status, gender, race, socioeconomic status, and off-campus housing as covariates. Recreational sports use was entered in the model as a continuous variable. In a secondary analysis, recreational sports use was entered as a categorical variable (10 times vs. 25 times). These groups were chosen based on the mean and standard deviation of recreational sports use. After controlling for all covariates, results suggested that utilizing the recreational sports fitness center 25 times in the first semester of freshmen year increased the likelihood of 5-year graduation by 2% as compared to students who used the fitness center 10 times in the first semester. However, it should be noted that recreational sports participation ranged from zero to 154 uses of the fitness centers in the first semester. The authors' statistical analysis compared 10 to 25 uses and therefore did not address the extreme ends of recreational sports participation. There is a clear need for more research in this area.

SUMMARY

Previous literature assessing the relationships between recreational sports participation and 1) GPA, 2) retention, and 3) Bachelor's degree attainment is scarce and the existent literature is limited by self-report and lacks specificity of recreational sports use (time and type) and

sophisticated study design and analysis. More specifically, previous literature includes very diverse definitions of recreational sports participation. Some authors focused on a single semester, while others included multiple semesters of participation. Few authors focused on a single component of recreational sports (i.e. intramural sports, group fitness, fitness center use, club sports, or recreational sports student employees), while most included all aspects of recreational sports in their ‘recreational sports participation’ definition. To ensure continued funding for recreational sports, data are necessary to further investigate the relationships between participation in recreational sports and college student academic success. This dissertation will focus on modifiable factors related to college student success. Specifically, we will address student membership and utilization of recreational sports fitness centers as factors that may impact college student academic success defined by, GPA, retention, and Bachelor's degree attainment. The unique analysis of these relationships will strengthen previous literature and may help solidify the argument for a positive relationship between recreational sports and academic success. Findings may encourage college students to participate in regular PA to enhance student success and may encourage university administrators to allocate funding resources to recreational sports departments for the promotion of PA.

RESEARCH AIMS

Definition:

Recreational Sports Participation: Recreational sports participation is defined in two ways throughout this dissertation.

1. In Specific Aim 1 recreational sports participation is defined by purchasing a recreational sports *fitness center membership*. This membership includes access to

two on campus weight rooms and cardio centers, which are not accessible to students who do not purchase a fitness center membership. Use of other recreational sports components (i.e. club sports, intramural sports, group fitness, and building use other than the fitness centers) was not considered.

2. In specific aims 2-4 recreational sports participation is defined as *use of recreational sports fitness centers*. Use of on campus fitness centers is recorded via identification swipes. Use of other recreational sports components (i.e. club sports, intramural sports, group fitness, and building use other than the fitness centers) was not considered.

Specific Aims:

Specific Aim 1: To investigate the differences in college student semester grade point average (GPA), credits completed, class standing, and retention between students who purchased a recreational sports fitness center membership their freshmen year and students who did not.

Hypothesis 1: Students who purchased a recreational sports fitness center membership in their first semester will earn higher cumulative GPAs, complete more credits, and are more likely to be retained a second and third year than students who did not purchase a recreational sports fitness membership in their first semester.

Specific Aim 2: To investigate the relationship between recreational sports fitness center use and college student one- and two-year retention.

Hypothesis 2: There will be a direct relationship between use of recreational sports fitness centers and one- and two-year retention.

Specific Aim 3: To investigate the relationships between recreational sports fitness center use over four years and college student academic success defined by cumulative GPA and Bachelor's degree attainment.

Hypothesis 3.1: There will be an inverted U shape relationship between recreational sports fitness center use and college student cumulative GPA. Students using the recreational sports fitness center the least and most often will earn lower cumulative GPAs than those who use the facilities a moderate amount.

Hypothesis 3.2: There will be an inverted U relationship between recreational sports fitness center use and college student five-year Bachelor's degree attainment. Students using the recreational sports fitness center the least and most often will be less likely to complete their degrees in five years compared to students who use recreational sports fitness centers a moderate amount.

Specific Aim 4: To investigate the impact of year in school on the relationship between recreational sports use and GPA.

Hypothesis 4.1: There will be an interaction between year in school and recreational sports use on yearly GPA. First year students will experience the greatest effect of recreational sports use on GPA.

ORGANIZATION OF THE DISSERTATION

This dissertation is organized into six chapters. Chapter one includes the introduction, specific aims, and hypotheses. Chapter two is a review of the literature related to the specific aims. Chapter three is organized as a manuscript (abstract, introduction, background, methods, results, discussion, and references) published previously in the *Recreational Sports Journal*, and includes an addendum to the published manuscript. Chapters four and five are organized as manuscripts (introduction, methods, results, discussion, and references). Chapter three addresses specific aim one, chapter four addresses specific aim two, and chapter five addresses specific aims three and four. All findings are summarized in chapter six.

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CHAPTER 2

REVIEW OF THE LITERATURE

INTRODUCTION

The United States (US) Department of Health and Human Services (DHHS) recommends that all adults participate in at least 150 minutes of moderate- or 75 minutes of vigorous aerobic physical activity (PA) per week, or an equivalent combination of moderate and vigorous intensity aerobic activity.¹ In addition, the DHHS recommends that all adults participate in strength training activities that are at least moderate intensity and include all major muscle groups on two or more days per week.¹ Research indicates that few adults meet aerobic and strength training recommendations.² The 2012 National Health Interview Survey (NHIS) revealed that 50.0% of adults met DHHS aerobic PA guidelines, 23.9% met DHHS strength training guidelines, and 20.6% met both, which were marginal increases from the 2008 NHIS.² To bring attention to the importance of regular PA, Healthy People 2020² personnel defined objectives related to decreasing sedentary activity and increasing PA participation. The second Healthy People 2020² PA objective relates directly to the DHHS PA recommendations.

PA-2 Increase the proportion of adults who meet current Federal PA guidelines for aerobic PA and for muscle-strengthening activities.²

Effective public health programming is necessary to increase the percentage of adults meeting PA guidelines, which will help meet the Healthy People 2020 objective. However, the most appropriate population to focus on has not been established. PA participation declines

throughout the lifespan.³ Researchers have identified the sharpest decline between the ages of 13 and 18 years.⁴ In an effort to minimize the sharp decline of PA in the teenage years, researchers have developed PA interventions specific for school aged children. Dobbins, Husson, DeCorb, & LaRocca⁵ reviewed 44 studies assessing the effect of PA interventions in children and adolescents aged six to 18 years. They found that school based PA interventions led to increased participation in PA during school hours (Odds Ratio=2.74, 95% Confidence Interval=2.01-3.75).⁵ While PA interventions are often effective in children and adolescents, the relationship between child PA and adult PA participation is weak to moderate at best.⁶

Telama et al.,⁶ utilized a questionnaire to measure the relationship between child/adolescent PA and adult PA. Subjects (n=2309) were 3, 6, 9, 12, 15, or 18 years old at initial assessment, secondary assessment took place 21 years later. Spearman correlations between initial PA assessment and secondary PA assessment varied from 0.33 to 0.44 in males and 0.14 to 0.26 in females, indicating a weak to moderate relationship between PA in childhood and PA in adult life. Telema et al.,⁶ assessed the relationship between child/adolescent PA and adult PA, but did not include college student PA (ages 18-24 years). Researchers have categorized young adults as “emerging adults.”⁷ Positive PA behaviors may emerge during college and carry over into adult life. The relationship between PA in college and adult life is largely understudied.

It is well known that college impacts student behavior development.^{8,9} For decades researchers have investigated behavior change in college students.^{8,9} Many theories have been developed that describe the impact of college on various aspects of student development such as psychosocial development¹⁰, identity development¹¹⁻¹³, and intellectual development^{14,15}. Despite the effects of college on various components of student development, few studies have

investigated PA intervention during college as a means of developing healthy lifestyle behaviors such as regular PA participation.

Plotnikoff et al.,¹⁶ recently published the first review of interventions that target PA, nutrition, and healthy weight in college students. The authors identified studies that 1) were written in English, 2) included students attending post secondary institutions, 3) included interventions aimed at improving PA and/or dietary intake and/or weight, and 4) were quantitative. The authors selected 41 studies. Twenty-nine of the 41 studies examined PA, 11 assessed PA exclusively, and 18 in combination with other health outcomes. Eighteen of the 29 studies examining PA showed significant improvements in PA or fitness behaviors from pre- to post-intervention. Improvements in PA and fitness behaviors included increases in total minutes of PA, number of days participating in PA, MET levels, and decreases in exercise barriers.

Plotnikoff et al.,¹⁶ followed their systematic review with three meta-analyses. The meta-analyses addressed the impact of intervention on 1) total PA participation¹⁷⁻²¹, 2) vigorous PA participation^{17,21,22-24}, and 3) moderate PA participation^{17,21,22-24}. The results indicated no differences in total PA or vigorous PA participation between intervention and control groups.¹⁶ However, the results of the meta-analysis did indicate that intervention groups participated in significantly more moderate PA post intervention than control groups.¹⁶ Together the results of the three meta-analyses indicate that previous PA interventions in college students increased moderate PA, but had no effect on vigorous or total PA participation during college. More research is needed in this area to identify effective means of increasing all types of PA participation in college students.

University recreational sports departments are vehicles for PA promotion in college students. Recreational sports departments offer students a diverse array of opportunities to

participate in PA, such as pools, courts, tracks, intramural sports, group fitness classes, and fitness centers including strength and cardio equipment. *NIRSA: Leaders in Recreation* state that approximately 85% of college students who live on campus utilize recreational sports in some capacity.²⁵

Participation in recreational sports in college may carry over into post-college life. Forrester et al.,²⁶ investigated the relationship between participation in campus recreational sports and post-college PA. The authors utilized multiple regression and a convenience sample of health, physical education, and recreation alumni who graduated from a single university between May 2001 and May 2005 (n=310). The independent variable was recreational sports use in college and the dependent variable was current PA participation, both assessed with a survey. Forrester et al.,²⁶ noted that the frequency of recreational sports use in college was positively related to post-college self-reported PA participation ($t=2.51$, $p=0.013$).

PA interventions developed through recreational sports have the opportunity to impact the majority of college students in the nation. However, the successes of such interventions depend on the funding necessary to ensure the upkeep of equipment, quality programming, and the continued promotion of PA through recreational sports. University administrators may consider the development of healthy lifestyles as important, but ancillary to college student academic success. To obtain adequate funding, recreational sports departments must provide academic administrators with data that illustrate the departmental worth in student academic success.

Foundational Theory

Historically, researchers have fixated on student recruitment and student retention as definitions of academic success when analyzing the relationship between recreational sports participation and academic success. More recently investigations have focused on the relationship between recreational sports participation and 1) college student grade point average (GPA) and 2) Bachelor's degree attainment. Investigations assessing the relationship between recreational sports and college student academic success are grounded in two well-established theories of college student success, Astin's²⁷ Theory of Involvement and Tinto's^{28,29} Theory of Departure.

Astin's Theory of Involvement. Astin's²⁷ Theory of Involvement was established in 1984 and is based on student involvement as a behavior. Astin²⁷ stated, "It is not so much what the individual thinks or feels, but what the individual does, how he or she behaves, that define and identifies involvement." Astin²⁷ further defined student involvement by the following phrases: attach oneself to, commit oneself to, devote oneself to, engage in, go in for, incline toward, join in, partake of, participate in, plunge into, show enthusiasm for, tackle, take a fancy to, take an interest in, take on, take part in, take to, take up, undertake. He believed student success was not defined entirely by academics, but also by the extent to which the student engaged with the school. By Astin's²⁷ philosophy, students are more likely to be retained if they feel a sense of belonging at the school, if they identify with other students, and/or identify with a particular place at the institution.

Tinto's Theory of Departure

Astin's²⁷ Theory of Involvement identified multiple variables related to student success and retention, but did not uncover the magnitude of the relationship. Tinto^{28,29} addressed the "...reasons for, magnitude of, and mediating aspects of retention."³⁰ Tinto^{28,29} agreed with Astin's²⁷ findings, that student involvement was a large indicator for student retention; however, he further broke Astin's²⁷ theory down into academic and social involvement. Tinto^{28,29} stated that student retention depended on the students' integration into the academic and social communities of the institution. Some departures from the institution are considered involuntary, for example the student did not meet the required GPA. Tinto^{28,29} argues departures that are voluntary often are due to student perception of a problem related to academic or social belonging. Institutions have the ability to assist students in feeling a sense of belonging to both the academic and social constructs. Tinto²⁹ states, "The point of retention efforts is not merely that individuals be kept in college. Education, the social and intellectual development of individuals, rather than just their continued presence on campus should be the goal of retention efforts" (p. 145).

Astin²⁷ and Tinto's^{28,29} models are widely accepted in student success research. They are considered the foundation of research assessing the relationship between recreational sports and college student academic success. Future research assessing this relationship should continue to consider variables identified by Astin²⁷ and Tinto^{28,29}, such as, precollege attributes (sex, race), precollege experience (high school GPA), university commitment, and academic and social integration while in college.

RECREATIONAL SPORTS AND ACADEMIC SUCCESS

Of the few studies investigating the relationship between recreational sports and college student academic success, most utilize self-report for both recreational sports use and academic success variables. Additionally, few utilize proper statistical analysis to control for confounding variables. Despite these limitations, data trend towards a positive relationship between recreational sports participation and 1) GPA, 2) retention, and 3) Bachelor's degree attainment. However, the contribution of recreational sports programs to college student academic success remains largely understudied and the literature available is somewhat contradictory.

Grade Point Average

Previous research indicates a variety of factors that influence college student GPA including, but not limited to: high school GPA³¹⁻³³, gender^{31,32}, race³¹, ACT and SAT scores³², first generation status³⁴, socioeconomic status (SES)³⁵, and smoking³². High school GPA is considered the best predictor of college academic success and has been shown to account for 19% of the variance in college student GPA.^{27,36} However, investigators have examined a variety of models to predict college student GPA. At best, these models account for 50% of the variance in GPA. Future research should focus on additional variables to better predict college student GPA.

The authors of four studies to date have investigated the relationship between participation in recreational sports and college student GPA.³⁷⁻⁴⁰ Three studies agree on a positive relationship³⁷⁻³⁹ and one study found no association⁴⁰. Researchers utilized different definitions of recreational sports use and measured college student GPA at varying time points.

No researchers controlled for the effects of confounding variables and all utilized univariate statistical methods (Student's t-tests or Chi-square).

Belch et al,³⁸ were the first to investigate the relationship between participation in recreational sports and college student GPA. The sample included all first time freshmen in the Fall semesters of 1993, 1994, and 1995 (n=11,076). Students who swiped their student ID to enter the recreational sports facility in their first semester at the institution (Fall semester 1993, 1994, or 1995) were considered recreational sports users (73% of the sample). Academic information was obtained via university Registrar. The authors compared recreational sports user GPA to non-user GPA. Student's t-tests revealed that recreational sports users had lower mean high school GPAs, SAT scores, and ACT scores, but earned higher first *semester* GPAs (Mean=2.53) compared to non-users (mean=2.44, $p<.001$). However, no differences were found in first *year* GPA between users and non-users. Strengths of this study included the objective measurement of recreational sports use (ID swipe) and obtaining academic information from the university Registrar. However, the study did not control for confounding variables and did not address the homogenous sample by accounting for level of recreational sports use.

Kampf and Teske³⁹ addressed one of the limitations of the Belch et al.³⁸ study by accounting for the number of times a student entered the recreational sports building. The study sample included first-time full-time students (n=3,809). Researchers obtained data from a university database that included club sport enrollment (yes/no), campus recreation student employment status (employed/not employed), student recreation center entry counts measured via ID swipes into the recreational sports building, and latest term cumulative GPA. Latest term cumulative GPA was the last recorded GPA after the Fall, Spring, or Summer semester during the first academic year. Researchers utilized last recorded GPA because they did not know if or

when a student dropped out of the institution. Student's t-tests revealed no differences in latest term cumulative GPA between club sport participants and non-participants. Correlation analysis revealed a weak to moderate correlation and a direct relationship between student recreation center entry counts and latest term cumulative college GPA ($r=.204$, $p<0.001$). In addition, campus recreation student employees earned higher latest term cumulative GPAs (3.05 ± 0.72) than non-employees (2.56 ± 0.99 , $p=0.021$). These findings agree with and expand those of Belch et al.,³⁸ and suggest that the type of recreational sports participation (i.e., club sports participation, student recreational center entry counts, recreational sports employment) may mediate the relationship between recreational sports participation and college student GPA. Strengths of this study include the large sample size, various measures of recreational sports participation, and the obtainment of data from a university database. However, latest term cumulative GPA is not a valid measure of student success as time of attendance at the University is not consistent among subjects. Additionally, the authors did not report a range or mean for student recreation center entry counts, which inhibits interpretation. Finally, similar to Belch et al.,³⁸ this study did not control for confounding variables.

