



Bryant University

HONORS THESIS

Let's Hit the Gym: An Analysis of the Relationship Between Exercise, Achievement, and Social Anxiety

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ABSTRACT

An emerging body of literature has documented the positive influence of exercise on student achievement. Human and non-human animal studies have proven that exercise can improve memory, academic stressors, social anxiety, and sleep along with more broad topics such as mental and physical health. With exercise improving memory and academic stressors, this leads to a potential conclusion that exercise could benefit student's grade point average which will be tested in this study. Exercise is also exhibited to help reduce social anxiety which leads to a potential conclusion that exercise could improve one's involvement in extracurricular activities because one would have less social anxiety. This paper seeks to understand if there is a potential relationship between exercise and a college students' overall achievement. Data were collected amongst 117 Bryant University students using a survey. As shown through the survey, those students who have a higher GPA, also have a higher need to achieve excellence. Surprisingly, those students who exercise more often, have a lower GPA. However, those students who exercise more have lower social anxiety which is also a reason for why students participate in extracurricular activities or not. As exhibited in the data analysis, more exercise leads to less social anxiety which leads to more participation in extracurricular activities, which ties into students' overall achievement. In conclusion, based on the literature and the data analysis of the survey, exercise shows direct benefits to helping with students' social anxiety. Although there was no direct relationship between students GPA and their amount of exercise, there could be other factors that tie into what makes individuals have a particular GPA along with exercise. Because of the small sampling size, it was difficult to see the correlation between GPA and exercise. Therefore, if the researcher were to conduct this study again, they should focus on getting a larger sampling size, especially with students with lower GPA's.

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INTRODUCTION

Lack of exercise is one of the major causes of obesity, depression, and cardiovascular disease (Hillman et al., 2008). Exercise is shown to be beneficial for mental and physical health which has been evident through many years of literature. However, there is a gap in the research regarding the impact of exercise on achievement and social anxiety. Achievement is a broad term and can mean something different to you than the person sitting next to you. While achievement can refer to many things, the present research is explicitly focused on undergraduate students' GPA and involvement in extracurricular activities to measure one's overall achievement. The goal of the present study seeks to illustrate whether exercise can have tangible effects on other aspects of one's life outside of their mental and physical health. There are even more benefits to exercise, specifically achievement. This study will show students that it is worth exercising to improve their achievement inside and outside the classroom.

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LITERATURE REVIEW

Throughout the existing literature, there has been ample research focusing on the various benefits of exercise. These studies provide extensive evidence that exercise has many benefits (Hillman, et al., 2008). However, 74% of adults in the United States do not meet the recommended guideline of at least 30 minutes of moderate-intensity physical activity on most days of the week (Hillman et al., 2008). Physical activity includes movement in the body that increases energy use, whereas exercise is planned, structured physical activity which makes it more goal oriented (Colberg et al., 2016). Through many years of research, it has been clear that exercise can benefit your mental health and physical health.

The literature exemplifies a clear relationship between exercise and respondent mental health. Clinical depression is a major public health problem affecting approximately 121 million adults worldwide (Rimer et al., 2013). Specifically, depression, post-traumatic stress, acute stress disorder, exhaustion, detachment from others, anxiety, emotional exhaustion, irritability, and other trauma-related mental health disorders have been affecting those during the COVID-19 pandemic (Fernandez et al., 2020). One important intervention that has been helpful during quarantine has been physical exercise and activity. Existing research has shown that physical exercise relieves depressive symptoms and helps people get through difficult times (Fernandez et al., 2020). Exercise is also demonstrated to improve mental health because it makes us feel more confident, improves our self-image, improves social skills and our cognitive functioning (Rimer et al., 2013).

Another benefit of exercise is the effect it has on physical health. The American Heart Association, the Centers for Disease Control and Prevention and the American College of Sports Medicine all recommend regular physical activity for the prevention of several diseases (Agarwal, 2012). Cardiovascular disease (CVD) is the leading cause of death for both males and females in the United States. However, this is a preventable condition (Agarwal, 2012). A modifiable behavior that can greatly impact CVD is inactivity. Inactivity or a sedentary lifestyle is associated with increased cardiovascular events and premature death. The literature has exhibited those physical activities like walking, swimming, cycling,

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and stair climbing have reduce type 2 diabetes, various forms of cancers, falls and depression (Agarwal, 2012). Clearly, it is critical to promote healthy behaviors like exercise. The US Department of Health and Human Services advises that school-age students should achieve 60 minutes of daily exercise (US DOH, 2018).

Further, the transition from high school to college is associated with a steep decline in physical activity (Agarwal, 2012). Since exercise is an easy, inexpensive way to avoid these negative effects, students should not stop exercise after high school because of the clear benefits it has on their overall physical health. Clearly there are many positive benefits to exercise both mentally and physically.

Cognitive Benefits

A study by Deslandes et al., (2009), was conducted to show whether there was a relationship between exercise and overall learning performances. The authors argue that exercise increases various neurotransmitters in the brain such as serotonin, dopamine, acetylcholine and norepinephrine (Deslandes et al., 2009). These receptors that are released change the cortical and subcortical activity. One study observed an increase in peripheral catecholamine plasma levels after exercise which is associated with memory and learning improvements (Deslandes et al., 2009). This effect is based upon the enhancement of neurogenesis in the hippocampus through bodily activity, which is a part of the brain that is critical for learning and memory, particularly with long term memory (Esch et al., 2010). Along with many cognitive and memory benefits, both the structure of the brain and the memory are benefited through exercise which in turn is related to learning improvements which could potentially lead to a higher GPA for college students because they are more likely to remember content. Clearly, there is still research that must be done to address whether there is a direct relationship between exercise and grade point average.

There is also existing research on exercise and memory recall. When taking a test, memory recall from all your studying is helpful. Higher test scores correspond with higher GPAs (Plant, 2005). Specifically focusing on the relationship between exercise and memory, a study was conducted using a group of 120 college students. Randomized into 6 various

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experimental groups (Wingate et al., 2018) sought to analyze whether there was a difference in memory recall and mood in those who were non-exercisers versus those who exercised. The study results showed that exercise may help to minimize retroactive memory interference by enhancing chemicals, like post-synaptic density protein, which aids in the process of working memory (Wingate et al., 2018). It is likely that exercise does help memory recall, which could potentially help those recall more information when taking an exam, making it possible to achieve a higher-grade point average.

Grade point average

A popular measure of performance in college is individuals cumulative grade point average (GPA) for a given semester (Plant, 2005). GPA measures the average of course grades for that student either in each semester or cumulatively over the time they have been at college thus far. There are many factors that can influence an individual's GPA, such as knowledge and skill level prior to enrolling in college (Plant, 2005). Other factors include the learning and non-learning activities that take place outside and inside the classroom during the semester (Plant, 2005). For example, a study conducted on 2,472 freshman college students sought to analyze whether there was a correlation between participation in recreational sports and academic achievement (Gibbison et al., 2011). Survey results revealed that students who participated in recreational sports more than once a week, and twenty or more times a semester, had a higher-grade point average compared to those individuals who did not participate or participated less than 20 times a semester (Gibbison et al., 2011). Since recreational sports is a way to exercise, this shows that there is the potential correlation between exercise and grade point average.

This correlation between exercising and students' academic achievement is a recent trend that experts are beginning to unfold. College can be a stressful time for individuals and students often get overwhelmed and reach a burn out point (Babenko et al., 2018). Individuals who get burnt out are typically overwhelmed by their studies and are exhausted, as they reach a point where they feel like they cannot mentally or physically study anymore. To this end, a survey was conducted on 200 medical students involved in rigorous studies. The study's conclusions demonstrate that individuals who were less self-compassionate, who exercised less and who

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avoided goals reported a higher exhaustion rate and reached this burn out stage much faster than those who are self-compassionate, who exercised and who set goals for themselves (Babenko et al., 2018). By avoiding this burnout stage, these medical students were more successful in their academic studies and achieved higher grades (Babenko et al., 2018). According to the existing literature. The researcher offers the following hypothesis: If a college student exercises 5-7 days a week for 30 minutes or more a day, then they will achieve a higher GPA.

