A Comparison of Frequency of Exercise & Perceived Academic Performance in Full-Time UW Undergraduate Students

Calcium: Iris Hyseni, Yuill Jin, Hodan Omar, Tashmee Sarwar, Terresa Tran, Joanna Wang

INTRODUCTION

Academic performance is important for undergraduate students because it greatly impacts their future success, such as in higher academia or professional settings. According to an article by Forbes, "73% of potential employers have screened job candidates by GPA" (Kane, 2020). Additionally, exercise is associated with increased physical and mental health benefits, which impact one's study habits, motivation, and overall outcomes in school. Assessment of the correlation between exercise and academic performance can provide the basis for better promotion of well-being in undergraduate students to improve their future outcomes.

Previous research studies consistently show a positive link between physical activity and academic achievement among adolescents and young students. A study by Hou et al. (2020) on Chinese medical and dental students at Tongji University, where the mean age was 21.9 years old, found that students with a regular exercise routine had higher academic performance scores. The study defines regular exercise as 30 minutes per day for at least three days per week. We defined exercise as greater than or equal to 150 minutes per week. Our reasoning for redefining exercise frequency was based on the CDC's (2022) recommended exercise frequency for people ages 18 to 64. Another study done by Keating et al. (2013) discovered similar findings. They found that university students who exercised at least three days a week had higher self-reported/perceived GPAs.

A potential limitation of both of these studies is that GPA does not fully encompass the many factors in a student's academic performance, which our study addresses using the perception of academic stress (PAS) scale. This leads to our research question: is there an association between frequency of exercise and self-perceived academic performance (PAS) in full-time University of Washington - Seattle (UW) undergraduate students in the past week during Spring Quarter 2023?

Specific Aims

Descriptive aim: To identify the percentage of full-time UW undergrad students who have high exercise frequency (> 150 minutes per week of intentional exercise with moderate exertion. **Hypothesis:** 45% of full-time UW undergrad students have high exercise frequency.

Analytic aim: To assess the association between the amount of exercise per day and perceived academic success. **Hypothesis**: Full-time UW undergrad students with high exercise frequency (>/= 150 minutes of moderate exercise per week) will have a 30% higher prevalence of self-perceived academic success (average score of 3 or higher) than full-time UW undergrad students who have low exercise frequency (< 150 minutes per week).

METHODS

Study Design

We conducted a cross-sectional design for our study.

Study Population

Our target population is college students, and our source population was UW undergraduate students. The key eligibility criteria are students enrolled in at least 12 credits and at least 18 years of age. We did not include any exclusion criteria in this study. For our sampling approach, we will do non-probabilistic convenience sampling. Our target sample size was 50 respondents.

Data Collection Procedures

We promoted our survey over social media over a two-week period ending on May 22. Our survey was promoted to groups we researchers have access to, such as RSOs that we are part of or our friends. We also were able to recruit students from our course to be able to take the survey. It is active recruitment in that we ask specific people to fill it out, but there was also passive recruitment as people in larger groups, such as the RSOs, find out about the survey.

Our survey was self-administered by the participants. It was an electronic survey through Google forms split into nine different sections, which was able to be taken in under 10 minutes. The survey included close-ended

questions, short answer continuous questions, answers using the PAS subscale, and one qualitative question. While no identifying information was collected.

Key Variables

The study exposure is high exercise per week, defined by at least 150 minutes of moderate exercise per week, and the outcome of interest is high or low self-perceived academic performance of full time UW undergraduate students, using the Perception of Academic Stress scale (Bedawy, 2015). The cutoff we used for the exposure was the CDC guideline of a minimum of 150 minutes of moderate exercise per week for adults ("How Much Physical Activity", 2022). Meanwhile, the cutoff used for the outcome is above or below three, considered high or low-self perceived performance based on the Likert scale. Our confounding variables were courseload, which was not analyzed, and employment hours, which we focused on. This is defined as how many weekly hours the students work in a paid position (or equivalent role). High employment hours are defined with a cutoff of 10 or more hours per week, while low employment hours are defined as less than 10 hours. Our reasoning for this is that part-time positions for non-students are generally 20 hours a week, which is not feasible for full-time students, and many full-time students work around 10 hours weekly.

To qualify as a confounding variable, work hours must be associated with the exposure, and work hours does impact how much one can exercise. Secondly, it also needs to be associated with the outcome, and work hours also impact how much one can focus on academics. Thirdly, the confounder should not be on the causal pathway between the exposure and outcome, and the amount of time that someone exercises doesn't lead to deciding how much they work.

