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Exercise Behavior and Recreational Sports Participation Predicts Academic Success in University Students

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By

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Dedication

To Roland, Anett, Patrick, Ayda, and Jordy

This is for you.

I love you.

Acknowledgments

First and foremost, I would like to thank my parents, Roland and Anett Matian. The sacrifices you have made to get me to where I am now are unimaginable. I don't know how to express my love and gratitude to you both. Leaving your home country and immigrating to the United States at a young age in order to provide a better life for your family is truly selfless. Words cannot express how grateful I am to be your daughter. Completing my Masters is not just a representation of my own sacrifice, it's a representation of yours too because if you did not take that leap of faith of coming to the States, I would not be able to achieve anything that I have now. Thank you for risking your life, for starting over in a new place, and for being so resilient throughout the process. Thank you for your endless support. I love you both immensely.

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Exercise Behavior and Recreational Sports Participation Predicts Academic Success in University Students

Abstract

By Natalie Matian

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Most universities offer fitness and recreational opportunities. Few prospective studies have measured the effect of those services on academic outcomes. The purpose of this study is to evaluate the effect of exercise behavior and recreational sport participation on student success. We tracked 1,507 students at a private D1 university for 4 years. Upon completion of the 2017-2018 academic year, we exported a registry of every undergraduate student who accessed the university fitness center. We documented how often students swiped into the recreation facility and participated in group exercise classes, personal training sessions, and rock tower usage; these served as independent variables. We also recorded semester and cumulative GPA for the Spring 2018 semester; these served as dependent variables. Independent-sample t-tests and chi-squared tests measured group differences in academic outcomes. Linear regressions tested the effects of combinations of independent variables on GPA respectively. The results showed a 18.6% usage of Baun Fitness Center; 8.9% participated in group exercise classes, 0.15% participated in personal training sessions, and 4.8% participated in using the rock tower. Mean GPA was 3.1 ± 0.6. Significant and trending elevations of GPA were observed in students who participated in group exercise classes ($p<.001$; 95% CI: 0.1 to 0.4) and swiped into Baun Fitness Center ($p<.001$). Analysis indicated no significant correlation between the number of rock tower swipes

and personal training sessions with undergraduate GPA. In conclusion, increased involvement in exercise and recreational sports is associated with a higher GPA. Administrative emphasis on fitness programming may be an effective way to enhance student success.

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List of Abbreviations

GPA	Grade point average

CHAPTER 1: INTRODUCTION

Through its extensive facilities and extracurricular activities, the University of the Pacific excels at developing holistic programs that support the well-being of students in the Pacific community. Baun Fitness Center, the headquarters of on-campus recreation, waivers through hundreds of students on a daily basis. The center is fully equipped with cardio machines, free weights, selectorized equipment, a cycle studio, a racquetball court, multipurpose studios for group exercise classes, a 36-foot rock-climbing wall, and personal training services. It is also responsible for administering the participation of twelve active sports clubs, a variety of intramural sports, and outdoor adventure trips to multiple hotspots throughout Northern California. "The University of the Pacific is committed to the success and retention of all students through guidance, support, and cultivation of their personal well-being and development through the extracurricular programs and services offered" (Pacific Recreation, 2021). The University's ability to provide valuable opportunities for facilitating knowledge, skills, and beliefs of healthy behaviors through campus recreation centers enriches the campus environment by allowing students to engage in activities that improve their physical, cognitive, and social well-being.

The American College of Sports Medicine recommends healthy adults aged 18-65 years old participate in moderate aerobic physical activity for 30 minutes at least five times a week (Peterson & Tharrett, 2012). However, a considerable proportion of college students are inadequately physically active, with approximately 30% to 50% not obtaining enough physical activity to reap health benefits (Keating et al., 2010). The benefits of exercise are multifaceted and it can widely be believed that exercise is considered medicine for the human body