Achievement

From the researcher's personal experience, GPA does not define an individual's overall achievement. This led the researcher to explore more broadly, what is achievement?

Achievement is a broad term that has a different meaning to many researchers. A commonality found in research is achievement acknowledges how well an individual can succeed at what they are doing cognitively or behaviorally (Algarabel et al., 2001).

Cognitively there is a significant amount of research done on the benefits of exercise, but not much research done on the behavioral impacts from how much an individually exercises.

From the researchers own personal experience applying to jobs, many employers look at the individual's involvement in extracurricular activities. Specifically in the present study, achievement will be measured amongst college students using the calculation of their grade point average (GPA) and their involvement in extracurricular activities. These are ways of measuring an individual's success inside and outside the classroom to form an overall conclusion of their achievement. The researcher decided to explore students' involvement in extracurricular activities because this could be an indicator of student achievement.

Student Involvement

According to how achievement is defined in the existing literature, it is evident that this construct refers to more than merely achieving high grades, as one number does not define individual achievement. Achievement for many students' is also determined by their involvement in extracurricular activities such as sports, clubs, and organizations, off campus jobs, and so on. In the present study, we will seek to discover whether there is a relationship between exercising at least five days a week and a student's involvement in extracurricular

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activities. While exploring this relationship, the researcher landed on a variable that could potentially impact students' involvement in extracurricular activities, social anxiety. Since exercise helps decrease social anxiety (Schneier, 2006), this will enable individuals to feel more confident in joining activities.

Social anxiety is considered a social phobia, and one of the most prevalent psychiatric disorders (Schneier, 2006). Most individuals with social anxiety have a fear of social situations. These individuals often report fear and avoidance of public speaking and other social performance situations (Schneier, 2006). People with social anxiety disorder may avoid important activities, such as attending classes and meetings or attend but avoid active participation. Further research shows that those with social anxiety achieve less at school and work (Schneier, 2006). Since there is a relationship between social anxiety and academic achievement, there is likely a correlation between exercise and involvement in extracurricular activities, as exercise aids those with social anxiety. Therefore, it is likely that social anxiety may serve as a mediating variable between exercise and involvement.

Exercise is proven to help with mental health, specifically social anxiety, because it enables individuals to feel more confident, improves self-image, and improves social skills and cognitive functioning (Taylor et al., 1985). In contrast, individuals who struggle with social anxiety often experience feelings that affect their daily performance. A study conducted with 56 adult patients with generalized social anxiety disorder assigned participants to either mindfulness-based stress reduction (MBSR) or a comparison aerobic exercise program. The MBSR program consisted of an 8 week, 2.5-hour group classes per week, and a 1-day meditation retreat and daily home practice.

Participants in the 8-week aerobic exercise program were provided a 2-month gym membership and were required to complete weekly. A self-referential encoding task was administered at the start and at the end to examine changes in behavioral and neural responses during magnetic imaging (fMRI). This study showed that both MBSR and aerobic exercise yielded significant reductions in social anxiety symptoms and enhanced mindfulness skills. The study also indicated that there was an increase in one's self-esteem, decreased social

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anxiety symptoms, an increase in the use of cognitive reappraisal and increase in cognitive reappraisal self-efficacy (Goldin et al., 2012). This shows that exercise benefits those with social anxiety and those with social anxiety are more likely to be anxious around people, so they most likely will not want to join organizations due to their anxiety. An individual's social anxiety can truly have a great impact for individuals on their involvement in extracurricular activities which impacts their overall life achievement.

The Current Study

To date, there has been a preponderance of research demonstrating the effects of exercise on physical and mental health. However, the existing study seeks to understand whether there is a relationship between exercise, academic achievement, and social anxiety. Based on the existing literature, there is a noted relationship between memory recall and exercise (Schneier, 2006). Thus, students who exercise more frequently should have smoother memory recall during testing. Based on studies that have already analyzed the relationship between exercise and GPA, the researcher hypothesizes that students who exercise 5-7 days a week, 30-minutes a day will have a higher GPA.

The second hypothesis being tested in the present study is the relationship between student's involvement in extracurricular activities and exercise, as extra-curricular involvement can be used to operationalize achievement among college students. This relationship will most likely occur based on the existing literature that demonstrates relationships between social anxiety and exercise. Social anxiety likely serves as a mediating variable because the assumption is that those who have less social anxiety will be more likely to be involved and want to be around others. Thus, we hypothesize that there will be a positive relationship between exercise and student involvement in extracurriculars. In summary, the proposed analyses seek to explicate the ways in which exercise can tangibly impact achievement among college students. If there is a relationship, such findings could be used to encourage college students to exercise more frequently and lead healthier lifestyles.

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There is still further research that needs to be done to understand if exercise has any impact on students' achievement. This study seeks to fill in the research gap between exercise, achievement, and social anxiety in college students. Individuals might consider high achievement as performing well in the classroom, getting an A on a test they put a lot of effort into, or even completing a paper. However, achievement in college students is not merely defined by a student's grade point average. To this end, there is a considerable amount of existing literature demonstrating the tangible impacts of exercise on individuals, however, the goal of the present study seeks to analyze current literature on the relationship between exercise and student grade point average.

The literature led the researcher to explore the following research questions which led to the following hypotheses:

- 1) Will there be a positive relationship between exercise for at least 30 minutes a day, 5-7 days a week and GPA among college students?
 - a) The researcher hypothesizes that the more an individual exercises, the greater their GPA will be.
- 2) If a college student exercises 5-7 days a week for 30 minutes or more a day, will they be less likely to have social anxiety?
 - a) The researcher hypothesizes that the more an individual exercises, the less social anxiety they will have.
- 3) Will social anxiety act as a mediating variable for students' involvement in extracurricular activities?
 - a) The researcher hypothesizes that social anxiety will act as a mediating variable to students' participation in extracurricular activities.

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METHODOLOGY

Participants

Survey research questions were tested using a qualitative survey of 117 current Bryant University students. Many respondents identified as female, 74.4%, and the rest of the respondents identified as male, 25.6%. All participants were Bryant University students ranging from 18-22 years old. See Appendix A for the visual breakdown of various survey questions asked and the answers amongst the 117 Bryant University participants. As we can clearly see from the studied participants, these students have high GPA's, are involved in more than one extracurricular activity and spend a good amount of time exercising.

Measures

The following study attempts to close the research gap because there is no study that addresses the three following constructs: exercise, achievement, and social anxiety. Each of these constructs was operationalized by the researcher in various ways.

Exercise was measured by creating an exercise composite score. This was created by multiplying the hours per day an individual said they spent exercising by the days per week they indicated they spent exercising. For example, the greater the exercise composite score, the more that individual spends exercising.

Achievement was operationalized in three different ways. Academic achievement was operationalized by analyzing students grade point average. To build the rationale behind why GPA is a good way to operationalize achievement, I used the Cassidy and Richard motivation to achieve excellence test (Cassidy et al., 1989). This measure was used to see if there was a relationship between those with a higher GPA and motivation to achieve excellence.

Achievement was also operationalized by extracurricular activities. This was analyzed through the question in the survey: "Are you involved in extracurricular activities?" Participants had the option to indicate if they participate in one, more than one or no activities.