Danbert et al.³⁷ was the most recent group to assess the relationship between recreational sports and college student GPA (see Chapter 3 for complete manuscript). The study sample included all first time degree seeking freshmen students who graduated from high school in the Spring 2010, who in the Fall 2010 were in their first semester at the university, and who had no prior college class experience ($n=4,843$). All data were gathered from a university database. Most institutions utilize a fee-based model to fund their recreational sports department. In a fee-based model, each student is assessed a recreational sports fee as part of enrollment expenses. The university utilized in the Danbert et al.,³⁷ study employs a membership-model. Access to

some recreational sports facilities is included in tuition costs; however, a membership fee is charged to students who wish to use the recreational sports fitness centers, which house all cardio and weight training equipment. Recreational sports use was defined by fitness center member status (member/non-member), which included approximately twenty-five percent of the sample ($n=1,138$). Cumulative GPA was obtained from the Registrar and assessed after four completed semesters. Student's t-tests indicated that recreational sports users earned higher cumulative GPAs (3.13 ± 0.52) after four semesters than non-users (3.00 ± 0.52 , $p < 0.0001$). Danbert et al.'s³⁷ finding of a positive relationship between recreational sports membership and college student GPA support the findings of Belch et al.,³⁸ and Kampf & Teske³⁹. Similar to Belch et al., (2001) and Kampf & Teske,³⁹ strengths of the Danbert et al.,³⁷ study include a large sample, and the collection of data from a university database. Further, the impact of fitness center membership was assessed as opposed to global recreational sports use. A major limitation is the lack of potential confounding variable inclusion. In addition, level of recreational sports use was not accounted for. It is possible that some users had a fitness center membership, but never actually utilized the facilities.

In contrast to the previously discussed studies, Frauman⁴⁰ did not find a relationship between recreational sports and college student GPA. The sample included 389 students enrolled in twenty-five different classes at the institution. Study participants completed a one-time survey and reported demographic information, recreational sports user status, and GPA. Students who reported participating or using programs and services associated with the recreational sports department were considered recreational sports users (80.7% of the sample). GPA was reported by choosing one of the following categories: first semester student, 1.99 or below, 2.0-2.49, 2.5-2.99, 3.0-3.49, or 3.5 or above. Chi-square analyses indicated no relationship between

recreational sports user status and GPA. This finding contradicts that of all other studies.

Frauman's⁴⁰ study is limited by the relatively small, homogenous sample and self-report for all variables. Further, Frauman⁴⁰ did not account for confounding variables or level of recreational sports use. Frauman's⁴⁰ negative findings might be attributable to the small, homogeneous sample.

In summary, most authors have shown a positive relationship between a dichotomized measure of recreational sports use and college student GPA. While each of the four studies contributed valuable information to assessment of the relationship between recreational sports and college student GPA, all had similar limitations that must be addressed. Limitations include a lack of confounding variables and inconsistencies in the definitions of recreational sports participation. Further most studies had a homogenous sample due to most subjects participating in at least one aspect of recreational sports. Future research should identify, measure, and assess the impact of confounding variables through more sophisticated statistical analyses. Investigators should measure college student GPA at similar time-points to increase inter-study comparability and should increase the variability in the independent variable by identifying *levels and/or type* of recreational sports use. Finally, researchers should continue to investigate the relationship between recreational sports and GPA in specific entities of recreational sports such as fitness centers, intramurals, group fitness, and student employment. Future research will help recreational sports practitioners understand the most desired level and type of participation for maximal positive impact on college student GPA.

Retention

The National Center for Education Statistics defines retention as consecutive Fall-to-Fall enrollment.⁴¹ A student who enrolls full time in a Fall semester and again enrolls full or part time in the following Fall semester is classified as meeting one-year retention. Spring enrollment is not considered in Fall-to-Fall retention statistics. The risk of student attrition declines after the first year of college, thus retention research focuses primarily on the students' first and second years. The national one-year retention average at all four-year institutions in the United States is 78.8%.⁴² Thousands of dollars are lost for each student who leaves an institution prior to graduation.⁴³ To minimize funding loss, academic administrators are constantly working to increase college student retention rates. Previous investigators have identified many variables that predict retention (age^{30,44}, sex^{30,45}, race^{30,44,45}, residency⁴⁴, high school GPA^{30,44-46}, SAT/ACT scores³⁰, first quarter college GPA^{30,44,45}, SES³⁰, sense of belonging^{28,29,47}). These variables consist primarily of precollege attributes, or factors that exist prior to the student entering college (i.e., gender, race, high school GPA). Theorist's Astin²⁷ and Tinto^{28,29} would argue that college student retention is more complex than precollege attributes. Instead, they believe college student retention is affected by a student's level of involvement in social and academic settings while attending college. Research is needed to understand various types of involvement at the university level; of particular interest is the relationship between the level of involvement in recreational sports participation and college student retention.

Researchers have typically used survey data to investigate the relationship between recreational sports and college student retention.^{25,48-51} Most investigators utilize self-report for both the independent variable of recreational sports participation and the outcome variable of retention.^{25,48-51} Four groups of researchers took the investigation a step further and have

assessed this relationship with data from Registrars.^{37-39,52} Only two studies assessed the impact of confounding variables on the relationship between recreational sports and college student retention.^{39,52} To date, data from all but one⁵⁰ study indicate a positive relationship between recreational sports and college student retention.

Bradley, Phillipi, & Bryant⁴⁹ and Lindsey and Sessoms⁴⁸ utilized the National Intramural Quality and Importance of Recreational Sports Survey (QIRS). The QIRS is a battery of questions that assesses the basic benefits of participation in recreational sports. Specifically, one question, rated on a 5-pt Likert scale, relates directly to retention and is listed below:

“In deciding to continue at [insert institution], how important to you was the availability of recreational facilities and programs?”

Approximately 31-40% of students reported that recreational sports was either important or very important in deciding to continue at the institution.^{48,49} Lindsey and Sessoms⁴⁸ (n=244) further stated that the level of importance of the availability of recreational facilities and programming in deciding to continue at the institution differed by class standing. However, the authors did not indicate which class (freshman, sophomore, junior, senior) indicated the most and/or least importance. Bradley, Phillipi & Bryant⁴⁹ (n=2,000) reported racial differences in level of importance. African Americans were more likely to report that recreational sports were important or very important in their decision to remain at the university than their Caucasian counterparts. Both studies found positive relationships between recreational sports and college student retention. However, conclusions from the Lindsey and Sessoms⁴⁸ study should be drawn

cautiously due to their convenience sampling of students from a single Department of Physical Education and Health. Additionally, both studies are limited by self-report.

Henchy⁵¹ (n=237) used a variation of the QIRS, the National Intramural Recreational Sports Association Recreational Impact Survey. Similar to the previously discussed literature, she found that 31% of students indicated that recreational sports had a strong or moderate influence on their decision to remain at the institution. Beginning in 2006, *NIRSA Leaders in Recreation* partnered with *NASPA: Student Affairs Professionals in Higher Education* to assess the impact of recreational sports on various aspects of college student development. The NIRSA/NASPA consortium is utilized by recreational sports departments all over the United States. In 2010, *NIRSA: Leaders in Recreation* released a report on the NIRSA/NASPA consortium data.²⁵ The authors indicated that 45% of specifically junior and senior students reported recreational sports being moderately important to their decision to remain at the institution, marginally higher than the 31-40% of all students reported in previously discussed literature. Like the studies utilizing the QIRS, results from Henchy⁵¹, and the NIRSA/NASPA consortium²⁵ are limited by self-report. It is not possible to ascertain to what degree students utilized recreational sports or if the students were actually retained. Instead, results show student's beliefs in the importance of recreational sports on retention.

Mallicrodt & Sedlacek⁵⁰ utilized their own 24-item questionnaire to assess the relationship between recreational sports use and college student retention. A random sample, stratified by race, of 207 undergraduates completed the survey in their second semester at the institution. Eighty percent of the sample was retained the following Fall semester. The authors found use of recreational sports facilities did not predict retention for all students, but did positively predict retention in Black students. Mallicrodt and Sedlacek's⁵⁰ findings add to

previous literature by assessing the impact of recreational sports use on student retention by race. However the authors' null finding in all students contradicts the findings of previous literature. The contradiction may be due to a difference in the measurement of retention. Most researchers who used self-report assessed retention as a perception of the importance of recreational sports in the decision to remain at the institution. Mallicrodt & Sedlacek⁵⁰ utilized data from the university Registrar to measure retention. Further, the contradictory findings may be due to Mallicrodt & Sedlacek's⁵⁰ small sample.

To address the issue of self-report, investigators of two studies^{37,38} utilized data from a university Registrar to assess the relationship between recreational sports participation and college student retention. Belch et al.,³⁸ identified recreational sports users by recording identification card swipes into the recreational sports centers. Students who entered the facility in their first semester at the institution were considered users; those who did not were considered non-users. Danbert et al.,³⁷ separated recreational sports users and non-users via membership. Students who purchased a membership to the recreational sports fitness center in their first semester at the university were considered users, and those who did not purchase a membership were considered non-users. Together, the studies indicate a positive relationship with a 2-7% difference in one-year retention rates between recreational sports users and non-users. However, neither study accounted for level of use of the recreational sports facilities. It is possible that a student entered the facility for reasons other than exercise and it is possible that a student purchased a fitness center membership, but never actually utilized the facility. Additionally, neither study accounted for possible confounding variables.

Recently, researchers have utilized logistic regression to account for possible confounding variables in the relationship between recreational sports participation and college

student retention. Huesman et al.,⁵² utilized a sample of 5,211 first time degree seeking freshmen. Recreational sports use was assessed through identification swipes into the recreational sports facilities and analyzed on a continuous scale. The authors included 14 variables (ratio of credits attempted to credits completed, C's received, D's received, course withdraw count, ACT/SAT score, remedial classes taken, remedial classes failed, athlete status, gender, race, tuition-reciprocity, tuition non-reciprocity, socioeconomic status, and off-campus housing) in their model and found a positive relationship between recreational sports participation and college student retention (aOR=1.009; 95% CI=1.003,1.015, p<0.01). Although statistically significant, the adjusted odds ratio for recreational sports use was small and suggests low practical significance. Kampf et al.,³⁹ assessed the impact of recreational sports use on student retention with a sample of 3,809 first time degree seeking freshmen. The authors used logistic regression to assess the impact of three entities of recreational sports use (club sports, recreational sports student employment, and recreation center use measured through identification swipes into the recreational sports center) on student retention. Kampf et al.,³⁹ assessed a range of confounding variables in their model (club sports participant, Fall semester rec enter entry count, ACT score, high school GPA, latest term cumulative college GPA, sex, first generation status, citizenship, White race, Native American race, Asian race, Black/African American race, Hawaiian/Pacific Island race, and non specified race). Students who participated in club sports were 2.4 times more likely to be retained than students who did not participate in club sports. Additionally, each one-unit increase in recreational center use increased the odds of being retained by 1.4 times. Recreational sports student employment was not included in the logistic regression because 100% of the recreational sports employees were retained. After controlling for confounding variables, the findings of both Huesman et al.,⁵² and

Kampf and Teske³⁹ indicate a positive relationship between recreational sports participation and college student retention.

Huesman et al.,⁵² and Kampf & Teske³⁹ extended previous literature by accounting for confounding variables. However, study limitations include the assessment of recreational sports use in the first semester only and possible multicollinearity within logistic regression models. Variables that may have contributed to multicollinearity include the academic variables (Cs received, Ds received, withdraw count, remedial class taken, and remedial class failed), and the socioeconomic variables (tuition reciprocity, tuition non-reciprocity, and Pell grant eligibility). Future investigators should assess recreational sports use on a yearly basis and address multicollinearity when building models. Future researchers should aim to replicate studies by utilizing the same independent, dependent, and confounding variables to increase comparability between studies. Replication of research may help to narrow the gap in effect sizes that were reported by previous literature.

Each study discussed concluded a positive relationship between recreational sports participation and college student retention, with the exception of Mallinckrodt and Sedlacek⁵⁰. The null findings of Mallinckrodt and Sedlacek⁵⁰ are likely attributable to the author's relatively small, homogenous sample. Despite the null findings of Mallinckrodt and Sedlacek⁵⁰, most research shows that recreational sports participation is in some way related to student retention. However, drawing conclusions from previous literature should be done cautiously, due to study design limitations and limited data analysis. For example, just two of the cited studies assessed recreational sports use as a continuous variable^{39,52}, most relied on self-report of both independent and dependent variables^{25,48-51}, and few studies included confounders^{39,52}. Therefore, future research that better defines and assesses both independent and dependent variables is

needed to further substantiate the findings and to uncover the level of recreational sports associated with student retention.

Bachelor's Degree Attainment

Bachelor's Degree attainment is the primary goal of college students. Students who complete a Bachelor's degree have high job satisfaction and earn an income two times that of high school graduates and six times that of high school dropouts.^{53,54} The unemployment rate of college graduates is much lower than that of high school graduates.⁵⁵ Additionally, higher income is associated with a variety of health related outcomes, such as increased life expectancy, improved quality of life, and lower risk of disease.⁵⁶

On an individual level, college graduation is important for student overall wellbeing in adult life; on a national level, college graduation is important for colleges and universities as it is considered in institution rankings; on a global perspective, college graduation is important when comparing countries. The United States' graduation rate is currently ranked 13th among 30 countries participating in the Organization for Economic Co-operation and Development.⁵⁷ President Obama advocates for an increase in United States' college graduation rates. His goal is "...that by 2020, America would once again have the highest proportion of college graduates in the world."⁵⁸ Despite the economic reasons to graduate college, the university driven need to achieve high college graduation rates, and President Obama's goals, few students who begin college actually complete a Bachelor's degree in timely fashion. Of all first time degree-seeking students attending four-year degree granting institutions in 2006, 39% completed a degree in four years, 54.9% in five years, and 58.7% in six years.⁵⁹ Research is necessary to understand why college students do and do not graduate and how to increase graduation rates.

Decades of research have identified multiple variables that contribute to college student degree attainment, including, but not limited to: gender⁶⁰⁻⁶³, race⁶⁰⁻⁶², SES^{35,60}, first generation status³⁵, high school GPA⁶³, first year college GPA⁶⁴, and college major⁶⁴. However, similar to college student GPA and retention, these variables together account for minimal variance in college student degree attainment. Females, Asian and Pacific Islanders, students with a high SES, families with experience in higher education, those majoring in the social sciences, and those with high- high school GPAs and first year college GPAs, are more likely to earn a college degree than all other groups. In short, a myriad of factors interact and subsequently affect whether or not a student graduates college. More research is necessary to better understand college student degree attainment, to identify additional variables to may impact the success of students, and to meet President Obama's goal of becoming the country with the highest proportion of college graduates in the world.

Huesman et al.,⁵² appear to be the only investigators who have assessed the relationship between recreational sports use and college student degree attainment. The authors utilized a sample of 5,211 first time degree-seeking students who began college in the Fall of 2001. Recreational sports use was defined as the number of times the student entered the fitness facilities in the first semester of college. Students entered the facility an average of 9.9 ± 15.4 times in the first semester at the University, entry counts ranged from 0-154. Students entering the facility at least one standard deviation above the mean (25 times) were compared to those who entered the facility 10 or less times. Students who earned a Bachelor's degree within five years of their first semester of enrollment were considered to achieve degree attainment. Utilizing logistic regression and controlling for 14 possible covariates (ratio of credits attempted to credits completed, C's received, D's received, course withdraw count, ACT/SAT score,

remedial classes taken, remedial classes failed, athlete status, gender, race, tuition-reciprocity, tuition non-reciprocity, socioeconomic status, and off-campus housing) the authors found a statistically significant positive relationship between recreational sports fitness center use and five-year graduation (aOR=1.007; 95%CI=1.003,1.012). Although statistically significant, the adjusted odds ratio for recreational sports use was small and may not be practically significant. However, the authors concluded that utilizing the fitness center approximately 25 times over the course of the first semester in college increased the predicted probability of five-year graduation by 2%. The authors did not account for recreational sports use after the first semester of college nor did they address the wide range of recreational center entry counts (0-25). It is possible that multicollinearity was present in the final logistic regression model. Variables that may have contributed to multicollinearity include the academic variables (Cs received, Ds received, withdraw count, remedial class taken, and remedial class failed), and the socioeconomic variables (tuition reciprocity, tuition non-reciprocity, and Pell grant eligibility). Despite some limitations, this study stands alone in assessing the relationship between recreational sports and college student degree attainment. More research is needed in this area.