(Berryman, 2010). For many, the notion that exercise works to improve functional work capacity and metabolic health is self-evident (Gabriel & Zierath, 2017). Any form of exercise training is a scientifically validated intervention that can help deter health problems associated with metabolic disorders (Booth et al., 2012). Exercise promotes healthy physiological remodeling in cardiac structure and function which improves endothelial dysfunction, muscular blood supply and strength, ventricular contractility, ventilatory efficacy, and flexibility (La Gerche & Claessen, 2015). In other words, exercise puts good stress on your bones and muscles, which is essential for strength and durability, as well as muscle hypertrophy. Adopting healthy habits can help promote an overall healthy lifestyle in adulthood, however, the transition to college is frequently followed by an increase in unhealthy behaviors that may affect a student's academic performance (Ruthig et al., 2011). Evidence supports that adherence to exercise guidelines and training can positively influence academic performance (Keating et al., 2013; Reuter & Forster, 2021; Wald et al., 2014). Participation in recreational facilities on college campuses has also been linked to academic success. Roddy et al. (2017) illustrated that regular usage of the recreational center led to higher GPAs than those students who visited on an irregular basis.

The purpose of this study is to compile former undergraduate student data from Baun Fitness Center, Student Admissions, and Student Life to evaluate a relationship between facility usage and student success at the University of the Pacific, Stockton campus. This research will help determine if the use of Campus Recreation services, such as frequency of Baun Fitness Center attendance, use of rock climbing wall, and engagement in group exercise classes and personal training, has an effect on academic success, which will be characterized by GPA. Innosoft Fusion Software collects facility usage information from Baun Fitness Center at the

University of the Pacific. The information collected enables Campus Recreation employees to analyze and review student or member recreational data. The Innosoft Fusion data is utilized solely to analyze facility utilization among active students at the University of the Pacific. The study database is completely anonymous, with each participant being assigned a unique subject identification number. The hypothesis being tested is that more engagement in Student Life will correspond to a higher semester and cumulative GPA.

Students' academic success in higher education has become a primary focus of many American universities (Herzog, 2005; Levitz et al., 1999). It has been shown through research that supplementing exercise and well-being with your daily life positively benefits academic outcomes (Cid et al., 2017). Student success is measured by grade point average (GPA), and attrition is typically higher among students with lower GPAs (Braunstein et al., 2006). Although student performance is multifactorial, student engagement in exercise and Student Life are probable predictors of success. Numerous studies on exercise behavior and academic success have been performed, but much of the work is qualitative, and regression modeling remains relatively scarce (Calestine et al., 2017; Carnagio et al., 2016; Bellar et al., 2014). This study aims to elucidate the interrelationships between GPA, academic success, and various domains of student engagement on campus.

CHAPTER 2: LITERATURE REVIEW

Campus Recreation Background

For students, faculty, staff, alumni, and spouses, college campus recreation centers offer cutting-edge facilities and extensive recreational programs. It aids in the education and holistic development of individuals who are seeking to relax, relieve stress, and network with people around campus. Additionally, these centers provide employment opportunities for students who are interested in a career in campus recreation or just need an on-campus job. Recreation centers serve as a sense of community for students to engage in imaginative and distinctive activities (Dalgarn, 2001). Baun Fitness Center at the University of the Pacific is the main recreational center on campus that is utilized by all students on a daily basis. Students are asked to swipe into the facility using their identification card administered by the university. This allows the recreation center to collect usage data and present research findings to the Division of Student Life, in hopes of the university tailoring campus offerings to be more compatible with student needs. Some of the programs that Baun Fitness Center offers are personal training services, outdoor activity trips, rock climbing, racquetball, and group exercise classes.

Over the years, many researchers have examined the overall benefits of university recreational centers for college students. Miller (2018) examines the relationship between university recreational sports facilities, social belonging, and student retention. The study found that students who utilized the recreation sports facilities had a stronger sense of social belonging on campus and were more likely to return the following school year. Additionally, it was found that sports facilities played a significant role in facilitating social interactions and creating a sense of community among students. Another study explored the various benefits of recreational

sports program participation for undergraduate students. Haines (2001) found that participating in recreational sports at campus recreation centers can have a positive impact on students' physical and mental health, as well as their social development and academic performance. Specifically, the study found that students who participated in recreational sports had higher levels of self-esteem, greater academic achievement, and stronger connections with their peers.