Finally, social anxiety was measured using the Liebowitz social anxiety scale. Students were asked 24 questions from this study, and they had to indicate if they feared the various

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situation on a scale, 0 (none) to 3 (severe) and their avoidance in the descriptive situation 0 (never) to 3 (usually). These scores were added up to signify whether that individual has no social anxiety, mild, moderate, marked, severe or very severe social anxiety (Masia-Warner, C).

Procedures

The questions in the survey were administered digitally through an email survey link that was created through Google Forms. The survey consisted of 65 questions which took approximately 6 minutes or less to complete. The survey was sent to random Bryant University students using the snowballing sampling method. Some questions included in the survey included demographic questions, exercise questions, achievement scale questions using the Cassidy and Richard model of excellence, and social anxiety questions from the Liebowitz social anxiety scale. Below are some example questions and the remaining questions can be found in Appendix N.

1. Gender?
2. What is your cumulative GPA? (This means at the current moment)
3. How long do you exercise each day?
4. Are you involved in any extracurricular activities?
5. I hate to see bad workmanship
6. I get a sense of satisfaction out of being able to say I have done a very good job on a project
7. Fear of anxiety in the following situations: Telephoning in public
8. How would you rate your avoidance of the situation above?
9. Fear/anxiety in the following situation: Participating in small groups
10. How would you rate your avoidance of the situation above?

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RESULTS

The following section will show the results of the research questions. There are three research questions which will be labeled and discussed within this section.

Question 1: Will there will be a positive relationship between exercise for at least 30 minutes a day, 5-7 days a week and GPA among college students?

Question 2: If a college student exercises 5-7 days a week for 30 minutes or more a day, will they be less likely to have social anxiety?

Question 3: Will social anxiety act as a mediating variable for students' involvement in extracurricular activities?

Methodology for Achievement

Achievement means many different things to different people, however, usually individuals measure their own achievement through their effort and/or skills (Algarabel et al., 2001). But are students motivated to achieve excellence? To see whether there is a relationship between student's need to achieve excellence and their GPA, the researcher will be using the achievement motivation of excellence scale to ask seven questions. The measure utilizes a five-point Likert scale, where one corresponds to "never," and five corresponds to "almost always." This scale seeks to understand whether individuals find reward in performing to the best of one's ability, which will help understand whether there is a relationship between GPA and need for achievement (Cassidy et al., 1989).

The best score to achieve in this "excellence" category of achievement is 31. All 7 questions asked to test their need for achievement in the category of excellence were asked in the survey. The question, "It is no use playing a game when you are playing with someone as good as yourself," was a reversed question, meaning the "best" score would be 1 (never). The remaining 6 questions were best if the participant answered a 5 (almost always). The researcher used excel to add everyone's achievement scores together. Then, the researcher separated the scores of those who received a 3.1-3.5 GPA versus those who received a 3.6-4.0

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GPA. The number of participants who have a 3.1-3.5 GPA is 35 individuals whereas there were 78 participants who indicated their GPA to be between 3.6-4.0. To get the average achievement score for each GPA range, the researcher divided the sum of the achievement score by the number of participants. There is a .978 difference which signifies that those who have the higher GPA also have a higher motivation to achieve excellence. See Appendix B for more detail.

Question 1

(Q1): Will there will be a positive relationship between exercise for at least 30 minutes a day, 5-7 days a week and GPA among college students?

The hypothesis for this question is that if a college student works out for at least 30 minutes a day, 5-7 days a week, they will receive a higher GPA.

To analyze this question, the participants were asked “do you exercise,” “if so, how many days a week,” “for how many minutes a day,” and “what is your current GPA?” Since the data were categorical, the researcher wanted to make exercise numerical so they could better understand the relationship between exercise and GPA for the purpose of this study. The researcher decided to create an exercise composite score by multiplying the number of days in a week they indicated they exercise by the minutes/hours per day. This exercise composite score shows how many hours they are spending a week exercising. The higher the exercise composite score the more often that participant works out.

Once the researcher arrived at a composite exercise score, that number was compared the individual's GPA. The researcher categorized the GPAs into two categories: below 3.5 and above 3.6. This is because only 3 participants in the study indicated their GPA was lower than a 3.0. The researcher decided to categorize those three individuals in the below 3.5 category because 3 people is not significant enough to reach conclusions. On excel, using the pivot table function, the researcher was able to show the average exercise composite score for those with a GPA below 3.5, and an average exercise composite score for those with a GPA above a 3.6. Those that were in the below 3.5 GPA category average 4.57 hours of exercise per week.

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Those who have a GPA of a 3.6 or higher, average 4.22 hours of exercise per week. This analysis shows that those with a lower GPA, exercise more which rejects the hypothesis. See Appendix C for more detail. This was most likely due to range restriction because the researcher did not get enough participants in the lower GPA range.

It is important to note that when analyzing those who exercise vs. those who do not, leaving out the number of hours per week and days of the week, those who exercise in general have a higher GPA. Of the participants, 94% of them that indicated they have a 3.6 or higher, exercise. Whereas 86% of the participants that indicated they have below a 3.5, exercise. See Appendix D for a clear representation of the difference between those that exercise versus those who do not. There are significantly more people who do not exercise that fall into the below 3.5 category as opposed to those in the above 3.6 GPA category.

Question 2

(Q2) If a college student exercises 5-7 days a week for 30 minutes or more a day, will they be less likely to have social anxiety?

The researcher hypothesized that if a college student exercises 5-7 days a week for 30 minutes or more a day, they will be less likely to have social anxiety.

The Liebowitz Social Anxiety scale was used to assess the way that social phobia plays a role in life across a variety of situations. The participants were asked a variety of questions on a scale of 0-3. Zero signifies they never experience fear or avoidance, and 3 signifies they severely fear the certain situation or usually avoid it. Based on participants responses the researcher added up their scores for how they feared the situation and how they avoided the situation and added the two numbers together to arrive at a total social anxiety score. If the participant scored between a 0-29, "you do not suffer from social anxiety," if scored between 30-49, "mild social anxiety," if scored between 50-64, "moderate social anxiety," if scored between 65-79, "marked social anxiety," if scored between 80-94, "severe social anxiety," and if scored above 95, the participant has "very severe social anxiety." See Appendix E for a

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visual of the score breakdown. See Appendix F for the count of students in each social anxiety category.

This shows that all participants surveyed in this sampling pool have some sort of social anxiety. Not one participant fell under the “no social anxiety” category according to Liebowitz’s Social Anxiety scale. This means that 100% of participants in this survey have some sort of social anxiety. The researcher compared their social anxiety numbers to the exercise composite score to see if there was any relationship with individuals’ social anxiety and the time they spend exercising.

To analyze if there is any relationship between the amount of time exercising and social anxiety, the regression tool on excel was used. The line of best fit when the researcher ran the regression was $y = -1.4369x + 67.727$. It appears that when looking at the line of best fit, there is a slight relationship between the x variable, (exercise) and the y variable (social anxiety score). See Appendix F, for a visual of the graph and the line of best fit. To better understand if this relationship is significant, the p-value was analyzed because this value helps determine if this relationship also exists in the larger population. According to this regression, the p-value is .03 which is less than .05, signifying that it is unlikely that this pattern would be random. This regression helps analyze that there is a relationship between the amount of time you exercise and social anxiety. The more you exercise (the greater the exercise composite score), the less social anxiety the individual has which is depicted clearly in Appendix F. After this analysis, the researcher can accept the hypothesis that if a college student exercises 5-7 days a week for 30 minutes or more a day, they will be less likely to have social anxiety.

Question 3

(Q3): Will this act as a mediating variable for students’ involvement in extracurricular activities?

The researcher hypothesized that if a college student has higher levels of social anxiety, they will be less involved in extracurricular activities.