SUMMARY

Few adults meet DHHS aerobic and strength PA guidelines. Students develop lifestyle behaviors while attending college. PA interventions may be effective in a college student population. Recreational sports is an excellent platform to build PA interventions as recreational sports offers an opportunity for college students to participate in regular PA. The successes of such interventions depend on the funding necessary to ensure the upkeep of equipment, quality programming and the continued promotion of PA through recreational sports. University

administrators may consider regular PA participation as beneficial, yet ancillary to college student academic success. Therefore, research investigating the relationships between recreational sports participation and college student academic success are necessary.

Previous research trends towards a positive relationship between a dichotomized measure of recreational sports participation and college student GPA, retention, and Bachelor's degree attainment. However, previous literature is limited by self-reported data, lack of assessing confounding variables, and broad measures of recreational sports participation (type and amount). Future research should utilize data from a university database, should investigate the impact of confounding variables on the relationship between recreational sports participation and academic success, and should assess recreational sports use via student identification swipes into facilities to account for accurate assessment of recreational sports participation and specificity of participation in various components of recreational sports.

Research assessing the specific relationships between recreational sports participation and 1) GPA, 2) retention, and 3) Bachelor's degree attainment may help academic administrators understand the importance of recreational sports. A positive association between recreational sports participation and academic success will strengthen the argument for increased funding for recreational sports departments, which in turn may help to increase the proportion of adults meeting DHHS PA guidelines.

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CHAPTER 3

MANUSCRIPT ONE

Chapter three addresses specific aim one and was completed in 2014. The manuscript titled, *Academic Success and Retention: The Role of Recreational Sports Fitness Facilities*, was published in the *Recreational Sports Journal*, April 2014.¹

Specific Aim 1: To investigate the differences in college student semester grade point average (GPA), credits completed, class standing, and retention between students who purchased a recreational sports fitness center membership their freshmen year and students who did not.

ABSTRACT

This study evaluated the role of a university recreational sports and fitness center, in students' academic success. Study participants included freshmen at a large midwestern university (n=4843; 56% women; 67% white). Recreational sports fitness facility members (students who purchased a recreational sports fitness facilities membership in their first semester; n=1138) were compared to non-members (students who did not purchase a recreational sports fitness facility membership in their first semester; n=3705). Means \pm SD and percentages were calculated for all variables of interest. Differences between groups were analyzed using t-tests and percentages. Members had significantly higher high school grade point averages (GPA) ($p=0.002$). After four consecutive semesters, members had significantly higher cumulative college GPA ($p\leq 0.0001$) and cumulative credits completed ($p\leq 0.0001$). Significantly more members than non-members were enrolled in school after two completed years, 89% and 85%

respectively. Results show recreational sports fitness facility membership is associated with, and may be beneficial to, college students' academic success.

INTRODUCTION

Based on a meta analysis of 21 prospective studies leisure time physical activity is important to current health and chronic disease prevention for all populations.² However, physical activity tends to decline with age, including the college years, which bridge adolescence and adulthood. While attending college, participation in recreational sports is one way for students to engage in daily leisure time physical activity.

Stable funding is necessary for the continued survival of recreational sports departments. University administrators may view recreational sports departments as beneficial, yet ancillary to the academic success and retention of college students. This perception may result in underfunding of recreational sports departments. Therefore, recreational sports departments must illustrate their contribution to academic success and retention to help demonstrate their importance and ensure stability.³

Through cross sectional studies using self-reported data, researchers have found recreational sports departments to be a deciding factor in whether students attend and continue at a given University.³⁻⁴ However, few studies have used longitudinal data collected from university databases to analyze the relationships among college student academic success, retention, and participation in recreational sports. Therefore, current data are needed to explore the impact of recreational sports on student academic success and retention.

BACKGROUND

Academic Success and Retention

Student academic success and retention research is founded primarily on two key theories, Astin's Theory of Involvement⁵, and Tinto's Theory of Departure⁶. Astin⁷ indicated a positive relationship among academic success, retention, and student involvement. He found that student success is not defined entirely by academics, but also by the extent to which the student engages with the institution. Students enhance their engagement by participating in many aspects of college life, such as academics, social events, and activities related to Student Affairs. Specifically related to recreational sports, Astin⁷ indicated that participation in sports has a profound positive effect on college student persistence.

Tinto⁸ stated that student retention depends upon the students' integration into the academic and social communities of the institution. Some student departures from the institution are considered involuntary; for example, the student did not meet the required grade point average (GPA). Tinto⁸ argued that voluntary departures are often due to the student's perception of a problem related to academic or social belonging. Institutions have the ability to assist students in feeling a sense of belonging to both the academic and social constructs. Tinto⁸ stated, "The point of retention efforts is not merely that individuals be kept in college. Education, the social and intellectual development of individuals, rather than just their continued presence on campus should be the goal of retention efforts" (p. 145). Recreational sports departments can capitalize on the theories of Astin⁵ and Tinto⁸ by creating an environment that connects students to the institution. This may result in improved academic success, retention, and current health of the student.

Researchers have identified variables related to student academic success and retention, including, but not limited to, first semester college student GPA, gender, race, high school achievement, participation in student support services, socioeconomic status, financial aid, interpersonal interactions, and place of residence.⁷⁻⁹ Previous literature indicates varying impacts of each factor related to academic success and retention.⁹ The number of potential confounders related to these outcomes, and the notion that students may be involved in multiple areas of campus concurrently, pose a difficult problem when researching the specific contribution of recreational sports to college student academic success and retention.

Recreational Sports and Student Services

Currently, over 85% of students who live on campus nationwide participate in some form of recreational sports, 62% of students who live off campus participate.¹⁰ Males participate more often than females. The majority of recreational sports participants are freshmen and sophomores.¹⁰ At the university in this study, 65% of all students participate in recreational sports and fitness services, 90% of the participants are undergraduate students, and freshmen and sophomores make up 60% of the students who participate.

Previous literature relating academic success, retention, and recreational sports and fitness services participation lacks consistency in study design and exposure variables. However, most literature indicates a small, but positive, relationship between participation in recreational sports and academic success and retention.^{3,11-17} In contrast, Frauman¹⁸ found no relationship, and Lindsey and Sessoms¹⁹ found a positive relationship only in junior and senior students, but not freshmen and sophomores.

Studies assessing this relationship are primarily cross-sectional, posing an issue in establishing causality between recreational sports and fitness services participation and academic success and retention. In 2001, Belch and colleagues¹¹ used a prospective cohort study design (n=11,076) and reported positive relationships among recreational sports use, student retention, and academic success outcomes such as GPA and earned credit hours. Recreational sports users had lower high school GPAs and lower ACT scores, but consistently had higher first year college GPAs and completed more credit hours than their non-user counterparts.

Huesman et al.¹⁵ reported participation in recreational sports accounted for only 1% of the variance in student retention. They stated that students who used the fitness center just 25 times in a single semester, increased their predicted probability of 1-year retention by 1%, and predicted probability of 5-year graduation by 2%. Although encouraging, this relationship is small, and the logistic model that Huesman and colleagues¹⁵ developed was designed to predict retention in retained students, but it did not address those who left the university.

With the exception of Belch et al.¹¹ and Huesman et al.¹⁵, studies have used self-report to evaluate both the exposure variable of recreational sports and outcome variables related to academic success and retention. There are discrepancies of exposure and outcome definitions within the literature. Some universities require an identification card swipe to enter the fitness center; others consider the exposure of recreational sports to be all recreational sports facilities--including outdoor facilities that are not monitored. Potentially, the largest limitation to any observational study of this type is that of unmeasured confounders. Some studies have accounted for several confounding variables, such as high school GPA, gender, race, and socioeconomic status—but left out others, such as place of residence. Despite these limitations,

studies cited are accepted as preliminary data displaying a positive relationship between student academic success, retention, and participation in recreational sports.

Recreational sports participation may be related to student success and retention; however, we found no studies that have assessed the relationship between purchasing a fitness membership at a university and student academic success and retention. The purpose of this study was to determine the relationship between recreational sports membership and college student academic success and retention. Based on previous literature it was hypothesized that students who purchase a fitness membership in their first semester at university will have higher GPAs, complete more credits, and are more likely to be retained than their non-member counterparts.

METHODS

Data were extracted from a university database at a large midwestern university. A sample of all first time degree seeking freshman-- students who had graduated from high school in the spring of 2010, who in the fall of 2010 were in their first semester at the university, and who had no prior college class experience were used in analyses ($n = 4843$, 56% women, 67% white). We chose these criteria to eliminate students who had earned college grade points, experienced a college classroom, or had been exposed to recreational sports previously. The cohort made up approximately 70% of the university's 2010 freshmen class.

Academic Success

Seven variables were identified as measures of academic success and analyzed at two time points, the first after two completed semesters (spring semester 2011), and the second after

four completed semesters (spring semester 2012). Variables included, high school GPA (HsGPA), cumulative college GPA (cGPA), cumulative college credits (ccc), one-year retention, two-year retention, and class standing. HsGPA was defined as the student's cumulative GPA in high school; this information was reported on a 4.0 scale to the university through high school transcripts. A student's cGPA was calculated as an average of the student's semester GPAs. Cumulative college credit was defined as the total number of credits the student completed with a passing grade; on average, a full-time takes between 12 and 17 credits each semester. If a student enrolled full or part time at the university for two consecutive fall semesters, one-year retention was achieved. If a student enrolled full or part time at the university for three consecutive fall semesters, two-year retention was achieved. Class standing was defined by the number of credits completed with a passing grade. Students with 0-27 credits completed were considered freshmen status, those with 28-55 credits completed were considered sophomore status, those with 56-87 credits completed were considered juniors, and those with 88 or more credits completed, seniors.

Recreational Sports Fitness Center Membership

The university recreational sports department was a multidimensional department including fitness centers, athletic courts and fields, group fitness classes, intramural sports, and other fitness activities. Most institutions assess recreational sports and fitness services fees within tuition costs, giving students "free" access to all or some of the facilities. At the university studied, use of most recreational sports facilities was included in the semester's tuition. An additional fee was assessed to students who chose to use the campus fitness centers, and to those who participated in intramural sports and/or group fitness. At the time of study, two recreational

sports fitness centers (~20,000 square feet) were available on campus. Each center consisted of standard cardio and strength exercise equipment, including treadmills, cycles, steppers, free weights, and strength machines. Purchasing a membership was voluntary for students and could be done on a one-semester (\$85) or two-semester (\$160) basis. Students who purchased a recreational sports fitness center membership in their first semester at the university were considered recreational sports fitness center members (n= 1138; 24%); those who did not purchase a membership in their first semester were considered recreational sports fitness center non-members (n=3705; 76%).

Data Analysis

Descriptive variables were reported using means \pm standard deviations. Our exposure variable was recreational sports fitness center membership. Student's t-tests were used to analyze differences between recreational sports fitness center members and non-members in HsGPA, as well as cGPA and CCC, across four consecutive semesters. Percentages and confidence intervals were used to assess group differences in one- and two- year retention rates, as well as class standing following two consecutive semesters.

RESULTS

The study sample was very similar to the demographics of the university; women made up 56% of the sample and 67% of the sample were white. International students made up 13% of the sample, which is consistent with institutions similar to the university studied. Table 1 shows outcome variables of interest by recreational sports and fitness membership status. Recreational sports and fitness center members achieved higher GPAs and completed more credits than non-

members. As seen in Table 1, HsGPA was significantly higher ($p = 0.002$) in members ($3.55 \pm .38$) compared to non-members ($3.52 \pm .30$). After four consecutive semesters, cGPA was significantly higher ($p \leq 0.0001$) in members ($3.13 \pm .52$) compared to non-members ($3.00 \pm .59$), and CCC was significantly higher ($p \leq 0.0001$) in members (56.6 ± 8.9) compared to non-members (54.1 ± 11.3). Although not statistically significant, more members than non-members were still enrolled at the university after one completed year, which may hold practical significance, 91% and 88%, respectively, and significantly more members than non-members were still enrolled after two completed years, 89% [86.6 - 90.3%] and 85% [83.9 - 86.2%], respectively. After two completed semesters, sophomore status was achieved by more members (74%) than non-members (60%).

Table 3.1. Academic success variables for recreational sports fitness center—members and nonmembers.

Success Variables		RSFS fitness center members (n=1,138)	RSFS fitness center nonmembers (n=3,705)
HsGPA	M (SD)	3.55 (0.38)*	3.52 (0.30)
CGPA ^a	M (SD)	3.13 (0.52)*	3.00 (0.59)
CCC ^a	M (SD)	56.6 (8.9)*	54.1 (11.3)
1-Year Retention	%	90.7	88.0
	95% CI	[89.0-92.4]	[86.9-89.0]
2-Year Retention	%	88.5	85.0
	95% CI	[86.6-90.3]**	[83.9-86.2]
Class Standing ^b	%	73.6	60.4
	95% CI	[71.0-76.1]**	[58.8-62.0]

Abbreviations: HsGPA = high school grade point average; CGPA = cumulative college grade point average; CCC = cumulative credits completed; Class Standing = % of students who reach sophomore status; CI = confidence interval; a = assessed after four completed semester; b = assessed after two completed semesters.

Note. * $p < 0.05$, **Significantly different by 95% Confidence Intervals.

DISCUSSION

Maintenance and growth of recreational sports is necessary to ensure continued participation of college students in daily physical activity. Positive relationships between recreational sports participation and academic success may help to increase funding for recreational sports and fitness center memberships because university administrators may see this as an essential service to provide to students. Previous research shows that recreational sports may have a small, but positive impact on academic success and retention. However, limitations of previous studies include a lack of longitudinal data, dissimilar study designs, self-report for exposure and outcome variables, and insufficient information regarding how students accessed the campus fitness facilities. The present investigation extends previous findings by utilizing longitudinal data, assessing specifically fitness center memberships, and by including multiple measures of academic success to help provide comparability to other literature. The results support the proposed hypothesis and illustrate a positive association between recreational sports fitness center membership and academic success and retention.

Although study findings with respect to GPA are encouraging, it is important to analyze their practical significance. Cumulative GPA was found to be 0.13 points higher for recreational sports and fitness center members compared to non-members. Depending on an individual student's future goals and actual GPA, this small difference may not be meaningful. However, an increase of GPA of 0.13 points due to recreational sports fitness center membership would be more meaningful for a student whose absolute GPA is near a cutoff point for acceptance into graduate school.

Perhaps a more important finding was the relationship between recreational sports fitness center membership and student retention. Previous studies have noted recreational sports fitness center participation to increase predicted probability of one-year retention by 1%.¹⁵ These results

show a significant increase of 3.5% in two-year retention among recreational sports and fitness services members, compared to non-members. Although not statistically significant, these data also suggest a positive relationship between recreational sports fitness center membership and 1-year retention. The current study was performed at a large university with approximately 49,000 students. A difference in retention of 3.5% equates to approximately 1575 students. The financial impact on a university of a single student departure may equate to thousands of dollars.²⁰ This loss includes unrealized tuition, fees, and alumni contributions.²⁰ While these data presented are not able to confirm a causal relationship between recreational sports and fitness center membership and student retention, they do illustrate a compelling argument for the association of the two variables.

This study did not statistically account for potential confounding variables. High school GPA is a known predictor of college student academic success. It may be argued that the difference in cumulative college GPA between recreational sports members and non-members is due to the confounding influence of high school GPA. However, cumulative college GPA decreased from high school GPA for both members and non-members. This decrease was greater in non-members, which indicates that membership in recreational sports may have a positive influence on college student academic success. Additionally, gender may influence the relationship between recreational sports membership and academic success. Research indicates that females tend to earn higher GPAs than males.²¹ This is also true at the university of study where females consistently earn higher GPAs than men (Office of the Registrar, personal communication, September 25, 2013). Specifically, cumulative college GPA for this study was assessed in the spring semester of 2012 when the university average GPA for females (3.09) was higher than males (2.97) (Office of the Registrar, personal communication, September 25, 2013).

There were more male recreational sports members, and more female non-members. Therefore the relationship of recreational sports membership and academic success may be stronger than these data illustrate due to the confounding nature of gender.

Factors contributing to college student success and retention make up a complex framework. Many environmental variables not assessed in this study may influence the relationship between recreational sports and fitness membership and student academic success and retention. Previous literature indicates that if students can feel a sense of community with the university they are more likely to be retained and succeed.⁵ It is possible that students participating in recreational sports are forming bonds with students from other areas of campus, or teachers and friends on campus, which may also contribute to higher academic success. Socioeconomic status (SES) may play a key role in this relationship as well. Recreational sports and fitness center members in this study made the voluntary decision to purchase a membership. Therefore, student SES may confound the relationship between recreational sports membership, student academic success, and retention. This study did not account for SES; future research should investigate this potential confounder.