A multi-institutional meta-analysis conducted by Forrester (2015) examined the benefits of college students participating in campus recreation programs. The study was based on a national survey of more than 10,000 students from over 50 colleges and universities in the United States, which was conducted as part of the 2013 National Association of Student Personnel Administrators (NASPA) Assessment and Knowledge Consortium. The findings showed that students who participated in recreational sports had higher levels of physical activity, better overall health, and greater academic success compared to their non-participating peers. Students who participated in recreational sports had higher GPAs than those who did not, with an average difference of 0.17 points. Recreational sports participation was also associated with a greater sense of community and social connectedness, as well as increased leadership skills and civic engagement. Students participating in recreational sports were more likely to stay enrolled at their institution, with retention rates 5-7% higher than non-participants. Overall, recreation center usage highlights the importance of recreational sports programs in promoting the physical, mental, and social well-being of college students and lowering levels of stress, anxiety, and depression.

Campus Recreation and Academic Performance in College-Aged Students

Understanding previous research conducted on campus recreation participation and student academic success is important to keep analyzing so data stays up to date and is beneficial

to university administrators globally (Kampf & Teske, 2013). The correlations between campus recreation engagement and academic success have been investigated to determine if aspects of campus life can aid students' efforts to maximize their college experience. Stier et al. (2005) conducted survey-based research to investigate the activities emphasized, student participation patterns, trends, and future offerings contemplated by campus recreation directors at National Intramural-Recreational Sports Association (NIRSA) institutions. The study found that the most popular activities were fitness and wellness programs, intramural sports, and informal recreation, while outdoor recreation and sports clubs were growing in popularity. The directors reported that the participation rate in campus recreation programs was increasing, and they were planning to offer more diverse programs in the future. Findings suggest that campus recreation programs are evolving to meet the changing needs and interests of college students. Danbert et al. (2014) aimed to investigate the relationship between the usage of campus recreational sports and fitness facilities and the academic success and retention of university students. The researchers conducted a survey of 427 undergraduate students from a large public university in the United States. The survey asked questions about the students' frequency and duration of using the university's recreational sports facilities, as well as their academic performance and intention to return to the university for the next academic year. The study found a significant positive relationship between the frequency and duration of recreational sports facilities and academic success, as measured by GPA and course completion rate. The results also showed that students who used recreational sports facilities were more likely to report higher levels of satisfaction with the university and their overall university experience. Finally, the study found that students who used the recreational sports facilities were more likely to intend to return to the university for the next academic year, which has implications for student retention. This suggests that the

availability and usage of recreational sports fitness facilities on university campuses can have a positive impact on student's academic success and satisfaction with the university, which in turn may increase their intention to return and ultimately improve student retention.

Additionally, Huesman et al. (2007) aimed to determine if the use of campus recreation facilities has a relationship with academic success among college students. The researchers collected data through surveys and university records and analyzed it using structural equation modeling. The results showed that there is a positive correlation between the frequency of using campus recreation facilities and academic success. Furthermore, the study found that recreation facility usage contributes to student satisfaction with their university experience. Sanderson et al. (2017) discuss the relationship between college students' participation in recreation activities and their academic success. The study found that students who participated in the college recreation center's programs had higher GPAs and a higher likelihood of staying enrolled in school. The study also identifies specific factors of the recreation center that contributed to this positive relationship, including social support, time management skills, and stress reduction.

To further investigate these relationships, Kiss (2017) discusses the link between participation in specific campus recreation programs and academic success in undergraduate students. The study found that participants in campus recreation programs completed more class credits and obtained a higher GPA than nonparticipants. It also found significantly higher retention rates. It is evident through proper administration and marketing of campus program offerings, undergraduate students can attain better academic performance. Moreover, Roddy et al. (2017) examined the relationship between university students' recreation center usage and academic performance. The research suggests that students who use the recreation center regularly tend to have higher GPAs than those who don't use it or use it less frequently. The

study also suggests that students who participate in group fitness classes may have higher GPAs than those who don't participate in any fitness activities. The authors suggest that universities should consider promoting and encouraging recreation center usage as a way to support student success.