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For this analysis, the researcher focused on the question asked in the survey “Are you involved in extracurricular activities? Giving the respondent three choices: “Yes, just one,” “Yes, more than one,” or “No.” The researcher also focused on the sum of the social anxiety scores. But, for this analysis, individuals were categorized based on their scores. Based on their score, they either had no social anxiety, mild social anxiety, moderate social anxiety, marked social anxiety, severe social anxiety, or very severe social anxiety.

Using pivot tables in excel, the researcher analyzed the relationship between students' participation in extracurricular activities and their social anxiety. The researcher then analyzed the values in percentages which were taken out of each social anxiety index. For example, 9.76% of people who fell into the mild social anxiety category do not participate in extracurricular activities, 24.39% participate in just one extracurricular activity and 65.85% participate in more than one extracurricular activity. As you can see, these percentages added together equal 100% in the mild social anxiety category. See Appendix H for the breakdown for each type of social anxiety category.

It is important to note that 67.52% of the students who participated in this survey, participate in more than one extracurricular activity. Because of this difference, the researcher decided to analyze each category of extracurricular activity (No, yes just one and yes more than one) and see if the percentages either increased or decreased as the social anxiety scale got more severe. First, the researcher analyzed the individuals who do not participate in extracurricular activities. 9.76% of individuals with mild social anxiety do not participate in extracurricular activities, whereas 33.33% of individuals with very severe anxiety do not participate in extracurricular activities. This signifies that the more social anxiety you have, the less likely you are to participate in an extracurricular activity. As displayed in graph form, in Appendix I, the more severe their anxiety gets, the less likely they are to participate in extracurricular activities.

Social anxiety was further analyzed amongst those individuals who participate in just one extracurricular activity and those who participate in more than one. 24.39 % of individuals who participate in just one activity, score in the mild social anxiety category. However, 6.67

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% of students who participate in one activity, score in the very severe social anxiety category. This trend line going down as imaged in Appendix J clearly shows that the more you are involved the less percentage of chance you fall into the higher social anxiety categories.

The last analysis was done on those students who participate in more than one extracurricular activity. This is where most of the students, 67.22 % of the data set fall into. Therefore, this sampling pool is very involved in extracurricular activities. 65.85 % of students who participate in more than one activity score in the mild social anxiety category, whereas 61.54 % of students who are involved in more than one activity score in the very severe category. This is the smallest difference that we see amongst all the extracurricular activities relating to social anxiety. It is also important to note that 76.47 % of students who participate in more than one extracurricular activity fall into the marked social anxiety category. See Appendix K for more of a visual representation of those who participate in more than one extracurricular activity in relation to their social anxiety.

Other analysis

Because a lot of the data were asked in a categorical way, the researcher decided to further analyze the data that was numerical to see if there could be any other relationships. Since exercise was shown using a composite score, the researcher was able to see if there were any relationships between exercise and students need for achievement as well as students' social anxiety scores versus their need for achievement.

Exercise vs. Need for Achievement

Prior to running the regression, the researcher hypothesized that if the student exercised more and scored higher on the exercise composite score (x-axis), then their need for achievement would also be higher (y-axis). See Appendix L for the visual representation of this regression.

To see if there was a relationship, a regression was done on excel. The line of best fit read $y = 0.0813xx + 28.324$. Based on the graph and the equation of the line of best fit, it seems like there is a very small slope which means there is not much of a relationship. It is upward sloping which means that the more exercise, the more need for achievement. To test the significance of this, I looked at the P-value which reads .287 which is much greater than .05.

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This means that the exercise composite score does not have any impact on the student's social anxiety score.

Social Anxiety vs. Need for Achievement

Both the social anxiety score and need for achievement score are numerical, so a regression was run to see if there was a relationship worth noting. Prior to running the regression, the researcher hypothesized that if an individual were to score high on the achievement score, then their social anxiety would be lower. This is because they can achieve more and be involved in more extra curriculars and leadership positions because of their lower social anxiety.

To see if there was a relationship, a regression was run on excel with social anxiety score on the x-axis, and the need for achievement on the y-axis. The line of best fit read $y = -0.237x + 30.215$, see Appendix M for a visual of the graph. Based on the graph, it looks like social anxiety has a low impact on the need for achievement score, but the researcher decided to look at p-value and see if this relationship was significant. The p-value shows that there is a significant relationship because the p-value is below .05. The p-value for this analysis is .0217, therefore it is less than .05 which means it is significantly different from zero. This means the more social anxiety a student has, the less they have a need to achieve excellence.

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DISCUSSION

Achievement

In the current study, students GPA and involvement in extra curriculars was a measure of how much they are achieving. Based on the literature, the researcher predicted that the more an individual exercises, the more they will achieve both in the classroom and outside the classroom. For starters, the researcher wanted to see if those who achieved a higher GPA also scored high on the need for achievement scale (Cassidy, et al., 1989). The results of this study concluded that those who have a higher need to excel, receive a higher GPA. This allows us to see that GPA is a good measure of student's achievement. In the current literature, there is a clear research gap between students' overall achievement and exercise. This study attempted to aid in helping to fill this gap.

Relationship between exercise and GPA

According to the literature, it was likely to see a relationship between the quantity a student exercises versus their average GPA. Exercise is proven to minimize retroactive memory interference by enhancing various chemicals in the brain. These chemicals that are activated by exercising helps with the brain's memory recall (Wingate, et al., 2018). Therefore, the researcher predicted that if an individual exercises, they will be able to recall more information to take a test, in turn resulting in a higher GPA.

However, the results conflict with the previous literature. Out of the two GPA groupings (Below 3.5 and 3.6-4.0), the average exercise composite score was higher in the GPA range of below 3.5. This was opposite of what was predicted since the previous literature indicates some studies proving a possible positive correlation between exercise and GPA.

However, when analyzing those who exercise in general versus those who do not, those who indicate they exercise, have a higher GPA. This correlates to the study found on freshman college students that analyzed whether those who exercise in general by participating in recreational sports achieve a higher GPA (Gibbison et al., 2011). This study analyzed those that exercise versus those who do not and found that those who participate in sports have a higher GPA. In the current study, it is hard to see if there is a relationship worth noting

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because the GPAs were categorical. Therefore, the researcher could not run a regression or see if the p-value was significant. There could be other reasons besides exercise as to why students achieve a better or worse GPA.

Relationship between exercise and social anxiety

Exercise is proven to help decrease social anxiety (Schneier, 2006). Exercise is helpful specifically with individuals who have social phobia because it makes people feel more confident, improves their self-image, improves their social skills and their overall cognitive functioning (Taylor, et al., 1985). The literature led the researcher to believe that those who exercise will have less social anxiety.

Using the Liebowitz Social Anxiety scale responses and students exercise composite score, the researcher discovered that the literature and data were correlated. The more the student exercises each week indicates a lower scoring on the social anxiety scale which means that those who exercise regularly are less likely to fear a social situation. This is a significant finding because exercise can aid to prevent or reduce social anxiety. The study done by Goldin showed that a group of individuals with social anxiety made great improvements from an exercise plan and it even enhanced their mindfulness skills (Goldin et al., 2012). This is important because since there is a relationship between exercise and social anxiety, the researcher could then see if there is a relationship between social anxiety and extracurricular activities to see if social anxiety acts as a mediating variable for students' participation in extracurricular activities.

Relationship between social anxiety and extracurricular activities

Since those with high social anxiety have a fear of being in social situations, the researcher predicted they will be less likely to be involved because in most extracurricular activities you are around people. According to research, students with high social anxiety might try to avoid important activities like attending class and typically they avoid active participation (Schneier, 2006). That is why it is being assumed that if they do not exercise and have high social anxiety, they will avoid participating in social clubs.