Despite a number of limitations, this investigation has many strengths. For example, a large sample and multiple variables were used to assess academic success. A concrete definition of recreational sports exposure was utilized. This study did not specifically assess use of recreational sports, however it may be argued based on Self Determination Theory²² that students who choose to purchase a recreational sports membership are more motivated to use the facility than students who have a fee for recreational sports included in tuition costs. All results, regardless of size, were in the hypothesized direction. Future research should continue to include multiple variables to assess academic success, which will allow for better comparison among

studies. Environmental variables must be assessed in future research to help establish a causal relationship. Our study assessed membership as a way to access the recreational sports fitness facilities; the next step is to assess use of the facilities and the relationship of use to academic success and retention. As previously noted, recreational sports and fitness services is a means for students to participate in daily physical activity. Future research should also address overall physical activity behaviors of students in relation to recreational sports fitness center use, academic success, and student retention.

ADDENDUM

The previously published manuscript did not include an assessment of possible confounding variables. To address this limitation we chose to identify possible confounding variables and utilize more sophisticated statistics. Our methods and results are below.

Covariates

Based on previous literature^{6-9,22} and information available from the university Registrar, we identified six possible covariates that may impact the relationship between recreational sports use and college student academic success; these variables included: HsGPA, first year college GPA, ACT score, gender, race, and first semester Pell grant eligibility. HsGPA and first year college GPA were based on a 4.0 scale. ACT score could range from 1-36. All other covariates were categorical: gender (male/female), race (white/other, which included: American Indian/Alaskan Native, Asian, Black (non-Hispanic), Hawaiian/Pacific Islander, Hispanic, and Multiracial), and Pell grant eligibility (eligible/not eligible).

Statistical Analysis

The independent variable was recreational sports membership (members vs. non-members). Dependent variables included: cGPA, CCC, one- and two-year retention, and class standing. Description information for all variables is reported with means \pm standard deviations and percentages.

The relationship between recreational sports membership and 1) cGPA and 2) CCC was assessed via analysis of covariance (ANCOVA). The relationships between recreational sports membership (ref: non-member) and 1) one-year retention, 2) two-year retention, and 3) class standing were assessed via logistic regression. Possible covariates for both sets of analyses included: HsGPA, ACT score, gender (ref: male), race (ref: other), and Pell grant eligibility (ref: eligible). Recreational sports membership was entered into the models first. Covariates were entered based on the strength of relationship to the dependent variable determined via chi-square and one-way ANOVA. Variables related to the dependent variable ($p < 0.1$) were considered in model building. Unadjusted odds ratios (OR) and adjusted odds ratios (aOR) were calculated with associated 95% confidence intervals for reaching one-year retention versus not, reaching two-year retention versus not, and achieving sophomore status versus not, according to recreational sports member status. Variables were removed from the model if they did not significantly ($p < 0.05$) impact the overall model or did not change the odds ratio associated with recreational sports member status by more than ten percent. As a final step, first year college GPA was added to two of our adjusted models to identify if recreational sports remained significantly associated with two-year retention and class standing, after controlling for the robust predictor of academic success. First year college GPA was not entered into the model

predicting one-year retention as it is well known that students who have low GPAs are most likely to drop out in the first year as compared to students with high GPAs.

Results

Means, standard deviations, and percentages for all variables of interest are listed in Tables 3.2-3.5. Descriptive information for the relationship between recreational sports member status and 1) cGPA and 2) CCC is listed in Table 3.2. Descriptive information for the relationship between recreational sports member status and 1) one-year retention, 2) two-year retention, and 3) class standing is listed in Tables 3.3, 3.4, and 3.5 respectively.

Univariate analyses revealed significant relationships between membership status and 1) all covariates (except ACT), 2) cGPA, and 3) CCC ($p < 0.05$). After adjusting for gender, Pell grant eligibility, race, ACT score, and high school GPA, cGPA was significantly higher ($p < 0.001$) in members (3.17 ± 0.48) compared to nonmembers (3.01 ± 0.55) and CCC was significantly higher ($p < 0.001$) in members (57.56 ± 7.1) compared to non-members (55.7 ± 9.0) (Tables 3.6 and 3.7).

Univariate analyses showed one-year retention, two-year retention, and class standing were all significantly related to membership status and all covariates with the exception of gender (Tables, 3.3-3.5). Therefore, membership status, Pell grant eligibility, race, high school GPA, and ACT score were entered into logistic regression analyses. As seen in Tables 3.8-3.10, the adjusted odds of achieving one-year retention, two-year retention, and sophomore status differed only slightly from unadjusted models when comparing recreational sports members to non-members. Specifically, the adjusted odds were significantly higher for members compared to non-members to reach one-year retention (aOR=1.42, 95%CI: 1.10-1.85), two-year retention

(aOR=1.39, 95%CI: 1.10-1.76), and to achieve sophomore status (aOR=1.59, 95%CI: 1.14-2.22). When entered into logistic regression models for two-year retention and class standing, first year cumulative GPA was the only significant predictor of two-year retention (aOR=4.26, 95%CI: 3.66-4.96), and class standing (aOR=14.96, 95%CI: 11.57-19.35); recreational sports membership was no longer significant (data not shown in tables).

Table 3.2. Means, standard deviations (SD), frequencies, and percentages of dependent and covariate variables separated by recreational sports membership.

Variable	Total	Member	Nonmember
n	3470	899	2571
<i>frequency (percentage)</i>			
Gender*			
Male	1467 (42.3)	509 (56.6)	958 (37.3)
Female	2003 (57.7)	390 (43.4)	1613 (62.7)
Pell*			
Eligible	1070 (30.8)	174 (19.3)	896 (34.9)
Not Eligible	2400 (69.2)	725 (80.7)	1675 (65.1)
Race*			
White	2721 (78.4)	786 (87.4)	1935 (75.3)
Other ^a	749 (21.6)	113 (12.6)	636 (24.7)
<i>Mean±SD</i>			
High School GPA*	3.55±0.31	3.57±0.29	3.55±0.32
ACT	24.25±3.12	24.71±2.60	24.09±3.25
cGPA^{b,c*}	3.05±0.54	3.17±0.48	3.01±0.55
CCC^{b,c*}	56.19±8.59	57.56±7.12	55.71±9.01

Abbreviations: GPA = grade point average; cGPA = cumulative college grade point average; CCC = cumulative credits completed; a= Black (non-Hispanic), Hispanic, Asian, Hawaiian/Pacific Islander, American Indian/Alaskan Native, and Multiracial; b = assessed after four completed semesters, c = dependent variable.

Note. *Statistical difference between recreational sports membership status at p<0.05.

Table 3.3. Means, standard deviations (SD), frequencies, and percentages of independent and covariate variables separated by one-year retention status.

Variable	Total	Retained	Not Retained
n	3992	3551	441
<i>frequency (percentage)</i>			
Recreational sports membership^{a*}			
Member	990 (24.8)	911 (25.7)	79 (17.9)
Nonmember	3002 (75.2)	2640 (74.3)	362 (82.1)
Gender			
Male	1687 (42.3)	1505 (42.4)	182 (41.3)
Female	2305 (57.7)	2046 (57.6)	259 (58.7)
Pell*			
Eligible	1291 (32.3)	1106 (31.1)	185 (42.0)
Not Eligible	2701 (67.7)	2445 (68.9)	156 (58.0)
Race*			
White	3073 (77.0)	2767 (77.9)	306 (67.1)
Other ^b	919 (23.0)	784 (22.1)	135 (30.6)
<i>mean±SD</i>			
High School GPA*	3.54±0.32	3.55±0.31	3.44±0.35
ACT*	24.14±3.21	24.24±3.15	23.42±3.62

Abbreviations: GPA = grade point average; a = independent variable; b = Black (non-Hispanic), Hispanic, Asian, Hawaiian/Pacific Islander, American Indian/Alaskan Native, and Multiracial.

Note.*Statistical difference between retention groups at $p<0.05$.

Table 3.4. Means, standard deviations (SD), frequencies, and percentages of independent and covariate variables separated by two-year retention status.

Variable	Total	Retained	Not Retained
n	3875	3293	582
<i>frequency (percentage)</i>			
Recreational sports membership^{a*}			
Members	968 (25.0)	864 (26.2)	104 (17.9)
Nonmember	2907 (75.0)	2429 (73.8)	478 (82.1)
Gender			
Male	1639 (42.3)	1395 (42.4)	244 (41.9)
Female	2226 (57.7)	1889 (57.6)	338 (58.1)
Pell*			
Eligible	1244 (32.1)	983 (29.9)	261 (44.8)
Not Eligible	2631 (67.9)	2310 (70.1)	321 (55.2)
Race*			
White	2983 (77.0)	2607 (79.2)	376 (64.6)
Other ^b	892 (23.0)	686 (20.8)	206 (35.4)
<i>Mean±SD</i>			
High School GPA*	3.54±0.32	3.56±0.30	3.41±0.37
ACT*	24.16±3.19	24.31±3.05	23.33±3.78
First year cGPA^{c*}	2.95±0.69	3.07±0.57	2.29±0.92

Abbreviations: GPA = grade point average; cGPA = cumulative grade point average; a = independent variable; b = Black (non-Hispanic), Hispanic, Asian, Hawaiian/Pacific Islander, American Indian/Alaskan Native, and Multiracial; c = assessed after two completed semesters.

Note.*Statistical difference between retention groups at $p < 0.05$.

Table 3.5. Means, standard deviations (SD), frequencies, and percentages of independent and covariate variables separated by class standing.

Variable	Total	Sophomore	Not Sophomore
n	3875	3541	334
<i>frequency (percentage)</i>			
Recreational sports membership^{a*}			
Members	968 (24.9)	921 (26.0)	47 (14.2)
Nonmember	2907 (75.1)	2620 (74.0)	287 (85.8)
Gender			
Male	1639 (42.3)	1489 (42.1)	150 (44.9)
Female	2236 (57.7)	2052 (57.9)	184 (55.1)
Pell*			
Eligible	1244 (32.1)	1069 (30.2)	175 (52.4)
Not Eligible	2631 (67.9)	2472 (69.8)	159 (47.6)
Race*			
White	2983 (77.0)	2803 (79.2)	180 (53.9)
Other ^b	892 (23.0)	738 (20.8)	154 (46.1)
<i>Mean±SD</i>			
High School GPA*	3.54±0.32	3.56±0.31	3.31±0.38
ACT*	24.16±3.19	24.33±3.07	22.27±3.83
First year cGPA*	2.95±0.69	3.06±0.55	1.75±0.84

Abbreviations: GPA = grade point average; cGPA = cumulative grade point average; a = independent variable; b = Black (non-Hispanic), Hispanic, Asian, Hawaiian/Pacific Islander, American Indian/Alaskan Native, and Multiracial.

Note. * Statistical difference between class standing groups at $p < 0.05$

Table 3.6. Analysis of covariance for cumulative grade point average after four consecutive semesters.

Effects	Sum of squares	df	Mean square	F Value	P value
Recreational sports membership^a	7.61	1	7.61	36.19	<0.001*
Gender^b	4.27	1	4.27	20.32	<0.001*
Pell^c	5.52	1	5.52	26.25	<0.001*
Race^d	6.80	1	6.80	32.36	<0.001*
ACT	22.25	1	22.25	105.83	<0.001*
High School GPA	96.56	1	96.56	459.37	<0.001*

*Significant difference at $p < 0.05$

^aMember, nonmember (ref)

^bFemale, Male (ref)

^cNot eligible, Eligible (ref)

^dWhite, Other(ref)

Note. ^dOther includes: Black (non-Hispanic), Hispanic, Asian, Hawaiian/Pacific Islander, American Indian/Alaskan Native, and Multiracial.

Table 3.7. Analysis of covariance for cumulative credits completed after four consecutive semesters.

Effects	Sum of squares	df	Mean square	F Value	P value
Recreational sports membership^a	856.84	1	856.84	14.54	<0.001*
Gender^b	2721.14	1	2721.14	46.16	<0.001*
Pell^c	3280.54	1	3280.54	55.65	<0.001*
Race^d	1608.43	1	1608.43	27.29	<0.001*
ACT	5623.90	1	5623.90	95.40	<0.001*
High School GPA	10562.02	1	10562.02	179.17	<0.001*

*Significant difference at $p < 0.05$.

^aMember, nonmember (ref)

^bFemale, Male (ref)

^cNot Eligible, Eligible (ref)

^dWhite, Other (ref)

Note. ^dOther includes: Black (non-hispanic), Hispanic, Asian, Hawaiian/Pacific Islander, American Indian/Alaskan Native, Multiracial)

Table 3.8. Odds ratios (OR), adjusted odds ratios (aOR), and 95% confidence intervals (CI) for the effect of independent and covariate variables on one-year retention status.

Variable	OR [95% CI]	aOR [95% CI] ^b
Recreational sports membership^c		
Member	1.58 [1.23-2.04]*	1.42 [1.10-1.85]*
Nonmember	a	a
High School GPA	2.73 [2.03-3.64]*	2.25 [1.63-3.09]*
ACT	1.08 [1.05-1.11]*	1.02 [0.99-1.06]
Pell Grant		
Not Eligible	1.59 [1.31-1.96]*	1.29 [1.03-1.61]*
Eligible	a	a
Race		
White	1.56 [1.25-1.93]*	
Other ^d	a	

Abbreviations: GPA = grade point average; a = reference group; b=adjusted model, which includes recreational sports membership status, high school GPA, ACT, and Pell grant eligibility; c = independent variable; d = Black (non-Hispanic), Hispanic, Asian, Hawaiian/Pacific Islander, American Indian/Alaskan Native, and Multiracial.

Note. *Significantly difference by 95% CI.

Table 3.9. Odds ratios (OR), adjusted odds ratios (aOR), and 95% confidence intervals (CI) for the effect of independent and covariate variables on two-year retention status.

Variable	OR [95% CI]	aOR [95% CI] ^b
Recreational sports membership^c		
Member	1.64 [1.30-2.05]*	1.39 [1.10-1.76]*
Nonmember	a	a
High School GPA	3.98 [3.07-5.18]*	3.10 [2.35-4.09]*
ACT	1.10 [1.07-1.13]*	
Pell Grant		
Not Eligible	1.91 [1.60-2.29]*	1.43 [1.17-1.75]*
Eligible	a	a
Race		
White	2.08 [1.72-2.52]*	1.33 [1.07-1.66]*
Other ^d	a	a

Abbreviations: GPA = grade point average; a = reference group; b=adjusted model, which includes recreational sports membership status, high school GPA, Pell grant eligibility, and race; c = independent variable; d = Black (non-Hispanic), Hispanic, Asian, Hawaiian/Pacific Islander, American Indian/Alaskan Native, and Multiracial.

Note. *Significant difference by 95% CI.

Table 3.10. Odds ratios (OR), adjusted odds ratios (aOR), and 95% confidence intervals (CI) for the effect of independent and covariate variables on class standing.

Variable	OR [95% CI]	aOR [95% CI]^b
Recreational sports membership^c		
Member	2.15 [1.56-2.95]*	1.59 [1.14-2.22]*
Nonmember	a	a
High School GPA	8.52 [6.17-11.77]*	4.73 [3.30-6.79]*
ACT	1.22 [1.18-1.26]*	1.07 [1.03-1.12]*
Pell Grant		
Not Eligible	2.55 [2.03-3.19]*	1.35 [1.02-1.77]*
Eligible	a	a
Race		
White	3.24 [2.58-4.09]*	1.48 [1.11-1.98]*
Other ^d	a	a

Abbreviations: GPA = grade point average; a = reference group; b=adjusted model, which includes recreational sports membership status, high school GPA, ACT score, Pell grant eligibility, and race; c = independent variable; d = Black (non-Hispanic), Hispanic, Asian, Hawaiian/Pacific Islander, American Indian/Alaskan Native, and Multiracial.

Note. *Significant difference by 95% CI.

Conclusion

Our original manuscript showed that recreational sports members earned higher cGPAs, completed more credits, and were more likely to reach two-year retention compared to non-members.¹ No differences were found between members and non-members in one-year retention. The results of this addendum support those of our original manuscript.¹ After controlling for confounding variables, recreational sports members earned higher cGPAs, completed more credits, were more likely to reach one- and two- year retention, and were more likely to achieve sophomore status after two consecutive semesters as compared to non-members. These results provide additional evidence that supports the positive relationship between recreational sports membership and college student academic success. However, it is important to note that first year GPA is a stronger predictor of two-year retention and class standing than all other predictors entered into the models, including recreational sports membership (data not shown). Therefore, future research should investigate the relationship between recreational sports participation and first year GPA. Further, this addendum addresses only a few of the limitations of our original study; it does not address all. In particular, future research should investigate the relationship between recreational sports *use* and college student academic success as well as the relationship between recreational sports use and physical activity behaviors.