The study by Zhai et al. (2020) investigated the relationship between physical fitness and academic performance among Chinese college students. The authors aimed to explore the relationship between various dimensions of physical fitness and academic performance, as well as the potential mediating role of academic self-efficacy. The study included 1,438 college students from three universities in China. Physical fitness was assessed using five measures, including cardiorespiratory endurance, muscular strength, muscular endurance, flexibility, and body composition. Academic performance was measured using students' GPAs. The authors also assessed students' academic self-efficacy, which refers to their belief in their ability to successfully perform academic tasks. The results of the study showed that physical fitness was positively associated with academic performance among Chinese college students. Specifically, students who scored higher on measures of cardiorespiratory endurance, muscular strength, and flexibility had higher GPAs. Interestingly, body composition was not found to be a significant predictor of academic performance. The authors also found that academic self-efficacy partially mediated the relationship between physical fitness and academic performance. This suggests that students with higher levels of physical fitness may have higher levels of academic self-efficacy, which in turn contributes to better academic performance. The findings of this study have important implications for promoting physical fitness and academic performance among college students. The authors suggest that efforts to improve students' physical fitness levels could potentially improve their academic performance as well. Additionally, the role of

academic self-efficacy in this relationship highlights the importance of promoting students' confidence in their academic abilities. It is important to note that the study has several limitations, including the use of self-reported measures of physical activity and potential confounding variables that were not accounted for in the analysis. Nonetheless, the study provides valuable insights into the relationship between physical fitness and academic performance among college students and underscores the importance of promoting physical activity and fitness as part of a comprehensive approach to promoting student success.

Although numerous studies have revealed the advantages of exercising and participating in campus recreation, not all research establishes a link between campus recreation engagement and academic performance (Hall, 2006). While researchers have found positive correlations, certain findings contradict this relationship. Whitford (2021) investigated the relationship between physical activity and GPA among college students. It was conducted using a correlational research design and involved a sample of 200 undergraduate students from a large public university in the southeastern United States who were enrolled in the Spring 2019 semester. Physical activity levels were measured using the International Physical Activity Questionnaire, which assesses the frequency and intensity of physical activity over the past seven days. The survey consisted of four blocks of questions: Block 1 included questions on socio-demographics and self-reported GPA; Block 2 included questions on health-related behaviors, such as physical activity; Block 3 included self-report questionnaires on depression and personality; and Block 4 consisted of a series of computer-based cognitive tasks. GPAs were obtained from official university records. When controlling for age, sex, race/ethnicity, and number of years in college, Whitford suggests that there is no correlation between physical activity and GPA ($p<.05$). Although the results did not support the known findings from other

peer reviews, Whitford's study still provides valuable insights into the relationship between physical activity and academic performance among college students and underscores the importance of promoting physical activity as part of a comprehensive approach to supporting student success. Future research is necessary to further explore the relationship between the usage of campus recreation centers, recreational sport participation, and academic performance.

CHAPTER 3: METHODS

The discussed methods aim to discover the interrelationships between student fitness participation, campus recreation engagement, and academic performance.

Data Collection:

Once permission was obtained from the Institutional Review Board (IRB), facility usage data was compiled from Baun Fitness Center from 1507 undergraduate students at the University of the Pacific during the Spring 2018 semester. The IRB approval letter can be found in Appendix A. Each time a member accesses the facility, an identification card is swiped and recorded. The electronic database software, Innosoft Fusion, places a timestamp on this swipe and records it. The Recreation Staff at Baun Fitness Center can access the number of times a member swipes into the facility. The data was exported and compiled, deleting all personal identifiers, such as name and student identification number. It was then replaced with a new subject identification number. The only data preserved in the database are year and semester, semester and cumulative GPA, number of swipes in Baun Fitness Center and Rock Tower, and usage of exercise classes and personal training.

The continuous independent variables measured in this study are facility usage information from Baun Fitness Center, the number of times a student engaged in group exercise classes and personal training, and the number of swipes at the rock tower. The dependent variables examined are class information and semester and cumulative GPA.

Inclusion and Exclusion Criteria:

Inclusion criteria are defined as undergraduate students enrolled at the University of the Pacific during the Spring 2018 semester. Special considerations will be made for full-time and

part-time status, although both groups were eligible. Students who are of graduate standing and students who are auditing classes are excluded from the study.

Statistical Analysis:

Each sample was characterized with means, standard deviations, categorical percentages, and p-values. Using comparison data, the independent and dependent variables between males and females were assessed using independent sample t-tests and chi-square tests. A Pearson correlation coefficient was computed to assess the linear relationship between the number of swipes at Baun and semester GPA. Simple linear regression analyses were performed to test if the number of Baun swipes, group exercise classes, rock tower usage, and personal training swipes significantly predicted semester GPA points. Statistical analyses were conducted using IBM SPSS 28.0.