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After analyzing students' involvement in extracurricular activities and their social anxiety, the data showed that the more severe the individual's social anxiety is, the less likely they are to participate in extracurricular activities. This data could potentially indicate that exercise helps those with social anxiety, which in turn will make them participate in more extracurricular activities which is a type of achievement used in this study. The researcher concluded this by observing that the highest category of social anxiety (very severe) indicated the most percentage for those who indicate they did not participate in extracurricular activities.

It is important to note that there could be other factors impacting students' involvement or non-involvement in extracurricular activities. Because this part of the analysis was categorical, the researcher could not test the significance of the relationships between these two variables using a regression. But, based on the analysis, there is an impact between social anxiety and students' involvement.

Exercise vs. need for achievement

Since this study was about trying to analyze relationships between exercise and achievement, the researcher looked at the achievement scale used in this study. The researcher wanted to further analyze if students who exercise more have a higher motivation to achieve in the excellence category. Based on literature, those who exercise are more motivated and use goal-oriented mind sets which make them stick to a routine of excellence. That is why the researcher predicted there would be a relationship between student's overall need for achievement and the amount they exercise.

However, this relationship showed no significance according to the regression. This is most likely because the achievement scale used, only tested for excellence. There were seven other types of achievement the researcher could have analyzed within the survey (Cassidy et al., 1989).

Social anxiety vs. need for Achievement

According to the data results, the more social anxiety a student has, the less they have the need to achieve excellence. It is proven through data that exercise helps reduce social anxiety and mental health issues. Exercise is also demonstrated to improve mental health because it

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makes us feel more confident, improves our self-image, improves social skills and our cognitive functioning (Rimer et al., 2013). According to the data, it is already shown that the less you exercise, the more social anxiety you are likely to have. The literature explains how achievement is how well someone can succeed cognitively or behaviorally, and, in this situation, we are analyzing students' social anxiety which can be seen behaviorally or cognitively (Algarabel et al., 2001). Although the literature does not directly say that social anxiety affects achievement; social anxiety affects the well-being of individuals which can affect their level of achievement.

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ETHICAL CONSIDERATIONS

In this method of research, it is important to address various ethical considerations because the study collected data from humans. In the current study, participants shared their personal information like their GPA, which many students would not want their name attached to. All responses were anonymous to maintain confidentiality. This is out of respect for the individuals who were generous enough to participate in the study. The study was sent out via email, however, their participation in the study was completely voluntary. At any point, if they did not feel comfortable, they had the ability to exit out of the survey and those answers were not saved. Respondents to this study also participated based on informed consent; they understand the risks, which are minimal in this case. Offensive, discriminatory language was not to be tolerated in this survey to ensure everyone felt safe and comfortable participating. Finally, since the present study involved the participation of human subjects, it was reviewed and approved by the University Institutional Review Board to ensure the study is ethical.

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LIMITATIONS

A significant limitation to this project was that no survey questions were mandatory to respond to. This was due to ethical reasons, because the researcher did not want to force any of the participants to answer a question, they did not feel comfortable with answering. However, not all questions received a one-hundred percent response rate which meant that the researcher had to pool out a total of 6 respondents because those 6 individuals did not indicate their GPA. It was decided to take those individuals out because it was important to know that for analyzing the data.

Another limitation was the demographics of the pool of respondents. Almost 75% of the participants in the survey were female. Therefore, there is not an equal representation of gender. Also, 83% of participants have a GPA of 3.1 or higher. This meant that most participants were strongly motivated and high achieving students. This is probably since the survey was sent out to organizations the researcher is involved in on campus. This is a limitation because if the researcher were to get a wider range of students to take the survey, it would have been possible to incorporate findings from the GPA of 2.0-3.0, but instead the researcher eliminated those GPAs from the analysis because it only signified 3 students which was not enough people to gather strong conclusions from.

Another limitation is the lack of time and participants. Since there was a time frame to work with, this was a major limitation because only 117 people took the survey. The survey was kept open for two months. If there was more time, the researcher would have been able to send it out to more people and potentially reached out to other schools in the area. The limitation of the number of participants is significant because there were not many participants on the opposite end of the GPA spectrum. The researcher clearly surveyed mostly motivated and high achieving individuals which made it hard to get a clear answer on the thesis questions.

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Another assumed limitation based on the survey research method that must be considered is individuals dishonest answers. Especially when it comes to exercise, their GPA and social anxiety; some people are dishonest in their responses and do not want to admit to these topics. This is a clear limitation because then their responses are not accurate to how they feel or what they do.

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OPPORTUNITIES FOR FUTURE RESEARCH

This study had a time frame of about a year from start to finish. This included, creating an idea for the project, background research, approval of the survey, survey data collection and data processing. If there was more time allotted for this project, the survey could have been sent to more people which would have included more individuals from different backgrounds and genders. Further research could send this survey globally to get a more world-wide perspective. This survey was sent to Bryant students who are predominantly white and who are attending the same school. It would be interesting and beneficial to have a wider scope of participants. Therefore, the time frame and geographical location of the respondents are two future opportunities for others to potentially use as a starting point for more research.

Another opportunity to investigate is whether student's majors have any relationship with their GPA or exercise. Are certain majors more time consuming and stress insinuating than others? If so, this could potentially impact their overall GPA and their time to exercise. This would be valuable information to schools to know because they could potentially form programs around exercise for those harder/more time-consuming majors.

It was clear in the study that college students suffer a lot from social anxiety. This could be further researched at other colleges and potentially research could help those with social anxiety with necessary resources to prevent or reduce this social phobia. Research on exactly what causes college students to have rather high social phobia would be important to discuss.

From this study, we can see that general exercise has a benefit on overall achievement. It would be interesting to research how exercise impacts those in the workforce. In many jobs, individuals are sitting at a desk for 8-10 hours a day. If exercise can improve their achievement on the job, maybe companies should investigate having breaks throughout the day dedicated to getting up and taking a walk. It would also be interesting to know if companies have gyms to encourage exercise and if they give discounts to their employees.

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Finally, another area researchers could tap into is the impact that nutrition has on GPA and involvement in extra-curriculars. It could be more than just exercise that helps with individuals' overall achievement and social anxiety.