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CHAPTER 4

MANUSCRIPT TWO

Chapter four addresses *Specific Aim* two.

Specific Aim 2: To investigate the relationship between recreational sports fitness center use and college student one- and two-year retention.

INTRODUCTION

Regular participation in physical activity (PA) is important for current health and chronic disease prevention. However, few adults meet PA guidelines.¹ Decades of research indicate that students develop many lifestyle behaviors in college.^{2,3} However, data assessing the relationship between PA behaviors during and post college are limited, yet the existing literature points in a positive direction. Plotnikoff et al.,⁴ recently published the first review of interventions that target PA, nutrition, and healthy weight in college students. The authors identified 29 studies that assessed the impact of intervention on PA participation in college students. Eighteen of the 29 studies showed significant improvements in PA or fitness behaviors from pre- to post-intervention. Improvements in PA and fitness behaviors included increases in total minutes of PA participation, number of days participating in PA, activity intensity, and decreases in exercise barriers. Further, a survey of 380 college alumni (2-10 years post graduation) indicated a positive relationship between exercise behaviors during the senior year of college and exercise behaviors post graduation.⁵ Specifically, 85% of participants who indicated they were active as college seniors were as or more active at the time of survey, and, 82% of those who were not active as college seniors indicated they were the same or less active at the time of survey.⁵ More research is needed in this area; however, the literature discussed suggests that the development of positive

PA behaviors during college may help increase the proportion of college-aged adults meeting PA guidelines.

Recreational sports departments are a potential avenue for PA promotion to college students. Researchers have investigated the relationship between recreational sports use *during* college and PA participation *post* college in a sample of 310 health, physical education, and recreation alumni who graduated from a single university between May 2001 and May 2005.⁶ The authors⁶ reported that participation in recreational sports during college directly related to PA participation post college ($p=0.013$). These findings provide evidence that PA promotion through university recreational sports departments may result in increased PA participation not only during college, but also later in life.

University recreational sports departments are charged with promoting positive physical activity behaviors to college students. *NIRSA: Leaders in Recreation* report that 85% of all students engage in some form of university recreational sports at least once during an academic career.⁷ In addition to reaching a large number of students, recreational sports facilities house the equipment necessary to support PA, including, cardio and resistance training equipment. However, funding is necessary for continued PA promotion and equipment upkeep. Although development of student healthy lifestyle behaviors is important to university administrators, it is secondary to their interest in student retention. Therefore, recreational sports departments should seek to identify relationships between recreational sports and college student retention to help justify their existence to university administrators.

Not only is retention a very important measure to academic administrators, it is a bottom line issue. Thousands of dollars are lost for each student who leaves an institution prior to degree attainment.⁸ The risk of student attrition declines after the first year of college, thus past retention

research has focused primarily on students' first to second years. One-year retention is usually defined by two consecutive Fall semester enrollments and two year retention by three consecutive Fall semester enrollments.⁹

Previous investigators have identified many variables that predict retention including age^{10,11}, sex^{11,12}, race¹⁰⁻¹², residency¹⁰, high school GPA¹⁰⁻¹³, SAT/ACT scores¹¹, first semester college GPA¹⁰⁻¹², socioeconomic status (SES)¹¹, and sense of belonging¹⁴⁻¹⁶. Race, sex, SES, and high school GPA appear to be the most reliable predictors; White/Asian female students with high GPAs in high school and high socioeconomic status are most likely to be retained.¹⁷ However, variables known to impact college student retention are primarily unmodifiable, meaning the student cannot change their status. To increase retention rates, researchers much identify variables that are modifiable, i.e., the student can alter their status within the variable. Several investigators have posited that the most important variable predicting student retention may be student integration into university culture.^{14-16,18} Recreational sports offers a means for students to become part of the university. Students who participate regularly in recreational sports facility activities can develop self-esteem, social relationships, and communication and leadership skills. In addition to conventional programs (fitness classes, intramural sports), recreational sports departments provide wellness programs, outdoor recreation, and building space that appeals to various clubs, organizations, and other activities. Recreational sports departments can be versatile and offer a sense of community for a diverse group of students.

Researchers who have assessed relationships between recreational sports participation and retention have primarily utilized self-report measures obtained with the Quality of Intramural Recreational Sports survey (QIRS).^{19,20} Results indicate that 31-35% of students report that the availability of recreational facilities and programs is important or very important in their decision

to continue at the institution.^{19,20} However, these studies are limited by cross-sectional designs, self-report of both independent and dependent variables, and simplistic statistics and sampling strategies.

Four studies to date have utilized university databases to overcome the self-report limitation.²¹⁻²⁴ Results of this research corroborate the previous findings, indicating that recreational sports participation is positively related to retention. However, corroboration does not indicate that self-report is sufficient to measure retention. Researchers that utilized self-report measured students' *beliefs* that they would continue at the institution the following year. Researchers utilizing university databases were able to determine whether the student was in fact retained. Further, to our knowledge, studies utilizing the QIRS have not compared student *belief* of continuing at the institution and *actual* retention. Therefore, the two methods provide different information and should not be considered interchangeable.

The four studies utilizing university databases also have limitations. Two of them^{21,24} dichotomized recreational sports use into users and non-users. This method results in a largely homogenous sample as the majority of college students participate in some form of recreational sports. Further, both studies evaluated their data using percentages and 95% confidence intervals, which limits precise assessment of the complex nature of student retention. Two additional studies utilized logistic regression^{22,23} and each controlled for a variety of confounding variables. However, these studies used varying measures of recreational sports use, and included differing confounding variables (only ACT score, gender and race were consistently used), making their results difficult to compare. Although previous investigations are widely considered as preliminary evidence of a positive relationship between recreational sports use and retention,

researchers should be cautious when interpreting results that include homogenous samples and self-reported, convenience sampled data that fails to control for possible confounding variables.

There is a need to investigate the relationship between recreational sports participation and student retention by utilizing university data, considering many potential confounders, and implementing more sophisticated analytic techniques. Therefore, the purpose of this study was to investigate the relationship between university recreational sports fitness center use and college student one- and two-year retention. It was hypothesized that after controlling for potential covariates, there would be a direct relationship between use of recreational sports fitness centers and one- and two-year retention.

METHODS

Data Collection

Data were extracted from a university database housed at a large Midwestern university. Study participants included all first time degree seeking freshmen students who graduated from high school in the Spring of 2010. Participants were in their first semester at the university in Fall 2010, were not student athletes, and had no prior college class experience. Students who purchased a membership in at least one of their first two semesters (Fall 2010 and Spring 2011) at the university were utilized to assess one-year retention, and students who purchased a membership in at least one of their first four semesters (Fall 2010/11 and Spring 2011/12) at the university were utilized to assess two-year retention. Students who did not purchase a membership to the recreational sports fitness centers were excluded from this study. Few students enroll in the summer semester and even fewer elect to purchase a summer fitness

membership. Therefore, summer semester academic variables and recreational sports use were not evaluated.

Academic Success

Academic success was defined by one- and two-year retention. As per the National Center for Education Statistics, Fall-to-Fall retention was utilized to assess one- and two-year retention.⁸ Students who enrolled fulltime in the Fall 2010 semester and full or part time in the Fall 2011 semester were considered to have reached one-year retention. Students who enrolled full time in the Fall 2010 semester and full or part time in Fall 2011 and Fall 2012 semesters were considered to have reached two-year retention. Enrollment in Spring semesters was not considered for Fall-to-Fall retention rates.

Recreational Sports

The university recreational sports department offers a variety of opportunities for students to participate in PA including outdoor facilities, indoor pools, courts, cardio equipment, free weights, and strength training machines. Access to some university recreational sports facilities is included in tuition costs. However, an additional fee is charged to students who wish to purchase a fitness center membership, which provides access to all recreational sports fitness centers. There are two fitness centers on campus totaling ~20,000 square feet of space. These fitness centers house cardio machines and resistance training equipment. To verify membership, students swipe their student IDs each time they enter a recreational sports fitness center. This information is recorded electronically. For this investigation, total number of times study

participants swiped into the fitness center each semester was gathered and utilized to identify level of recreational sports use.

To our knowledge, there are no well-accepted standards used to establish cut points to define levels of recreational sports use. Therefore we identified cut points for four groups (never used, low use, medium use, and high use) by utilizing data from all students enrolled at the institution between Fall 2010 and Spring 2014. The level ‘never used’ was defined by purchasing a membership, but never utilizing the recreational sports fitness centers. To identify cut points for low, medium, and high use, recreational sports fitness center use per semesters of *membership* was calculated for all students who purchased a membership and used the recreational sports fitness facilities. We utilized a quartile split to first identify four groups of recreational sports fitness center use. The middle two groups were combined, resulting in three levels of recreational sports use (low = lowest quartile of use, medium = middle two quartiles of use, high= highest quartile of use). This allowed us to identify the extreme ends of the recreational sports use curve, thus improving comparability and reducing potential type two errors. Study participants were categorized into one of the four population derived levels based on the number of times they swiped their ID into a recreational sports fitness center per semesters of *enrollment*. Swipes in the first two semesters (Fall 2010, Spring 2011) were considered to evaluate one-year retention and swipes in the first four semesters (Fall 2010/11 and Spring 2011/12) to evaluate two-year retention.

Covariates

Based on previous literature¹⁰⁻¹³ and information available from the university Registrar, we identified six possible covariates that may impact the relationship between recreational sports

use and college student retention; these variables included: high school GPA (HsGPA), first year college GPA, ACT score, gender, race, and first semester Pell grant eligibility. HsGPA and first year college GPA were based on a 4.0 scale. ACT score could range from 1-36. All other covariates were categorical: gender (male/female), race (white/other, which included: Asian, Black (non-Hispanic), Hispanic, Hawaiian/Pacific Islander, and American Indian/Alaskan Native), and Pell grant eligibility (eligible/not eligible).

Statistical Analysis

Our exposure variable was recreational sports use level (ref: never used) and our dependent variables were 1) one- and 2) two- year retention. Possible covariates included: HsGPA, ACT score, gender (ref: male), race (ref: other), and Pell grant eligibility (ref: eligible). Descriptive information is reported with means \pm standard deviations and percentages. Chi-square and one-way analysis of variance were utilized to assess the univariate relationships between each variable and 1) one- and 2) two-year retention. Logistic regression models were developed to describe the relationship between recreational sports use and 1) one- and 2) two-year retention. Recreational sports use was entered into the models first, followed by HsGPA, race, and gender. This order of entry was based on previous research.¹⁰⁻¹³ Additional covariates, if related to retention ($p < 0.10$), were entered based on the strength of relationship. Unadjusted odds ratios (OR) and adjusted odds ratios (aOR) were calculated with associated 95% confidence intervals for reaching one-year retention versus not, and reaching two-year retention versus not, according to recreational sports level. Variables were removed from the model if they did not significantly ($p < 0.05$) impact the prediction of retention or did not change the odds ratio associated with recreational sports use by more than ten percent. After evaluating the final

adjusted model for two-year retention we planned to assess first year college GPA as a covariate to identify if recreational sports remained significantly associated with two-year retention after controlling for the robust predictor of academic success. First year college GPA was not entered into the model predicting one-year retention as it is well known that students who have low GPAs are most likely to drop out in the first year as compared to students with high GPAs.

RESULTS

The sample utilized to assess one-year retention ($n=1344$, 94% retained) was 50% female, 87% white, and 21% Pell grant eligible (Table 4.1). Mean \pm standard deviation HsGPA, ACT score, and first year cumulative GPA were 3.57 ± 0.29 , 24.65 ± 2.66 , and 3.09 ± 0.61 , respectively (Table 4.1). The sample utilized to assess two-year retention ($n=1583$, 90% retained) was 51% female, 87% white, and 22% Pell grant eligible (Table 4.2). Mean \pm standard deviation high school GPA, ACT score, and first year cumulative GPA were 3.57 ± 0.29 , 24.63 ± 2.74 and 3.09 ± 0.61 , respectively (Table 4.2). Recreational sports use cut points established from population data were defined as never used (purchased a membership, but never used the facilities), low use (0-5 times/membership), medium use (>5 -26 times/membership), and high use (>26 times/membership). The study sample was categorized into one of the four groups based on number of uses/semesters of enrollment. Medium use and high use categories were combined due to low frequencies of subjects who were not retained and categorized as medium/high users, which resulted in three categories for analyses, never used, low use (0-5 times/semester of enrollment), and medium/high use (>5 times/semester of enrollment). It should be noted that there was a low frequency of students categorized as ‘never used’ who did not reach two-year retention. However, we chose to continue the analysis without combining never

used and low use groups, as these two groups are inherently different. All descriptive information is listed in Tables 4.1 and 4.2.

Chi-square analyses revealed significant global differences in one-year retention among levels of recreational sports use. One-way analysis of variance indicated a positive relationship between HsGPA and one-year retention (Table 4.1). Based on previous literature, level of recreational sports use, HsGPA, race, and gender were consecutively entered into logistic regression models to predict one-year retention. Pell grant eligibility, and ACT score were not considered for model building, as they did not meet criteria to enter the model ($p < 0.1$). The most parsimonious model identified to predict one-year retention included recreational sports use level and high school GPA. As seen in Table 4.3, the unadjusted odds of achieving one-year retention were significantly higher among medium/high users of recreational sports compared to those categorized as never used (OR=1.98, 95% CI: 1.12-3.44). Results were minimally affected and remained significant after adjusting for HsGPA (aOR for medium/high users vs. never used =1.94, 95%CI: 1.12-3.38). No differences were identified in one-year retention between low users and never used. Univariate analyses showed a significant relationship between two-year retention and 1) race, 2) HsGPA, and 3) first year cumulative GPA. No relationship was found between two-year retention and 1) gender, 2) Pell grant eligibility, or 3) recreational sports use levels (Table 4.2). Therefore, due to the null findings between independent and dependent variables, we did not build a logistic regression model to predict two-year retention.

Table 4.1. Means, standard deviations (SD), frequencies, and percentages of independent and covariate variables separated by one-year retention.

Variable	Total	Retained	Not Retained
n	1344	1259	85
<i>frequency (percentage)</i>			
Level of RS Use^{a*†}			
Never Used	322 (24.0)	296 (23.5)	26 (30.6)
Low	363 (27.0)	332 (26.4)	31 (36.5)
Medium/High	659 (49.0)	631 (50.1)	28 (32.9)
Gender			
Male	676 (50.3)	631 (50.1)	45 (52.9)
Female	668 (49.7)	628 (49.9)	40 (47.1)
Race			
White	1165 (86.7)	1097 (87.1)	68 (80.0)
Other ^b	179 (13.3)	162 (12.9)	17 (20.0)
Pell Grant Eligibility			
Eligible	278 (20.7)	257 (20.4)	21 (24.7)
Not Eligible	1066 (79.3)	1002 (79.6)	64 (75.3)
<i>mean±SD</i>			
High School GPA^{*†}	3.57±0.29	3.58±0.29	3.46±0.28
ACT composite score	24.65±2.66	24.66±2.64	24.52±2.96

Abbreviations: RS = Recreational sports; GPA = grade point average; cGPA = cumulative grade point average; a = independent variable; b = Black (non-Hispanic), Hispanic, Asian, Hawaiian/Pacific Islander, American Indian/Alaskan Native, and Multiracial.

Note.

*Global statistical difference between retention groups at $p < 0.05$.

†Meets criteria to enter logistic regression model, $p < 0.1$

Table 4.2. Means, standard deviations (SD), and percentages of independent and covariate variables separated by two-year retention.

Variable	Total	Retained	Not Retained
n	1583	1420	163
<i>frequency (percentage)</i>			
Level of RS Use^a			
Never Used	67 (4.2)	59 (4.2)	8 (4.9)
Low	637 (40.2)	570 (40.1)	67 (41.1)
Medium/High	879 (55.5)	791 (57.5)	88 (54.0)
Gender			
Male	770 (48.96)	685 (48.2)	85 (52.1)
Female	813 (51.4)	735 (51.8)	78 (47.9)
Race^{*†}			
Other ^b	214 (13.5)	184 (13.0)	30 (18.4)
White	1369 (86.5)	1236 (87.0)	133 (81.6)
Pell Grant Eligibility			
Yes	346 (21.9)	307 (21.6)	39 (23.9)
No	1237 (78.1)	1113 (78.4)	124 (76.1)
<i>mean±SD</i>			
High School GPA^{*†}	3.57±0.29	3.58±0.29	3.47±0.32
First Year cGPA^{*†}	3.09±0.61	3.15±0.54	2.53±0.86
ACT composite score	24.63±2.74	24.65±2.68	24.46±3.18

Abbreviations: RS = Recreational sports; GPA = grade point average; cGPA=cumulative grade point average; a = independent variable; b = Black (non-Hispanic), Hispanic, Asian, Hawaiian/Pacific Islander, American Indian/Alaskan Native, and Multiracial.