Data Analysis

In our data cleaning process, we recoded the class year to the corresponding number of their year. In looking at the responses for exercise minutes per day, someone put 999, which is prefer not to answer, but we converted it to zero because their responses for other days classified them as high exercise. Someone else also put 999 as prefer not to answer for hours worked, which we recoded to zero because they said they were not employed. We had to delete someone's responses because they were underage. For our academic outcome questions using the Likert scale, we used Perception of Academic Stress guidelines to code the responses on a scale of 1-5 corresponding to strongly disagree to strongly agree, and some questions had to be reverse coded (Bedawy, 2015). We had to come up with cutoffs for our high / low binaries but did not make any new subjective decisions in changing them.

To address our descriptive aim of finding the prevalence of full-time UW undergrad students with high exercise frequency, we aggregated the total exercise minutes per week per participant, and then created a binary variable to classify them as either high or low exercise using the aggregation and cutoff of 150 minutes per week. To address our analytic aim of the association between the amount of exercise per day and perceived academic performance, we compared the amount of full time UW undergraduates with high exercise frequency with those with high self perceived academic performance. We took the mean of our recoded PAS numerical values and created a binary of those with an average above 3 being high performance and below three being low performance. We found the prevalence ratio for those with high PAS, comparing students with the weekly exercise above and below 150 minutes. To assess employment as a potential confounder, we stratified our data by high and low employment hours and calculated a Mantel-Haenszel (M-H) adjusted prevalence ratio. We compared the crude prevalence ratio to the M-H adjusted prevalence ratio. A difference of more than 10 percent would mean that confounding by employment hours is likely present in the exercise-academic outcome association.

Lastly for the qualitative aspect, we analyzed "What is your motivation for exercising and/or what is keeping you from exercising" through directed content analysis, categorizing the responses with the codes "time constraints," "social influence," "motivation and discipline," and "physical and mental health."

RESULTS

Population Characteristics

Our study received 61 respondents with only 50 responses producing viable data for our analysis. 76% of the people in our demographic were women, which was one of its significant features. We also discovered that people of Asian or Asian American ethnicity made about 60% of our sample group. Another important characteristic of our study was the fact that 60% of the population were third year students. Out of our entire respondents 56% expect to graduate in 2024. Additionally, we discovered that the prevalence of low work hours was higher than high work hours in our sample population, with 64% of the population indicating that

they had low work hours. In our study, 62% of participants fell into the group of high activity, indicating that higher exercise was also a population characteristic.

Aim 1 Findings
The percentage of students with high exercise was 62.0% which is higher than our hypothesis of 45.0%.

Aim 2 Findings
11.4% higher prevalence of high perceived academic success among people with high exercise frequency compared to people with low, which is lower than our hypothesis of 30%. For work hours Stratum-Specific Prevalence Ratios (PRs), the high work hours PR was 0.9, and the low work hours PR was 0.9, resulting in 0.9 for Crude Prevalence Ratio (PR). We calculated the Mantel-Haenszel Prevalence Ratio (M-H PR) and got 0.9. The difference between Mantel-Haenszel Prevalence Ratio (M-H PR) and the Crude Prevalence Ratio (PR) is 1.1% difference. Therefore, there is no evidence that work hour is a confounding variable.

Qualitative Analysis Findings
The open-ended question to understand the qualitative aspect of the study is: What is your motivation for exercising and/or what is keeping you from exercising. This opened up a space where UW undergraduate students were able to describe in their everyday lives what factors influenced their decision and accessibility to exercise. The responses were read through were organized in Facilitators connected to the first part of the question "motivation for exercise," Barriers connected to "keeping you from exercising," and Both. Coding the answers to the open-ended question with firstly these three codes allow us to see the differences between the student population, and how they influence their life.
The new codes with their main themes that we found in the responses were:
- Physical and Mental Health: injuries, feeling stressed or under pressure.
- Time Availability: having an intense course load, working while being in school, and free time.
- Motivation/Discipline: having a particular activity that motivates to exercise, being constant and able to follow a schedule.
- Social Influence: being a sport member at UW, having a support network and friends to go exercise with.

Other observations that were made individually by only two students in the study were not being able to feel safe in exercising outdoors in U-District, and not having access to a gym nearby.

Both key barriers and facilitators, or having multiple barriers and multiple facilitators playing into one student lifestyle were common in the answers. For example, a quote that was categorized as facilitator is "I think it depends on the type of exercise; I climb and bike a lot, both of which are things I do with my friends so I feel like having motivation from peers to exercise together helps a lot. I also think that my Apple watch and wanting to close my rings is a silly motivator but it kind of helps remind me to stay active." This codes for both the Social Influence and the Motivation/Discipline in this student's life, choosing a preferable activity to do with her friends and a strategy to stay motivated such as with an Apple watch. Barriers, such as the response "How much free time I have. I try to work out once every day, but often feel pressure to study instead," were coded as Time Availability and Physical/Mental Health because of being correlated with how much free time the student has, and how feeling pressure into studying is keeping them away from exercising.