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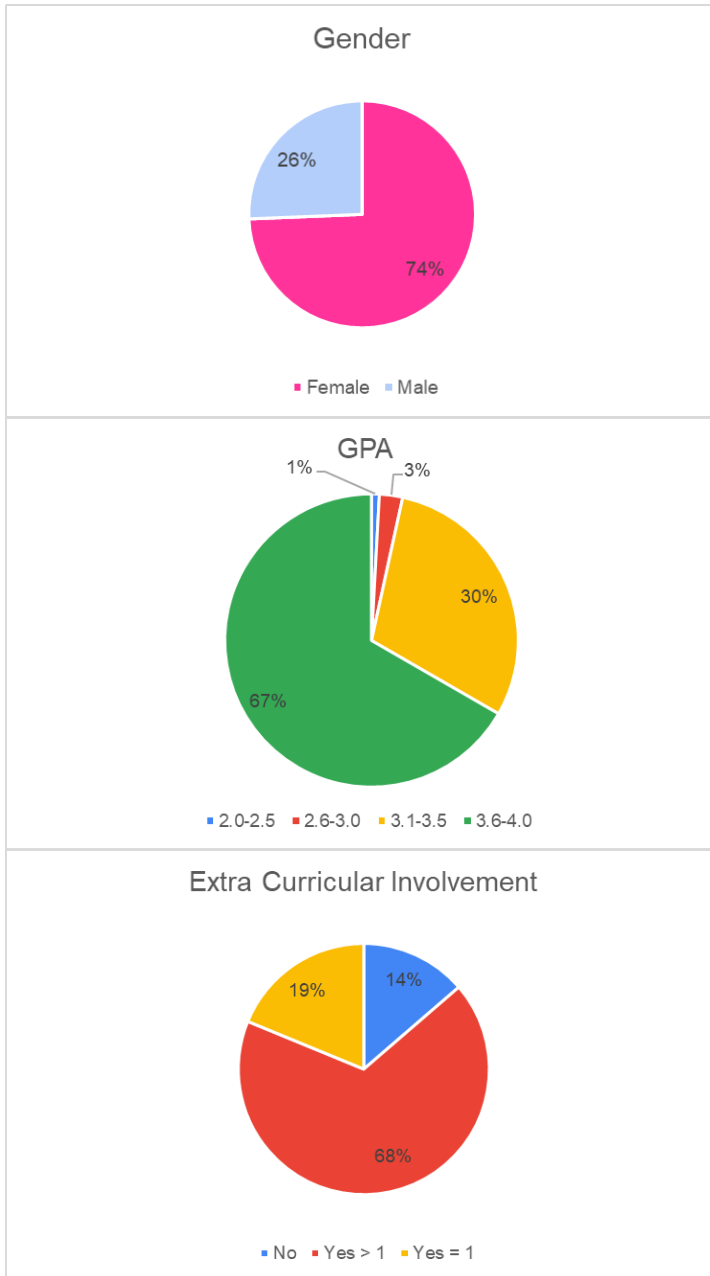
SUMMARY

In conclusion, exercise has many mental and physical benefits. The study attempted to fill in the research gap between exercise, overall student achievement including their GPA and student involvement and social anxiety. Based on the literature and data, there was not a direct relationship concluded between exercise and students GPA, but the study provides good data for future research to explore this topic more. Data and literature confirmed that exercise benefits those with social anxiety and helps prevent social anxiety. Data also shows that those with less social anxiety, participate in extracurricular activities which was consistent with the literature. This means that social anxiety could potentially act as a mediating variable between exercise and involvement in extracurricular activities and either positively or negatively affect students' involvement in extracurricular activities which is part of their overall achievement. Although the study aids in filling in this research gap, there is still research that should be done to attempt to fill in this gap more.

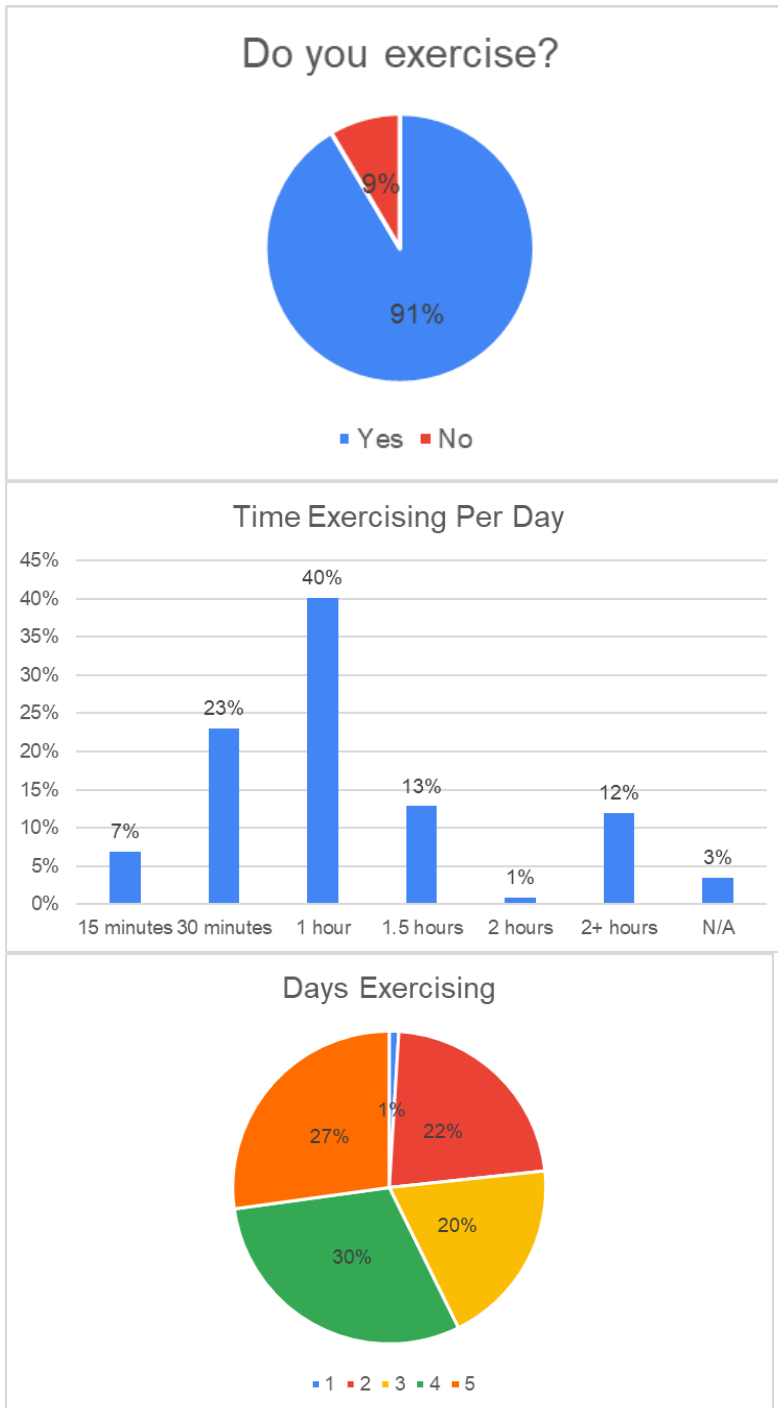
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APPENDIX

Appendix A



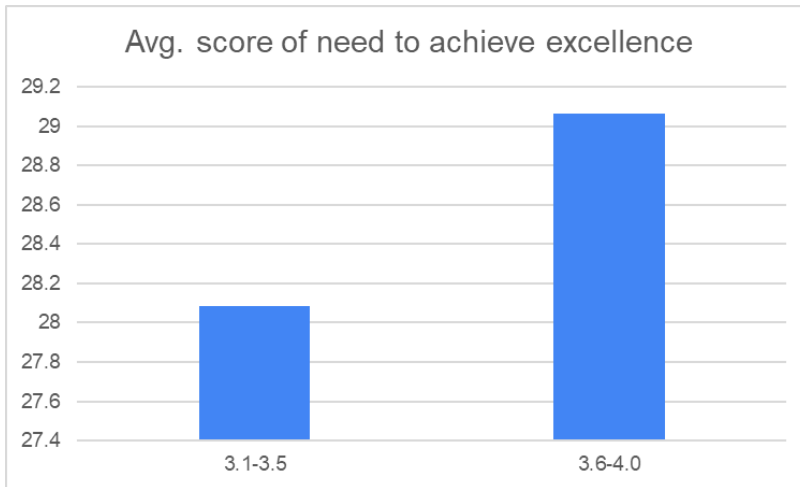
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The following graphs display various questions asked in the survey and of the total participants, what they said for each option.