Note.

*Global statistical difference between retention groups at $p<0.05$

†Meets criteria to enter logistic regression model, $p<0.1$

Table 4.3. Odds ratios (OR), adjusted odds ratios (aOR), and 95% confidence intervals (CI) for the effect of independent and covariate variables on one-year retention.

Variable	OR [95% CI]	aOR [95% CI] ^b
Level of RS use^c		
Never Used	a	a
Low	0.94 [0.55-1.62]	1.01 [0.58-1.75]
Medium/High	1.98 [1.12-3.44]*	1.94 [1.11-3.38]*
High School GPA	4.16 [2.09-8.23]*	3.59 [1.79-7.24]*
Gender		
Male	a	
Female	1.12 [0.72-1.74]	NA
Race		
Other ^d	a	
White	1.69 [0.97-2.95]	NA

Abbreviations: RS = Recreational sports; GPA = grade point average; a = referent group; b= adjusted model which includes recreational sports use level and high school GPA; c = independent variable; d = Black (non-Hispanic), Hispanic, Asian, Hawaiian/Pacific Islander, American Indian/Alaskan Native, and Multiracial.

Note. *Significant difference 95% CI

DISCUSSION

The results of this study support most previous literature¹⁹⁻²⁵ and our hypothesis of a direct relationship between recreational sports participation and college student one-year retention. After controlling for HsGPA, students who participated in recreational sports more than five times per semester were nearly twice as likely to continue at the institution after one year of enrollment than students who purchased a recreational sports membership, but never used the facilities. Based on this finding, students should be encouraged to utilize the recreational sports fitness centers early and often in their academic careers.

Results of this study do not support our hypothesis that recreational sports participation positively relates to two-year retention. The majority of study participants in our sample reached two-year retention (n=1420, 90% of the sample) and few students purchased a membership but never used the facilities (n=67, 4% of the sample), which resulted in a low frequency of students

not retained and categorized as ‘never used’ (n=8, 0.5% of the sample). The low frequency may have resulted in a type two error. Further, previous research suggests that integration into the university is a primary predictor of student retention and is most important during the first year of college.^{2,3,13-16} Therefore, it is possible that students in this study became integrated into the institution their first year of college, and therefore involvement through recreational sports in their second year of college was not critical to achieving two-year retention.

Previously, we investigated the relationship between purchasing a membership to recreational sports in the first semester at the institution and two-year retention.²⁴ Although we did not control for confounding variables, results showed that first semester recreational sports members were more likely to reach two-year retention than non-members ($p < 0.05$).²⁴ The finding suggests that institutional involvement through recreational sports membership in the first semester of college is important to two-year retention. However, our previous study did not assess actual *use* of the recreational sports facilities. Therefore, to fully understand the relationship between recreational sports use and two-year retention, future research should utilize one-year recreational sports use as the independent variable. Additionally, we believe that this is the first study to investigate the relationship between recreational sports use and two-year retention; our results await replication in other college samples before final conclusions can be drawn.

Theorists Alexander Astin¹⁸ and Vincent Tinto^{14,15} suggest that student integration into university culture, particularly in the first year, is extremely important for student success. More specifically, students who become involved both academically and socially in their first year of college are more likely to persist than students who are not involved.^{14,15,18} Further, the risk of student drop out declines drastically after the first year of college.^{14,15} Taken together, the results

of our 2014 study and the present investigation support Astin¹⁸ and Tinto's^{14,15} theories.

Involvement, through recreational sports, during the first semester and first year of college is positively related to college student one-year retention. However, involvement through recreational sports across two years, does not relate to two-year retention. Therefore, in an effort of increasing retention rates, recreational sports practitioners should encourage college students to purchase and utilize a fitness membership early in their academic careers.

Results of univariate analyses generally agree with recent research that reflects the ever-changing college student populations.¹² However, the findings of our study do not support previous literature relating socioeconomic status to retention.^{13,26,27} This contradictory finding may be explained by a possible type II error resulting from the low frequency of students who were Pell grant eligible and not retained (n=39, 2.5% of the sample). Further, we chose to use Pell grant eligibility as a proxy for student SES. Previous investigators have used several proxy variables to estimate SES (e.g. parental education, income, and/or occupation).^{26,27} Therefore the contradictory findings may be due to differences in what variable is used to estimate SES. More research is needed to understand how SES impacts retention in a sample of recreational sports members.

Although results of this study are encouraging, there are some limitations. This investigation was conducted at a university where students must purchase a membership to utilize the recreational sports fitness centers; more commonly, all students have access to fitness centers by paying a fee as part of tuition and fees. Further, an average of 92% of study participants were retained, which is much higher than the 2011 national average at four year public institutions for one-year retention (78.7%).²⁸ Therefore, results may not be generalizable to institutions that assess a recreational sports fee to all students or that have lower retention

rates. Additionally, use of recreational sports was calculated as use per semesters of enrollment. This method was chosen to create a variable that represents ‘regular use’. It is possible that a study participant utilized recreational sports a very high amount in one semester, and not in the next, but was categorized as a high user. Finally, covariates addressed in this study are primarily pre-entry attributes. We did not account for other variables that may impact a student’s decision to remain at the institution such as hours per week working for pay or whether the students lived on or off campus. Therefore, the interpretation of recreational sports use levels and the covariates measured should be considered when comparing the results of this study to previous literature.

Despite its limitations, this study has many strengths. We utilized a large sample, investigated six possible confounding variables, and investigated recreational sports use over more than one semester. This study also included definitions of recreational sports use levels via population data. Finally, we restricted the analysis to a single component of recreational sports, fitness centers, which allows for increased specificity compared to previous literature.

In summary, results of this study show significant differences in one-year retention among recreational sports use levels; students who use the facilities more than five times per semester are most likely to be retained. No differences were identified among recreational sports use levels and two-year retention. These results should be shared with academic administrators to bring attention to the positive impact of recreational sports participation on student retention. Future research should investigate the relationship between college student retention and additional components of recreational sports, such as intramurals and club sport participation, in a variety of college student populations. Further, future investigation should identify and assess additional confounding variables

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CHAPTER 5

MANUSCRIPT THREE

Chapter five addresses *Specific Aims* three and four.

Specific Aim 3: To investigate the relationships between recreational sports fitness center use over four years and college student academic success defined by cumulative grade point average (GPA) and degree completion.

Specific Aim 4: To investigate the impact of year in school on the relationship between recreational sports use and grade point average.

INTRODUCTION

Currently, the United States' has a college graduation rate of 37.7% and is ranked 13th, among 30 countries participating in the Organization for Economic Co-operation and Development.¹ Finland's graduation rate is first in the world at 62.6% followed by Slovak Republic at 57.1%.¹ President Obama has pushed for an increase in college graduates. He has set a new goal for the country, indicating, "...that by 2020, America would once again have the highest proportion of college graduates in the world."² Previous research indicates a number of variables that partially explain why college students do or do not graduate (e.g., AP credits³, college major⁴, first year grade point average (GPA)⁴, race⁴⁻⁷, gender⁴⁻⁸, socioeconomic status^{5,9}). However, the accuracy of each variable in predicting Bachelor 's degree attainment varies across studies^{7,8}, although there is general agreement that college GPA is the best predictor of college student degree attainment.⁴ Students with higher GPAs, particularly in the first year of college are more likely to be retained and graduate than students with lower GPAs.¹⁰⁻¹² Many factors

shown to predict college degree attainment also relate to college student GPA, including race¹⁰, gender^{10,11}, and high school GPA¹⁰⁻¹².

Theorists Alexander Astin¹³ and Vincent Tinto^{14,15} suggest that college student success depends more on student involvement than pre entry attributes (e.g., race, gender, and high school GPA). Astin's¹³ theory suggests that the more a student is involved at an institution, the more likely the student is to learn and succeed. In his theory, involvement is defined as, "... the amount of physical and psychological energy that the student devotes to the *academic* experience." Astin¹³ notes that uninvolved students are more likely to drop out of college than involved students. Similarly, Tinto's Theory of Departure^{14,15} focuses on student integration. His theory suggests that student pre-entry attributes (family background, skills and abilities, prior schooling) influence student goals and his/her commitment to the institution prior to attending college, which in turn impact institutional experiences and academic/social integration while attending college. The level of academic/social integration in college influences student goals and institutional commitment during college and ultimately affects the decision to continue attending the institution. It is important to note that the level of involvement in the first year of college is considered most important in college student success. Additionally, while student involvement is critical to college student success, too much involvement can be detrimental. Astin and Tinto both specify the importance of *meaningful* involvement, especially that which relates specifically to academics. Students who are under/over-involved and who do not manage their time effectively are less successful in college than students who identify time to study effectively and ways to become involved as part of a balanced lifestyle.¹⁶

Similar to the goals of President Obama, academic administrators often define success by academic measures such as GPA and degree attainment. However, student affairs professionals

focus more broadly on overall student development. The student affairs department at our university states, “The programs, services, and facilities provided...are designed to create a stimulating and supportive environment that enhances the personal development, learning, educational success, and career preparation of all students.”¹⁷ Their mission is to “...prepare graduates for participation and leadership in an increasingly diverse and complex global society.”¹⁷ One area of personal development is the development of healthy lifestyle behaviors such as regular participation in physical activity (PA).

In 2008, the United States Department of Health and Human Services (DHHS) issued PA guidelines indicating adults should participate in at least 150 minutes a week of moderate- or 75 minutes a week of vigorous-intensity aerobic PA, or an equivalent combination.¹⁸ Adults should also participate in “...muscle strengthening activities that are moderate or high intensity and involve all major muscle groups on two or more days a week...”¹⁸ In 2011, 56.8 percent of college aged adults met aerobic PA guidelines, 44.1% met strength-training guidelines, and 30.7 percent met both.¹⁹ Promotion of PA to college students is critical to increase the proportion of adults meeting PA guidelines. Recreational sports is one avenue for students to develop the healthy lifestyle behavior of regular participation in PA. Further, based on the theories of Astin¹³ and Tinto^{14,15}, participation in recreational sports is an opportunity for involvement at the university, which may help increase student academic success. However, funding is necessary to ensure the continued promotion of PA through recreational sports. Although academic administrators may believe PA is important, it is likely secondary to academic success. Therefore, research is necessary to investigate the relationship between recreational sports participation and academic success.

Research investigating the relationship between participation in recreational sports and GPA is scarce. Four studies²⁰⁻²³ have assessed this relationship. Three²⁰⁻²² found positive associations between recreational sports and GPA, and one²³ found no association. Belch, Gebel, and Maas²⁰ and Kampf and Teske²¹ utilized university records to compare recreational sports fitness facility use and GPA. Further, Kampf and Teske²¹ assessed the difference in GPA between 1) recreational sports student employees and non-employees, and 2) club sport participants and non-participants. Recently, we²² took a slightly different approach and assessed differences in GPA between recreational sports members and non-members. Differences in college GPA between recreational sports participants and non-participants of all three studies ranged between 0.09 and 0.13, with participants earning a higher GPA than non-participants. Although all three studies²⁰⁻²² utilized large sample sizes, $n=11,076$, $n=3,308$, and $n=4,843$ respectively, and performed similar analyses, no investigative group accounted for potential confounding variables or assessed levels of recreational sports use. In contrast, Frauman²³ found no difference in GPA between recreational sports users and non-users using a smaller sample ($n=385$). Therefore, due to limitations of previous investigations and conflicting findings, more research is needed.

Despite the importance placed on Bachelor's degree attainment in the United States, only one published study²⁴ has assessed the relationship between participation in recreational sports and Bachelor's degree attainment. Huesman et al.,²⁴ utilized logistic regression to assess the relationship between first semester participation in recreational sports (Fall semester of freshman year) and five-year degree attainment ($n=5,211$). The authors included the ratio of credits attempted to credits completed, C's received, D's received, course withdraw count, ACT/SAT score, remedial classes taken, remedial classes failed, athlete status, gender, race, socioeconomic

status, and off-campus housing as covariates. Campus recreation use was entered in the model as a continuous variable. In a secondary analysis, the authors²⁴ compared ten entries into the recreational sports center to 25 entries. These values were chosen based on the mean and standard deviation of campus recreation use in the first semester of college. Results suggested that utilizing the recreational sports fitness center 25 times in the first semester of freshmen year increased the likelihood of 5-year graduation by 2% compared to students who used the fitness center 10 times or less in the first semester. Although results of the study are in a positive direction, there is a clear need for more research in this area.

Due to a limited number of investigations and conflicting findings, research is needed to investigate the relationships between recreational sports and 1) college student GPA and 2) Bachelor's degree attainment. The purpose of this study was three-fold. The first purpose was to investigate the relationships between four-year recreational sports fitness center use and four-year cumulative GPA; the second to investigate the relationships between four-year recreational sports fitness center use and five year Bachelor's degree attainment. Due to the potential negative effects of over/under involvement on college student success, we hypothesized that students using the recreational sports fitness center the least and most often would earn lower four-year cumulative GPAs and be less likely to graduate in five-years than those who used the facilities a moderate amount. Previous authors have largely focused on recreational sports use in the first semester of college, therefore, our third purpose was to investigate the impact of year in school on the relationship between recreational sports use and yearly GPA. We hypothesized an interaction between year in school and recreational sports use on yearly GPA, with first year students experiencing the greatest effect of recreational sports use on GPA.

METHODS

Data Collection

Data were extracted from a university database housed at a large Midwestern university. Study participants included all first time degree seeking freshmen students who graduated from high school in Spring, 2010. Participants were in their first semester at the university in Fall, 2010, were not student athletes, had no prior college class experience, and purchased a fitness center membership in a Fall or Spring semester at least once in their academic careers. These criteria ensured all subjects had made similar academic progress, had the goal of achieving a college degree, and had access to the university recreational sports facilities for all earned college credits. Since varsity athletes have different college schedules than typical college students, they were excluded from the sample.

Academic Success

Academic success was defined by four-year cumulative GPA (4.0 point scale) and five-year Bachelor's degree attainment (yes/no). Four-year cumulative GPA was calculated as the average of all previous enrolled semester GPAs. University curricula are generally structured for four-year Bachelor's degree attainment. However, universities report, to the National Center for Education Statistics, the number of students who graduate within 150% of normal time to completion. Further, the majority of previous literature in higher education assesses five- and/or six-year graduation rates. Therefore, to allow for comparability, we assessed five-year degree attainment; students who completed a Bachelor's degree by May, 2015 were considered to have achieved five-year degree attainment. Academic success was defined by comparing yearly cumulative GPAs among study participants, calculated as the average of all enrolled Fall and

Spring semester GPAs in a given year, to assess the impact of year in school on the relationship between recreational sports use and GPA.

Recreational Sports

The university recreational sports department offers a variety of opportunities for students to participate in PA including outdoor facilities, indoor pools, courts, cardio equipment, free weights, and strength training machines. Access to some of the university recreational sports facilities is included in tuition costs. However, an additional fee is charged to students who wish to purchase a fitness membership, which provides access to the campus recreation fitness centers. There are two fitness centers on campus totaling ~20,000 square feet of space. These fitness centers house cardio machines and resistance training equipment. To verify membership, students swipe their student IDs each time they enter a recreational sports fitness center, and their information is recorded electronically. For this investigation, total number of times the study participants swiped into the fitness center during each semester (Fall or Spring) of enrollment was gathered and utilized to identify level of recreational sports use (never used, low use, medium use, high use).

To our knowledge, there are no established cut points to define levels of recreational sports use. Therefore we identified cut points for four groups (never used, low use, medium use, and high use) by utilizing data from all students enrolled at the institution between Fall 2010 and Spring 2015. The level ‘never used’ was defined by purchasing a membership, but never utilizing the recreational sports fitness centers. To identify cut points for low, medium, and high use, recreational sports fitness center use per *semesters of membership* was calculated for all students who purchased a membership and used the recreational sports fitness centers. We

utilized a quartile split to first identify four groups of recreational sports fitness center use. The middle two groups were combined resulting in three levels of recreational sports use (low use, medium use, high use). This allowed us to identify the extreme ends (low and high) of the recreational sports use curve, thus improving comparability and reducing potential type two errors. Study participants were categorized into one of the four population derived levels based on the number of times they swiped their ID into a recreational sports fitness center per *semesters of enrollment*. Semesters of enrollment over a four-year period were utilized to assess four-year GPA and five-year Bachelor's degree attainment. Semesters of enrollment per year were utilized to address our secondary purpose, which assesses the impact of year in school on the relationship between recreational sports and GPA.