CHAPTER 4: RESULTS

Descriptive and independent sample t-test demographic data analysis is shown in Table 1. Among the 1507 participants in this study, 47.1% are males and 52.9% are females. Independent sample t-test showed statistical significance of semester and cumulative GPA among males and females (*p = <0.001*). The effect is more pronounced in females than males, with an average semester GPA for males of 3.0 ± 0.9 and an average semester GPA of 3.1 ± 0.7 for females. The average cumulative GPA for males was 3.0 ± 0.6, while the females had an average cumulative GPA of 3.2 ± 0.6. The average number of swipes at Baun Fitness Center (p = <0.001) showed a higher swipe average in males (21.4 ± 20.3) than in females (16.0 ± 16.0).

Table 1

Descriptive and Independent Sample T-test Statistics for 1507 students that swipe into Baun

	Total	**Male**	**Female**	**P-Value**
N	1507	709	795	
Gender	0.5± 0.5	0.6± 0.5	0.5± 0.5	p = 0.52
Class Information	3.0 ± 1.0	3.0 ± 1.0	3.1 ± 1.0	p = 0.55
Semester GPA	3.0 ± 0.8	3.0±0.9	3.1 ± 0.7	p = <0.001
Cumulative GPA	3.0 ± 0.6	3.0± 0.6	3.2± 0.6	p = <0.001
Baun Access Count	18.5 ± 18.3	21.4 ± 20.3	16.0 ± 16.0	p = <0.001
Number of Tiger Training Swipes	0.0 ± 0.5	0.0 ± 0.4	0.1± 0.5	p = 0.307
Number of Rock Tower Swipes	0.1 ± 0.9	0.1±0.6	0.1±1.2	p = 0.558

A Chi-square test of independence in Table 2 was performed to examine the relationship between gender and participation in activity classes and exercise on the weekends. There was a significant difference in activity class participation between males and females, $X^2(1, N = 1507 = 63.9, p = <.001)$, as females were more likely to attend an activity class than males. There was no significant association between males and females exercising on the weekends, $X^2(1,N = 1507 = 2.2, p = 3.330)$.

Table 2

Chi-Square Group Statistics by Gender

	Total	**Male**	**Female**	**P-Value**
% Tiger X Participation	0.1±0.3	2.7%	14.4%	p = <0.001
% Exercise on Weekends	0.6 ± 0.5	60.2%	56.5%	p = 0.330

Table 3 presents a weak positive Pearson correlation coefficient between the number of Baun access swipes and semester GPA, r = .113, n = 1507, showing a statistically significant model ($p = <.001$).

Table 3:

Pearson Correlations among Measurable Dependent and Independent Variables

Variables		Semester GPA	Cumulative GPA	Baun Access Count	Rock Tower Swipes	Tiger Training Swipes	Tiger X Participation
Semester GPA	Pearson Correlation	1	.805**	.113**	.020	.035	.102**
	Sig. (2-tailed)		.000	<.001	.429	.177	<.001
Cumulative GPA	Pearson Correlation	.805**	1	.111**	.025	.042	.127**
	Sig. (2-tailed)	.000		<.001	.333	.103	<.001
Baun Access Count	Pearson Correlation	.113**	.111**	1	.079**	-.014	.035
	Sig. (2-tailed)	<.001	<.001		.002	.592	.179
Rock Tower Swipes	Pearson Correlation	.020	.025	.079**	1	-.004	.016
	Sig. (2-tailed)	.429	.333	.002		.871	.544
Tiger Training Swipes	Pearson Correlation	.035	.042	-.014	-.004	1	-.016
	Sig. (2-tailed)	.177	.103	.592	.871		.542
Tiger X Participation	Pearson Correlation	.102**	.127**	.035	.016	-.016	1

(Table 3 Continued)

Sig. (2-tailed)	<.001	<.001	.179	.544	.542

**Correlation is significant at the 0.01 level (2-tailed)

Simple linear regression in Table 4 was used to compare if Baun access swipes, tiger X class participation, rock tower swipes, and tiger training swipes significantly predicted semester GPA. The model showed that every swipe recorded at Baun Fitness Center increases Spring 2018 semester GPA points by .005 ($p = <.001$; 95% CI: .003, .007). The overall model was significant ($p <.001$; $R^2 = .013$). Every member who participated in a Tiger X group activity class increased semester GPA points by .288 ($p = <.001$; 95% CI: .147, .430). The overall model was significant ($p = <.001$; $R^2 = .010$). Baun access count retains significance ($p = <.001$). Holding Baun access count constant, the number of tiger training swipes was not significant ($p = .157$) and rock tower usage was not significant ($p = .642$). Although both did not show a pattern of increase, the overall model was significant ($p = <.001$; $R^2 = .013$).