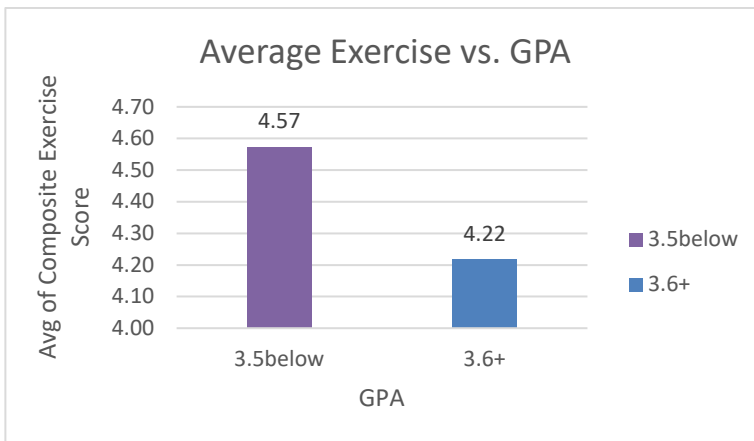
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Appendix B



This graph shows that those students with a higher GPA (3.6-4.0) score a higher need for achieving excellence. On average, those with a higher GPA score about one point higher than those with a lower GPA (3.1-3.5).

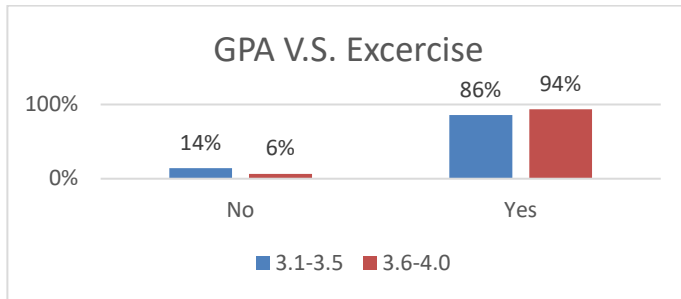
Appendix C



This graph shows the average composite exercise score for those individuals who indicated a GPA below 3.5 or above 3.6. Clearly, those individuals with a lower GPA seem to exercise more.

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Appendix D



In general, analyzing those who exercise versus those who do not exercise, those who have a higher GPA tend to exercise more. Not by a lot, but there is a small difference indicated.

Appendix E

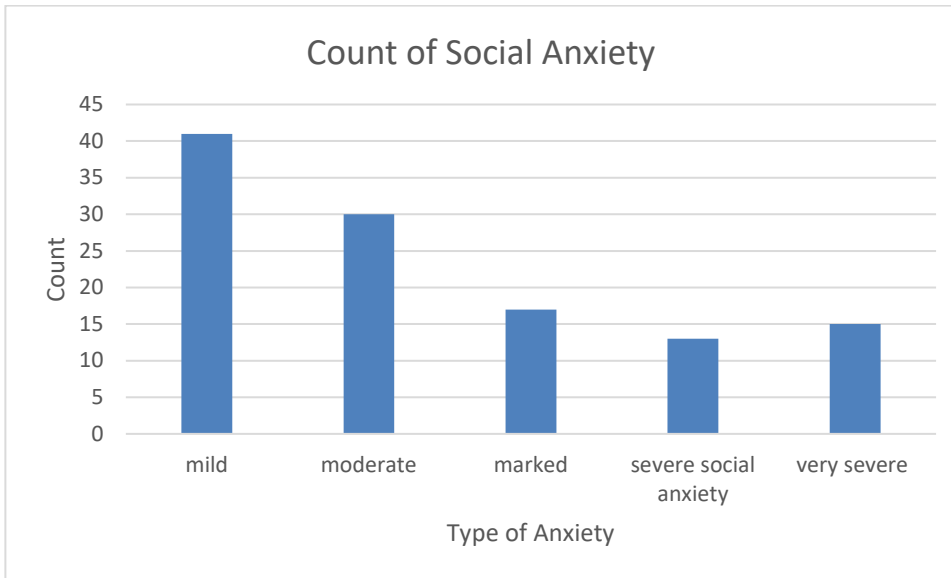
The scoring scale:

- 0–29 You do not suffer from social anxiety
- 30–49 Mild social anxiety
- 50–64 Moderate social anxiety
- 65–79 Marked social anxiety
- 80–94 Severe social anxiety
- > 95 Very severe social anxiety

According to Liebowitz Social Anxiety scale, these are the scoring categories. Depending on students' social anxiety score, they are given a type of anxiety.

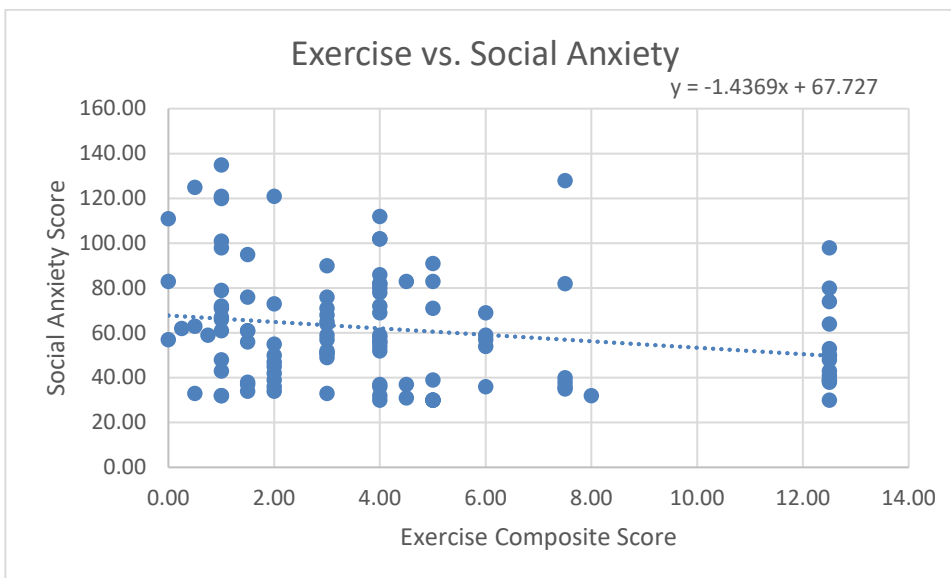
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Appendix F



This shows the breakdown of participants scoring according the Liebowitz Social Anxiety scale. Most participants fell under the mild social anxiety or moderate social anxiety.

Appendix G



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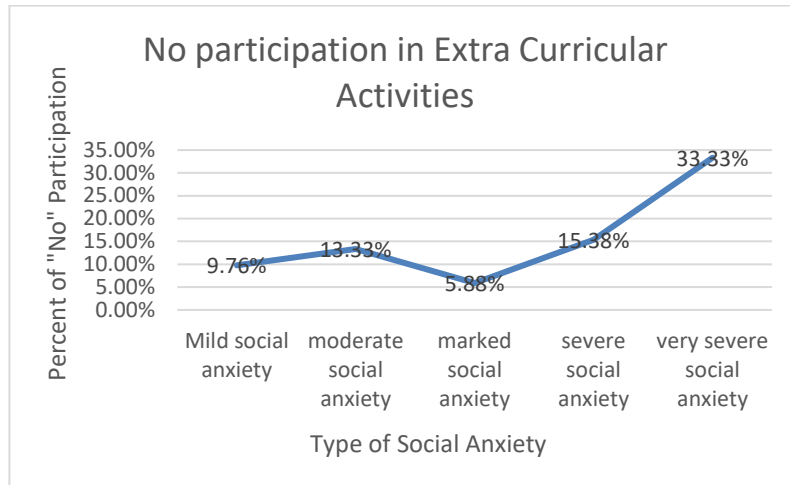
This graph depicts the relationship between the exercise composite score (hours a student exercises a day x day per week), and their social anxiety score according to Liebowitz Social Anxiety scale. This shows that the more students exercise, the less social anxiety they have.