DISCUSSION
In this study, we found that the percentage of full-time UW undergraduate students that had high exercise frequency (>/= 150 minutes per week) was 62.0%, which is 7.0% higher than our original hypothesis of 45.0%. We also found that there was an 11.4% higher prevalence of high PAS among those with high exercise frequency compared to those with low exercise frequency, which is lower than our hypothesis of 30.0%. A similar finding can be seen in other research, such as one done by Keating et al. (2013). They found that there was a positive relationship between the frequency of strength exercise and self-reported academic performance. Our findings demonstrate a similar positive association between exercise frequency and high perceived academic success. This may be because exercise has been shown to increase dopamine levels in the brain (Marques et al., 2021). Dopamine is a natural stimulant that increases mood, focus, and motivation and reduces anxiety and feelings of unhappiness. This may be a reason why students with higher exercise frequency have a higher PAS compared to students with low exercise frequency.

We found that high exercise does not mean higher PAS, which some of our qualitative results may explain. A possible reason that we did not see the expected correlation could be because of time availability, which was

the most popular reason for why people do or don't exercise. People could be spending more time on schoolwork instead of going to the gym, which is why they may have a higher PAS. Similarly, motivation or discipline, the second most popular reason, could play a role in how people may not have motivation to exercise after spending a lot of energy and time doing school work.

The strength of our study is that it is relatively easy and inexpensive to generate data about both our exposure and outcome from many participants because it is a cross-sectional study. We also use the PAS scale, which benefits our results, because it was a current measure of academic performance, while a 'current' GPA would reflect a past outcome that occurred before the exposure of exercise. It is a sub-scale of the validated Perceived Academic Stress (PAS) scale, and thus previous studies have tested how well it reflects perceived academic performance. A limitation in our study may be information bias from self-reported measures in the study. Our study greatly relies on self-reporting measures, and participants may not report their exercise accurately. This could bring recall bias to affect the reliability of our result since students may not accurately recall the amount of time spent exercising. A conceptualization factor that could have been a limitation would be how we defined what exercise was and how individuals may have defined exercise to themselves because they may be looking at it as intentional However, this does not take into account how different amounts of exercise work for different people, and the kinds of exercise that people do.

This study provided new insights into how UW undergraduate students often do not regularly exercise due to time constraints in their schedule while managing a full course load and, many times, a part-time job. We collected this data through our open-ended questions about what is preventing one from exercising for more time throughout the week. Our study suggests that the prevalence of high perceived academic performance is 11% higher in those that frequently exercise for an intentional period of time, despite their busy schedules. The implications brought about by this study are that college students have less time outside of school and work due to the transition from childhood to adulthood. Pursuing an undergraduate degree at UW Seattle is quite rigorous, which may add to a further lack of free time outside of academic affairs. Those that prioritize exercise may dedicate less time to their academics. In order to have a meaningful public health impact on college students' priority on exercise, academic performance should not be the only measure of the benefit. To be able to do well with a multitude of responsibilities, time management is key. Thus undergraduate students' time management skills to create room for exercise should also be explored.

APPENDIX

References

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Table

Table 1. Population characteristics of University of Washington undergraduate students, Spring Quarter 2023.

Characteristic	Statistic Mean (SD) or n (%)
Total respondents	50
Age (years)	20.6 (1.03)
Gender	
Woman	38 (76.0%)
Man	9 (18.0%)
Non-binary	3 (6.0%)
Race/Ethnicity	
Asian/Asian American	30 (60.0%)
Black/African American	4 (8.0%)
Latinx/Hispanx	2 (4.0%)
White	10 (20.0%)
Asian/Asian American, White	1 (2.0%)
Asian/Asian American, White, Latinx/Hispanx	1 (2.0%)
Black/African American, Asian/Asian American, White	1 (2.0%)
Prefer not to say	1 (2.0%)
Class Year	
First Year	5 (10.0%)
Second Year	5 (10.0%)
Third Year	30 (60.0%)
Fourth Year	10 (20.0%)
Intended graduation year	
2023	13 (26.0%)
2024	28 (56.0%)
2025	4 (8.0%)
2026	5 (10.01%)
Course load based on credits	15.2 (1.9)
High course load (>/= 15 credits)	35 (70.0%)
Low course load (< 15 credits)	15 (30.0%)
Work Hours per week	6.6 (7.7)
High work hours (>/= 10 hours)	18 (36.0%)
Low work hours (< 10 hours)	32 (64.0%)
Exercise (min)	282.3 (268.0)
High exercise (min >/= 150)	31 (62.0%)
Low exercise (min < 150)	19 (38.0%)
Average perceived academic success (PAS score)	2.7 (0.6)
High PAS (PAS score > 3)	30 (60.0%)
Low PAS (PSS score </= 3)	20 (40.0%)

PAS = Perceived Academic Success (> 3 is the PAS threshold for HIGH perceived academic success)