Covariates

Based on previous literature^{4,6,8-12} and information available from the university Registrar, we identified six possible covariates that may impact the relationship between recreational sports use and 1) four-year cumulative GPA and 2) five-year Bachelor's degree attainment; these variables included: high school GPA (HsGPA), ACT score, gender, race, and first semester Pell grant eligibility. HsGPA and first year college GPA were based on a 4.0 scale. ACT score could range from 1-36. All other covariates were categorical: gender (male/female), race (white/other, which included American Indian/Alaskan Native, Asian, Black [non-Hispanic], Hawaiian/Pacific Islander, Hispanic ethnicity, and Multiracial), and Pell grant eligibility (eligible/not eligible).

Statistical Analysis

Recreational sports use cut points established from population data were defined similarly for all purposes, categories included: never used (purchased a membership, but never used the facilities), low use (0-5 times/membership), medium use (>5-26 times/membership), and high use (>26 times/membership). The study sample was categorized into one of the four groups based on number of uses/total semesters of enrollment over four years for our first and second purposes, and number of uses/semester of enrollment per year for our third purpose.

To address our first purpose, the relationship between recreational sports use and GPA, we utilized four-year recreational sports use level as the independent variable and four-year cumulative GPA as the outcome variable. Possible covariates included: HsGPA, ACT score, gender, race, and Pell grant eligibility. Descriptive information is reported with means \pm standard deviations and percentages.

We utilized an analysis of variance (ANOVA) and Pearson correlations to assess the unadjusted relationship between four-year cumulative GPA and 1) recreational sports use level and 2) all covariates. Variables related to four year cumulative GPA ($p < 0.10$) were considered for adjusted analyses. To adjust for possible covariates, we utilized an analysis of covariance (ANCOVA). LSD post hoc tests were completed to identify specific differences in four-year cumulative GPA between recreational sports use groups.

Four-year recreational sports use (ref: medium use) and five-year bachelor's degree attainment were used as our independent and dependent variables to address our second purpose. The 'medium use' category of recreational sports use levels was chosen as a reference category based on our inverted U shape hypothesis, which suggested that students using the recreational sports fitness center the least and most often would be less likely to graduate in five-years than

those who used the facilities a moderate amount. Possible covariates included: HsGPA, first year college GPA, ACT score, gender (ref: male), race (ref: other), and Pell grant eligibility (ref: eligible). Descriptive information is reported with means \pm standard deviations and percentages. Chi-square and one-way ANOVA were utilized to assess the independent relationship between each variable (independent and covariates) and five-year degree attainment. We developed binary logistic regression models to describe the relationship between recreational sports use and five-year Bachelor's degree attainment. Variables that were related to five-year Bachelor's degree attainment ($p < 0.10$) were entered into the models. Recreational sports use was entered into the models first, followed by each covariate based on the strength of relationship to four-year degree attainment. Variables were removed from the model if they did not significantly ($p < 0.05$) impact the prediction of five-year degree attainment or did not change the odds ratio associated with recreational sports use by more than ten percent. We calculated unadjusted odds ratios (OR) and adjusted odds ratios (aOR) with associated 95% confidence intervals for achieving five-year degree attainment vs. not, according to recreational sports level.

Our third purpose was to investigate the impact of year in school on the relationship between recreational sports use and yearly GPA. We utilized a repeated measures analysis and included yearly recreational sports use level (never used, low, medium, high) and year in school (1-4) as independent variables. The dependent variable was yearly GPA. Year in school was considered the repeated time point. LSD post hoc tests were assessed to identify differences in GPA among year in school and recreational sports center use levels.

RESULTS

The sample (n=1548) utilized to assess differences in four-year cumulative GPA among recreational sports use levels was 52% female, 23% Pell grant eligible, and 86% White.

Mean±standard deviation high school GPA, ACT, first year cumulative GPA, and four year cumulative GPA were, 3.58 ± 0.29 , 24.61 ± 2.72 , 3.14 ± 0.52 , and 3.22 ± 0.42 respectively. Females earned higher four-year GPAs than Males (3.29 ± 0.39 vs. 3.15 ± 0.45), students not eligible for Pell grants earned higher four-year GPAs than eligible students (3.23 ± 0.40 vs. 3.14 ± 0.47), and Whites earned higher four-year GPAs than other races (3.26 ± 0.40 vs. 3.00 ± 0.46). Descriptive information by level of recreational sports use is listed in Table 5.1.

Univariate analyses revealed that four year GPA was significantly related to 1) recreational sports use level, 2) gender, 3) Pell grant eligibility, and 4) race; ACT score and HsGPA were also significantly related to four-year GPA, $r=0.21$, $p<0.001$ and $r=0.41$, $p<0.001$, respectively. As seen in Table 5.2, four-year cumulative GPA differed by recreational sports use level after adjusting for gender, Pell grant eligibility, race, ACT, and HsGPA ($p<0.05$). Students who were high (3.27 ± 0.45) and medium (3.26 ± 0.41) recreational sports users earned significantly higher four-year cumulative GPAs than the low users (3.20 ± 0.42) and those who never used the facilities (3.08 ± 0.47). There was no significant difference in four-year cumulative GPA between low users and never used or high and medium recreational sports users (Table 5.3).

The sample (n=1788) utilized to assess the relationship between recreational sports use level and five-year Bachelor's degree attainment was 52% female, 23% Pell grant eligible, and 86% White. Mean±standard deviation high school GPA, ACT, and first year cumulative GPA were 3.57 ± 0.30 , 24.6 ± 2.76 , and 3.08 ± 0.60 respectively (Table 5.3). As seen in Table 5.4,

univariate analysis showed significant differences in five-year graduation between genders, Pell grant eligibility, and races. High school GPA and first year cumulative GPA were positively related to five year graduation. ACT score was not related to five-year graduation. Most importantly for our study purpose, no differences were found among four-year recreational sports use level and five-year graduation. Therefore, due to the null finding between four-year recreational sports use levels and five-year graduation, logistic regression analysis was not performed.

The sample utilized to assess an interaction between year in school and recreational sports use level on yearly GPA was 49% female, 77% white, and 22% Pell grant eligible. Mean±standard error GPA by year in school and by recreational sports use level is listed in tables 5.6 and 5.7 respectively. Results of the repeated measures analysis indicated a significant relationship between year in school and yearly GPA ($F_{3, 2047}=7.143$, $p<0.001$), and between yearly level of recreational sports use and yearly GPA ($F_{3,5530}=4.60$, $p=0.003$). Specifically, the highest GPAs were earned in the first and fourth years, and the lowest in the second and third years of college (Table 5.4). High users of recreational sports facilities earned the highest GPAs and students who purchased a membership but never used it earned the lowest (Table 5.5). The interaction of year in school * yearly level of recreational sports use on yearly GPA was not statistically significant ($F_{9,2601}=1.73$, $p=0.08$). As seen in Figure 5.1, the interaction trended towards significance; the largest difference in GPA among recreational sports use levels was in the first year of college and the smallest in the fourth year of college.

Table 5.1. Means, standard deviations (SD), and percentages of dependent and covariate variables separated by recreational sports use level.

Variable	Total	Never Used	Low	Medium	High
n	1548	64	820	538	126
<i>frequency</i> <i>(percentage)</i>					
Gender*					
Male	735 (47.6)	25 (40.0)	330 (40.4)	278 (51.7)	102 (81.1)
Female	813 (52.4)	39 (60.0)	490 (59.6)	260 (48.3)	24 (18.9)
Pell					
Eligible	349 (22.5)	15 (23.1)	198 (24.1)	111 (20.7)	25 (19.7)
Not Eligible	1199 (77.5)	49 (76.9)	622 (75.9)	427 (79.3)	101 (80.3)
Race					
White	1333 (85.7)	53 (83.1)	692 (84.2)	471 (86.9)	116 (91.3)
Other ^a	215 (14.3)	11 (16.9)	128 (15.8)	67 (13.1)	10 (8.7)
<i>Mean+SD</i>					
High School GPA	3.58±0.29	3.53±0.30	3.57±0.30	3.60±0.26	3.58±0.31
ACT	24.61±2.72	24.50±3.03	24.57±2.81	24.67±2.59	24.61±2.52
First year cGPA*	3.14±0.52	2.87±0.59	3.10±0.53	3.22±0.49	3.25±0.53
Four year GPA^{b*}	3.22±0.42	3.08±0.47	3.20±0.42	3.26±0.41	3.27±0.45

Abbreviations: GPA = grade point average, cGPA= cumulative GPA; a = Black (non-Hispanic), Hispanic, Asian, Hawaiian/Pacific Islander, American Indian/Alaskan Native, Multiracial; b = dependent variable.

Note. *Global statistical difference among recreational sports use level groups at $p<0.05$.

Table 5.2. Analysis of covariance for four-year cumulative grade point average.

Effects	Sum of squares	df	Mean square	F Value	P value
RS Use Level^a	3.04	3	1.01	7.36	<0.001*
Gender^b	7.22	1	7.22	52.42	<0.001*
Pell^c	0.54	1	0.54	3.94	0.047*
Race^d	3.34	1	3.34	24.24	<0.001*
ACT	2.28	1	2.28	16.56	<0.001*
High School GPA	27.65	1	27.65	200.73	<0.001*

Abbreviations: RS = Recreational sports; GPA = grade point average

^aNever used, Low, Medium, High

^bMale, female

^cEligible, not eligible

^dWhite, Other (Black [non Hispanic], Hispanic, Asian, Hawaiian/Pacific Islander, American Indian/Alaskan Native, Multiracial)

*Significant difference at $p < 0.05$.

Table 5.3. LSD post hoc comparisons of four-year grade point average among recreational sports use levels.

Four year Recreational Sports Use Level ¹	Four Year Recreational Sports Use Level ²	Mean Difference 1-2	Standard Error	p-value
Never Used	Low Use	-0.09	0.07	0.057
	Medium Use	-0.15	0.08	0.002*
	High Use	-0.21	0.09	<0.001*
Low Use	Medium Use	-0.06	0.03	0.003*
	High Use	-0.12	0.06	0.001*
Medium Use	High Use	-0.06	0.07	0.12

Note. *Statistical difference between recreational sports use levels at $p < 0.05$.

Table 5.4. Means, standard deviations (SD), frequencies, and percentages of independent and covariate variables separated by five-year graduation.

Variable	Total	Graduated	Did not Graduate
n	1788	1352	436
<i>frequency (percentage)</i>			
Level of RS Use^a			
Never Used	81 (4.5)	58 (4.3)	23 (5.3)
Low	926 (52.8)	704 (52.1)	222 (50.9)
Medium	622 (34.8)	479 (35.4)	143 (34.8)
High	159 (8.9)	111 (8.2)	48 (11.0)
Gender*†			
Male	866 (48.4)	595 (44.0)	271 (62.2)
Female	922 (51.6)	757 (56.6)	165 (37.8)
Pell Grant Eligibility*†			
Eligible	414 (23.2)	273 (20.2)	141 (32.3)
Not Eligible	1374 (76.8)	1079 (79.8)	295 (67.7)
Race*†			
White	1529 (85.5)	1197 (88.5)	332 (76.1)
Other ^b	259 (14.5)	155 (11.5)	1704 (23.9)
<i>mean±SD</i>			
High School GPA*†	3.57±0.30	3.60±0.29	3.47±0.31
ACT composite score	24.60±2.76	24.64±2.59	24.46±3.24
First Year cGPA*†	3.08±0.60	3.21±0.48	2.69±0.74

Abbreviations: RS = Recreational sports; GPA = grade point average; cGPA = cumulative grade point average; a = independent variable; b = Black (non-Hispanic), Hispanic, Asian, Hawaiian/Pacific Islander, American Indian/Alaskan Native, Multiracial.

Note.

*Global statistical difference between retention groups at $p < 0.05$

†Meets criteria to enter logistic regression model, $p < 0.1$

Table 5.5. Means ± standard errors (SE) of cumulative grade point average by year in school.

Year in school	Mean±SE
Year 1	3.02±0.02
Year 2*	2.98±0.02
Year 3*	2.94±0.02
Year 4†	3.02±0.02

Note.

*Significantly different than year one ($p < 0.05$)

†Significantly different than year three ($p < 0.05$)

Table 5.6 Means \pm standard errors (SE) of cumulative grade point average by recreational sports use level.

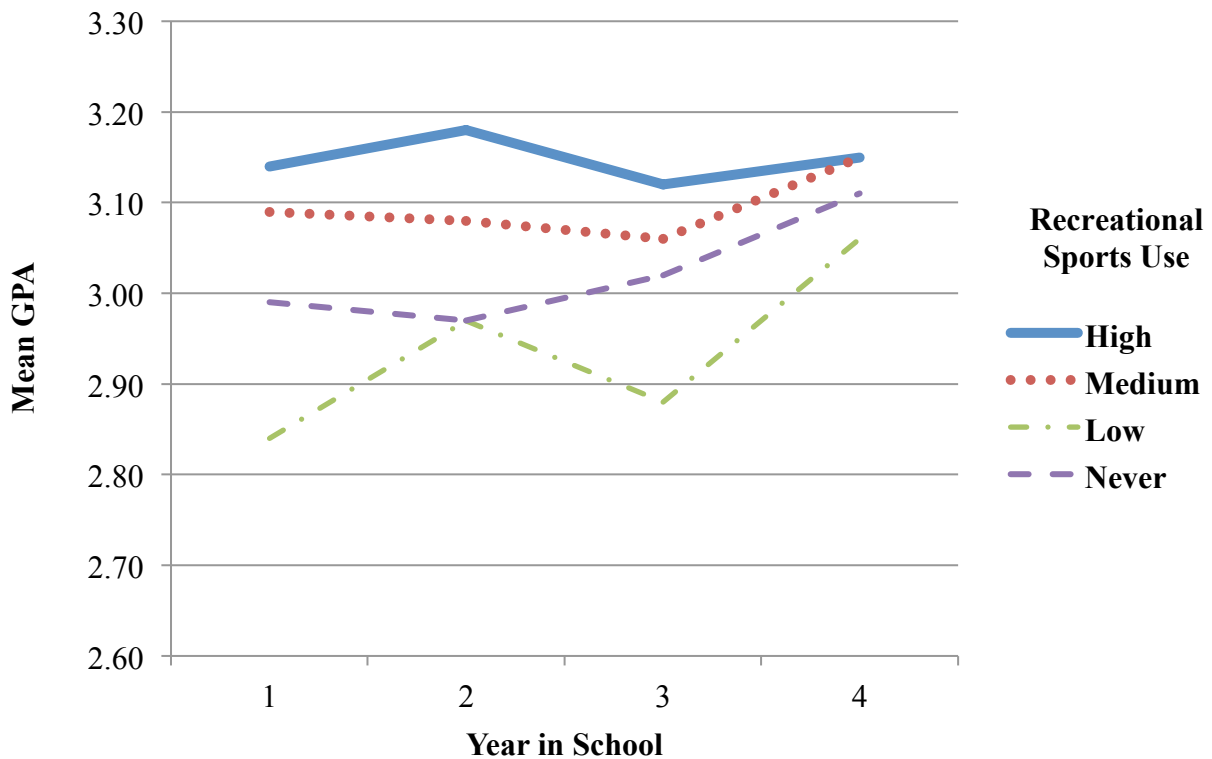
Recreational Sports Use Level	Mean \pm SE
Never Used [†]	2.97 \pm 0.02
Low use ^{*†}	2.84 \pm 0.02
Medium use	3.00 \pm 0.02
High use	3.04 \pm 0.03

Note.

*Significantly different than medium Use ($p < 0.05$)

[†]Significantly different than high use ($p < 0.05$)

Figure 5.1. Graphical depiction of the interaction between year in school and recreational sports use level on yearly grade point average.



DISCUSSION

In regards to our first purpose, previous research indicates a positive relationship between a dichotomized measure (user/non-user) of recreational sports use and first/second year college student GPA. The results of the present study extend previous literature by investigating four-year GPA and indicate that study participants who participated in recreational sports *regularly* (>5 times per semester) over four years, earned higher four-year cumulative GPAs than study participants who purchased a recreational sports membership, but did not use the facilities. Taken together, previous literature and the present study indicate strong evidence for a positive relationship between recreational sports use and cumulative GPA.

Although positive, the results of the present investigation do not support our hypothesis. We hypothesized that students participating a low and high amount in recreational sports would earn lower GPAs than students participating a moderate amount. This hypothesis was based upon previous literature that indicates low/high levels of student involvement may be detrimental to student success. Our recreational sports use level development was based on population data and indicated that high users entered the fitness facilities 26 or more times per semester. There are 16 weeks in a semester. Therefore, if a student was a high level and consistent user then they entered the fitness facilities less than two times per week. We anticipated the high level of recreational sports use category to include a larger number of fitness facility entries, which was an incorrect assumption. This level of involvement (26+ fitness center entries per semester) is not likely to induce detrimental effects on student success.