Table 4

Linear Regression Model with Semester GPA as the Dependent Variable

			95 % Confidence Interval	
	Unstandard. Beta	**P-Value**	**Lower Bound**	**Upper Bound**
Baun Access Count	.005	<.001	.003	.007
Tiger X Participation	.288	<.001	.147	.430
Rock Tower Swipes	.010	.642	-.033	.053
Tiger Training Swipes	.064	.157	-.025	.153

CHAPTER 5: DISCUSSION

The present study aimed to investigate the relationship between exercise behavior, recreational sports participation, and academic success among undergraduate students enrolled in the Spring 2018 semester. The results of the study suggest that exercise behavior and recreational sports participation are significant predictors of academic success in university students. Involvement in fitness activities and recreational sports was associated with better academic outcomes. Specifically, participation in group exercise classes was found to be a significant predictor of higher GPA, with students who participated in exercise classes showing significant and trending elevations in GPA. The findings of the study are consistent with previous research, which has demonstrated a positive relationship between physical activity and academic performance. This helps provide further evidence that exercise behavior and recreational sports participation are associated with higher academic success in university students.

This study has several implications for university administrators, faculty, and students. The results suggest that promoting exercise behavior and recreational sports participation among university students may lead to higher academic success. Universities could provide more opportunities for students to engage in physical activity, such as offering more fitness classes or recreational sports programs. This may suggest that fitness centers provide a positive environment that encourages healthy behaviors, including academic success. There are important factors to consider when developing strategies to support academic success among university students. Universities could provide targeted support to undergraduate students and students in certain academic majors, such as providing mentorship programs or academic

resources specific to their major. The study's strengths include its large sample size, which enhances the generalizability of the findings, and the use of longitudinal data that allowed for a more comprehensive evaluation of the relationship between exercise behavior and academic outcomes. Furthermore, the study found that sex was also a significant predictor of GPA, with female students who participated in group exercise classes having higher GPAs than male students. This finding is consistent with previous research indicating that female students tend to perform better academically than male students (Keating et al., 2013). It is possible that sex differences in academic success may be related to differences in motivation, study habits, or other factors. Interestingly, there was no significant correlation between the number of rock tower swipes and personal training sessions with undergraduate GPA. This may suggest that different types of physical activity have different effects on academic performance. It is also possible that these activities attract a different type of student who may have different academic goals or priorities.

It is important to note that the present study has several limitations. Firstly, it was conducted at a single private university and may not be generalizable to other institutions. This study only included undergraduate students in the Spring 2018 semester, however, future studies can include a larger varied sample of students that includes all-level college students from the other institutions. Secondly, the study only measured the association between physical activity and academic performance and cannot determine causality. It is possible that students who perform better academically are more likely to participate in physical activity. Future research could address this by conducting a randomized controlled trial. Other variables could have been investigated within this relationship, including graduation and retention rates between males and females.

This research adds to the growing body of evidence highlighting the relationship between physical activity and academic success. The findings suggest that universities and colleges should prioritize the provision of fitness and sports programs as part of their student support services. These programs can enhance students' academic success by promoting physical activity and potentially improving their overall health and well-being.

CHAPTER 6: CONCLUSION

The study was conducted to examine the relationship between exercise behaviors and academic success in college students. It showed the statistical significance of the number of times a member swiped into recreation facilities with their semester and cumulative GPA. The average GPA between males and females showed a low contrast in significance. A positive association between the number of swipes at Baun Fitness Center and GPA suggests there is a need to further examine this casual relationship. Information researched in this study regarding academic performance and exercise can be used to evaluate how students' involvement in recreation facilities affects student academic outcomes, which can benefit a university in many aspects. With all implications added, students can be better positioned for graduate school admission and post-graduate employment.

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