Researchers have not investigated possible mechanisms for the positive relationship between recreational sports fitness center use and college student GPA. It is possible that students who participate in recreational sports develop a sense of belonging to the university,

which in turn increases their commitment to the university and student success. Additionally, previous research indicates a positive relationship between participation in PA and college student grade average.²⁵ Students who participate in recreational sports may engage in more PA than students not participating, and thus may experience increased cognitive functioning. Future research should investigate the relationship between PA and recreational sports as a possible mechanism for the relationship between recreational sports use and cumulative GPA.

Based upon student success literature and one previous investigation related to recreational sports²⁴, we hypothesized that low and high users of recreational sports would be less likely to graduate in five years than moderate users. Results of the present investigation do not support our hypothesis. Previously, Huesman et al.²⁴, completed the only study that investigated the relationship between recreational sports use and five-year graduation. Their results indicated that students who participated in recreational sports 25 times in their first semester at the University were more likely to graduate in five years than students who participated 10 times. No relationship was found between four-year recreational sports use and five-year graduation in the present study. However, our methodology differed from that of Huesman et al.²⁴ We assessed recreational sports use across four years. Never used, in the present study, was a single group defined as purchasing a membership, but never using the facilities. We also controlled for different confounding variables than Huesman et al.²⁴ Additionally, student success theorists argue that institutional involvement in the first year of college, as opposed to subsequent years, is critical for retention and Bachelor's degree attainment.¹³⁻¹⁵ Therefore, it is possible that regular recreational sports participation across four years is not essential to complete a Bachelor's degree within five years. Future research should investigate the role of first year recreational sports use in five-year Bachelor's degree attainment.

Previous literature suggests that student experiences in the first year of college are the best predictors of college success.¹³⁻¹⁵ Therefore, we hypothesized an interaction between year in school and yearly recreational sports use on yearly GPA, with first year students experiencing the greatest effect of recreational sports use on GPA. Results do not support our hypothesis. Participation in recreational sports positively related to GPA similarly across all years of college. However, results trended towards a significant relationship ($p=0.08$). Based on our hypothesis, we would expect a larger range of mean GPAs across recreational sports use levels in the first year of college compared to subsequent years.

Figure 5.1 illustrates that recreational sports use may impact GPA in the first, second, and third years of college similarly, but have little impact on the fourth year of college. The similar effects on GPA in years one, two, and three, may explain the lack of statistical finding. This trend does not support our hypothesis and instead indicates that recreational sports use has a positive impact on GPA across the first three years of college. It is possible that recreational sports participation correlates directly to participation in PA. If so, students participating in recreational sports may experience the benefits of PA, such as increased cognitive ability and decreased stress, which in turn may positively influence student academic success. Additionally, recreational sports participation may relate to a sense of belonging similarly across year one, two, three, and four. Therefore, the continued positive relationship between recreational sports and GPA over four years may be due to an increased sense of belonging for recreational sports users as compared to non-users. Further, the identified relationship may be due to the combined, positive cognitive-, social-, and emotional- benefits associated with physical activity and feeling a sense of belonging at the university. This is the first study, to our knowledge, that investigated an interaction between year in school and recreational sports use on GPA. Future research should

investigate this interaction in a variety of college populations, and aim to identify possible mechanisms for the relationship.

Limitations and Strengths

Although the results of this study are encouraging and extend previous literature, there are some limitations that should be discussed. All study participants chose to purchase a membership to utilize the recreational sports fitness facilities at some point in their academic careers. Most institutions do not implement a membership model, but instead provide access to all students by assessing a fee that is included in the students' cost of attendance. Therefore, caution should be taken when generalizing these results to all universities. Although we accounted for a number of possible covariates when assessing the relationship between recreational sports use and four-year GPA, additional variables may impact academic success. Examples could include place of residence (on/off campus), college major, and hours per week working for pay. Additionally, recreational sports use was calculated to represent regular use across four years. Given our method of determining facility use, it was not possible to determine whether it was spread out evenly across the membership period, or whether it clustered in some meaningful fashion. It appears that we are the first investigators to analyze the relationship between recreational sports use level and GPA over time and the findings of this investigation may only be applicable to large, public universities. Therefore, future investigations should repeat this study at various types of institutions.

Despite limitations, the present investigation has many strengths. This study included a large sample size and was the first to investigate the relationship between four-year recreational sports use levels and 1) four-year GPA and 2) five year graduation. We also addressed multiple

covariates in analyses to assess these relationships, which substantiates our findings. Finally, we focused on a specific component of recreational sports (fitness centers), which focuses the interpretation and future comparison of our findings.

With respect to our third purpose, this is the first study to investigate whether an interaction exists between year in school and yearly recreational sports use on GPA. Studies relating recreational sports use to college student academic success primarily utilize analysis of covariance or logistic regression to control for potential covariates. Although beneficial, it is not possible to measure and control for all potential covariates. Our repeated measures analysis, utilized to address our secondary purpose, inherently controls for all covariates within our given sample, and therefore is a substantial strength to the present study.

Summary

In summary, our results show that four-year recreational sports use is positively related to four-year GPA. However, there are no apparent differences in five-year Bachelor's degree attainment among four-year recreational sports use levels. Finally, while yearly level of recreational sports use is positively related yearly GPA this relationship does not differ significantly by year in school. Based on our study results, we recommend that recreational sports departments share these findings with academic administrators to increase awareness of this modifiable factor (recreational sports participation) related to college student academic success. In addition, students should aim to participate in recreational sports at least five times per semester, as this may play a role in increased yearly GPAs, and increased four-year cumulative GPA. Future studies should be designed to investigate possible mechanisms for the relationship between recreational sports use and GPA, should assess the relationship between

first year recreational sports use and five-year bachelor's degree attainment, and should implement our methods in samples derived from various types of higher education institutions.

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CHAPTER 6

SUMMARY AND CONCLUSIONS

University recreational sports departments are designed to promote physical activity (PA) and provide ample opportunities for college students to develop healthy lifestyle behaviors. Recreational sports departments often include amenities and facilities such as, personal training, relaxation rooms, pools, gyms, courts, and fitness centers including weight lifting and cardio equipment. Previous research indicates that participation in recreational sports during college positively relates to PA participation post-college.¹ Therefore, PA promotion to college students, through recreational sports, may help to increase the proportion of adults meeting PA guidelines.²

Adequate funding is necessary for the promotion of PA through recreational sports. However, in times of tight university budgets, obtaining adequate funding is not an easy task and university administrators may consider PA participation beneficial yet ancillary to student academic success. Administrators at the institution assessed in this dissertation have charged university departments with proving their worth in student success. Therefore, to increase the likelihood of funding, the university recreational sports department must explain their impact on student success.

Previous literature indicates a positive relationship between recreational sports participation and 1) college student grade point average (GPA)³⁻⁵, 2) retention^{4,5}, and 3) five-year Bachelor's degree attainment⁶. However, previous literature is limited by simplistic statistics and self-report of the independent and dependent variables. Additionally, few studies address potential confounding variables, and most dichotomize samples into recreational sports users and non-users. Finally, most investigators assess recreational sports use in the first year of college.

The research presented in this dissertation extends previous literature by 1) identifying levels of recreational sports use within a single component of recreational sports (fitness centers), 2) measuring recreational sports use over time, 3) addressing potential confounding variables, and 4) implementing more complex analytics.

Results of the research presented in this dissertation indicate that students who purchase a recreational sports fitness center membership in their first semester of college are more likely to 1) achieve sophomore status after two consecutive semesters, 2) earn higher GPAs and complete more credits after four consecutive semesters, and 3) return for a second and third year of college, than students who do not purchase a membership. Further, among recreational sports fitness center members, GPA and likelihood of one-year retention vary by recreational sports use level. Members who utilize the fitness center more than five times per semester over four years earn higher four-year cumulative GPAs than members who use the facility zero to five times. Additionally, recreational sports use level was found to be positively related to yearly GPA. Students using the fitness centers more than five times per semester earn higher GPAs than those using the fitness centers one to five times. However, this relationship does not differ by year in school. With respect to retention, members who utilize the fitness centers more than five times per semester throughout their first year of college are more likely to return for a second year of school than members who never used the facilities. Two-year retention does not differ by recreational sports use level among members. The relationship between level of recreational sports use among members and 1) achieving sophomore status and 2) credits completed were not assessed. Finally, among members, four-year recreational sports use level is not related to Bachelor's degree attainment within five years.

The results of the studies presented in this dissertation generally agree with previous literature.³⁻⁵ However, two-year recreational sports use was not related to two-year retention, nor was four-year recreational sports use related to five-year Bachelor's degree attainment. These findings do not agree with previous investigations. Few students did not reach two-year retention (n=163, 10% of sample), and few students purchased a membership and never used the facilities (n=67, 4% of sample), which resulted in a low frequency of students who were not retained and categorized as never used (n=8, 0.5% of the sample). Additionally, only 25% of our sample failed to earn a Bachelor's degree in five years and few purchased a membership, but did not use the facilities (n=81, 5% of sample), which resulted in a low frequency of students who did not graduate and were categorized as never used (n=23, 1.3% of the sample). Therefore, the difference of findings may be due to a type two error due to low statistical power.

Application of theoretical beliefs may also provide insight into our findings. Theorists Alexander Astin⁷ and Vincent Tinto^{8,9} suggest that student integration into university culture, particularly in the first year, is extremely important for student retention and persistence. Previous literature, indicating a positive relationship between recreational sports use and 1) retention³⁻⁵ and 2) Bachelor's degree attainment⁶, assess recreational sports use in the first semester or first year of college. Based on the theories of Astin⁷ and Tinto^{8,9}, use of the recreational sports fitness centers in the second, third, and fourth years of college may not be as critical for two-year retention and five-year Bachelor's degree attainment.

Mechanisms for the relationships between recreational sports and college student academic success have not been explored. Previous research indicates a positive relationship between PA participation and GPA among college students.¹⁰ In this dissertation, level of recreational sports use was calculated as total use of fitness centers (during a specified time

frame) divided by semesters of enrollment. Therefore, high users in this study theoretically utilized the recreational sports fitness centers more regularly than never, low, and medium users. If we assume that recreational sports fitness center use directly relates to PA participation, then high users of recreational sports participate in more regular PA than never, low, and medium users. Based on this assumption, participation in recreational sports may positively relate to PA participation, which in turn may positively impact college student academic success. This relationship may be explained by previous research that indicates positive effects of PA on cognitive functioning such as increased reaction time, and improved short and long term memory.¹¹

A second potential mechanism is student integration into the university. Previous literature suggests that students who are socially and academically integrated into the university are more successful.⁷⁻⁹ University recreational sports fitness centers are rich in social possibility. Students may develop meaningful relationships with recreational sports employees and/or other recreational sports users. Level of recreational sports in this study may represent social integration. If so, then high users of recreational sports fitness centers may be more socially integrated than never, low, or medium users. Therefore, participation in recreational sports may positively relate to social integration, which in turn may positively influence college student success.

Students participating in recreational sports may also differ from students who do not participate. For example, students who have time to participate in recreational sports may be early risers, or have better time management skills (both factors are related to academic success^{12,13}). Further, we are not able to determine a causal relationship between recreational sports use and college student academic success due to the design of the studies presented in this

dissertation. It is possible that students who are more academically successful are also more self-motivated than students who are less academically successful and thus choose to participate in PA through recreational sports more readily than students who have less self-motivation.

Anecdotally, we hypothesize that recreational sports fitness center use levels directly relate to participation in PA, which in turn positively influences college student academic success. In our opinion, recreational sports fitness centers are more suited for PA participation than social opportunity. Students are socially isolated by the use of headphones when working out in the fitness centers. Students not socially isolated often work out with a single partner, who they likely met outside of the recreational sports fitness center. For these reasons, it is less likely that use of the recreational sports fitness centers directly relates to social integration, and instead relates to participation in PA. However, other aspects of recreational sports (e.g., intramurals, club sports) lend themselves to social integration more readily than fitness centers. Future research should explore the role of PA and social integration in the relationships found in this dissertation. Further, future research should investigate these relationships within additional components of recreational sports.

Although mechanisms for the relationships found in this study are not clear, the results are encouraging for those who have stake in college student success. Moreover, recreational sports participation is a modifiable factor, unlike most variables related to college student success (e.g. race, gender, socioeconomic status, and high school GPA). Recreational sports departments work to develop programming that positively enhances the college student experience. The studies discussed in this dissertation focus specifically on college student academic success. However, success can be defined in a number of ways and should not be limited to academics only. Several departments within student affairs share a similar mission,

“... (to prepare) graduates for participation and leadership in an increasingly diverse and complex global society”.¹⁴ Participation in PA has been shown to positively influence physical health¹⁵ as well as emotional wellbeing¹⁶, and cognitive functioning¹¹. Recreational sports departments promote regular participation in PA and therefore participation in recreational sports may increase PA participation and subsequently positively relate to other aspects of success (e.g., emotional wellbeing, physical health) beyond academics. Recreational sports departments should be encouraged to share the results of this dissertation and collaborate with other groups on campus (e.g., faculty, resources for persons with disabilities, women resource centers, leadership development groups, health centers, and graduate student programs) to improve students success and uncover other ways in which recreational sports participation might positively impact student success.

College student success does not depend on a single department, program, or event. Instead student success demands a collaborative effort among many members of the campus community, including the student. The American College of Sports Medicine (ACSM) recently began Exercise is Medicine on CampusTM (EIM-OC), an initiative aimed at increasing PA participation and awareness on college campuses. Universities that join the EIM-OC initiative recognize the power in collaboration among departments for the betterment of student health, wellness, and success. Recreational sports in particular has the capacity to impact students' lives in a variety of ways, including academic success, social development, emotional development, and physical health. Recreational sports is not simply a place for students to play sports, it is a department that provides students with opportunities to develop their whole selves and engage with the University. Those interested in enhancing college student experiences and outcomes

should consider becoming an active member of the EIM-OC initiative and should engage with recreational sports as it is a critical department in student health and success.

The results of this dissertation are encouraging for recreational sports departments and student affairs professionals. Further, there are ample opportunities to explore additional areas of college student success and their relationship to recreational sports participation. University administrators from the institution presented in this dissertation requested that all departments prove their worth in student success. Results of this study clearly illustrate how recreational sports participation relates to college student academic success and should be shared with campus administration so that adequate funding continues for their operation. In addition, results should be shared with recreational sports administrators and other campus wellness personnel to help promote memberships and regular participation.

LIMITATIONS, STRENGTHS, AND FUTURE DIRECTIONS

While the results of this study are very encouraging to recreational sports practitioners, there are some limitations that should be discussed. Most universities assess a fee to all students through tuition and fees, which provides open access for students to all recreational sports facilities. Although the majority of recreational sports facilities at the university in this dissertation were available to all students, a membership fee was assessed to those who wished to utilize the recreational sports fitness centers. Therefore, due to differences in payment models the results of this study may not be generalizable to all universities. Further, academic success variables are incredibly complex. Although we controlled for multiple covariates, we could not address all. For example, we did not measure factors such as hours per week working for pay, or

place of residence, which are factors that may influence college student academic success. Further, a large proportion of our samples chose to continue at the institution for a second (94%) and third (90%) year, which is higher than most colleges, and may have resulted in a type two error, particularly when assessing the relationship between recreational sports use level and two-year retention. Finally, we calculated level of recreational sports use as number of fitness center uses divided by semesters of enrollment. This method was utilized to create a variable that represented regular use. However, it is possible that a study participant utilized the fitness center many times in one semester, few in the next, and still was classified as a high user. These limitations should be considered when generalizing the findings of this study to other university populations.

Despite limitations, there are multiple strengths to this study. We utilized a large sample and assessed recreational sports use over multiple semesters. We also addressed multiple covariates in each assessment and utilized complex statistics to control for covariates when necessary. Further, this was the first investigation to assess recreational sports use over time in relation to GPA, retention, and Bachelor's degree attainment. Finally, we investigated a single component of recreational sports, fitness centers, which allowed for more precise interpretation of findings.

This study included a sample of students from a large public university. It is well known that student experiences differ by type of institution^{17,18}, therefore our results await confirmation before strong conclusions can be drawn. Further, in an effort to better understand the relationship between recreational sports use and Bachelor's degree attainment, researchers should investigate the relationship between recreational sports use during the first year of college and five year Bachelor's degree attainment. Additionally, this study focused on one aspect of recreational

sports, fitness centers, and did not investigate mechanisms of relationship. Future research should investigate these relationships, and their mechanisms, within intramural sports, club sports, and other components of recreational sports. Finally, researchers should collaborate with other departments on campus to identify additional areas of student success (e.g. emotional development, social development, and physical health) that relate to recreational sports participation.

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