Appendix H

Row Labels	Mild social anxiety	moderate social anxiety	marked social anxiety	severe social anxiety	very severe social anxiety
No	9.76%	13.33%	5.88%	15.38%	33.33%
Yes, just one	24.39%	13.33%	17.65%	23.08%	6.67%
Yes, more than one	65.85%	73.33%	76.47%	61.54%	60.00%
Grand Total	100.00%	100.00%	100.00%	100.00%	100.00%

This pivot table displays the types of social anxiety from least severe to most severe and the percentage of students in those social anxiety categories who participate in extracurricular activities with responses ranging from no, yes just one or yes more than one.

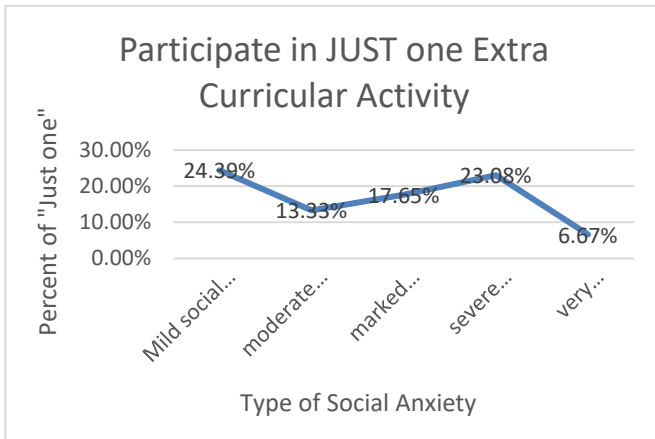
Appendix I



This graph shows a visual of the percentage of students who do not participate in extra-curriculars and which category most of the “no” responses fall under. A significant amount of people who have very severe social anxiety do not participate in extracurriculars.

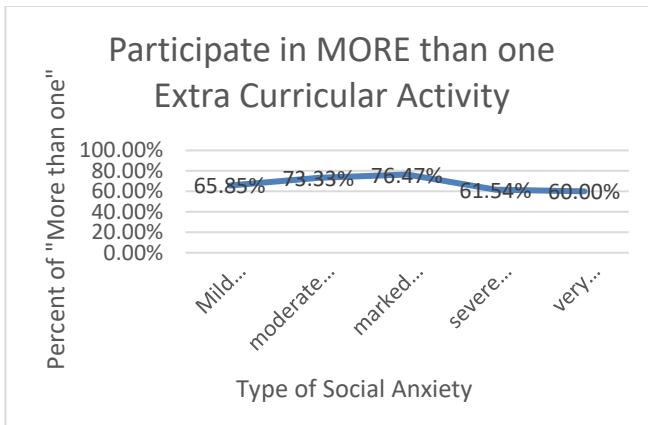
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Appendix J



This graph shows a visual of the percentage of students who participate in just one extracurricular activity that fall under each social anxiety category. We see from the graph that less people fall under the very severe anxiety that participate in an activity.

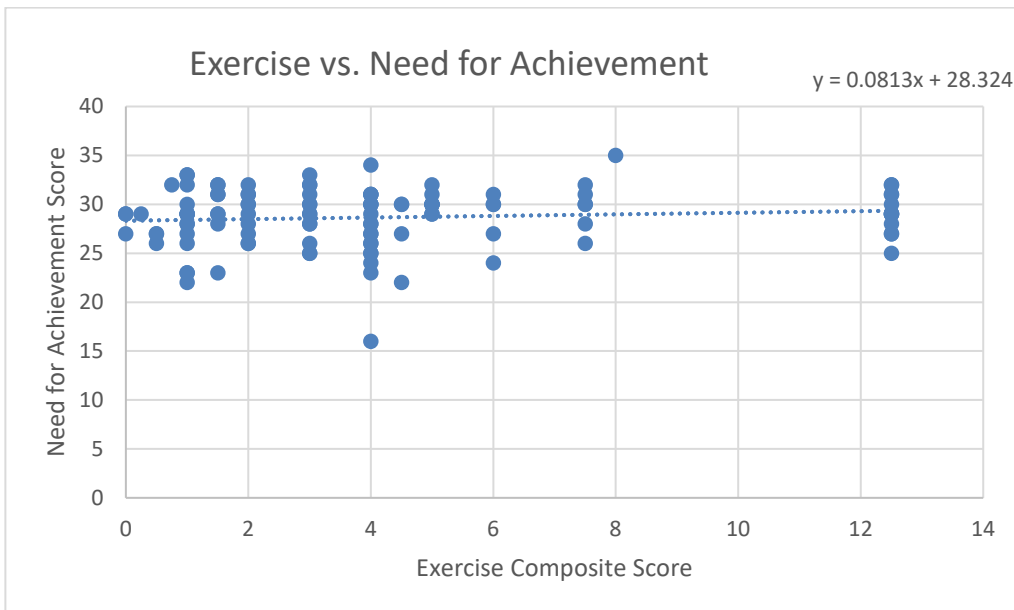
Appendix K



This graph shows a visual of the percentage of students who participate in more than one extracurricular activity that fall under each social anxiety category. Majority of participants participate in more than one activity which is why these percentages in each social anxiety category are the highest.

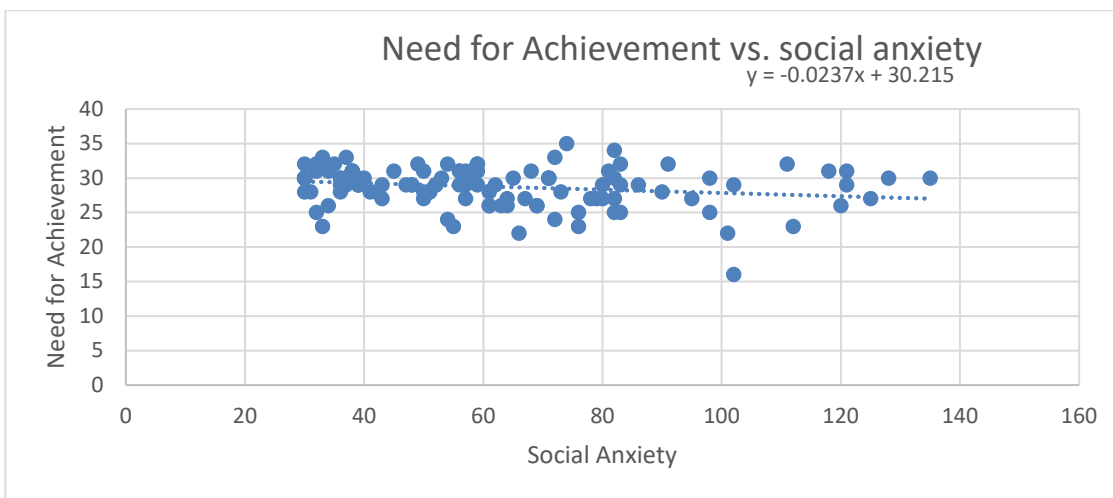
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Appendix L



This graph shows the relationship between the students exercise composite score and their need for achievement in excellence score. The graph looks like the more the student exercises the more they have a need to achieve, however the p-score was not significant enough to make the conclusion that there is a direct relationship between these two variables.

Appendix M



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This graph depicts the relationship between students' social anxiety score and their need for achievement in excellence score. According to the line of best fit, the higher an individual scores in social anxiety, the less they have a need to achieve. This relationship was proven based on the p-score to show that this relationship is significant.

Appendix N

1. Gender?
2. Grade?
3. What is your cumulative GPA? (This means at the current moment)
4. Are you a college athlete?
5. Do you exercise?
6. If answered yes to the previous question, how often do you participate in physical activity?
7. What physical exercise do you participate in?
8. How long do you exercise each day?
9. Do you have a gym membership?
10. Are you involved in any extracurricular activities?
11. I hate to see bad workmanship
12. Part of the satisfaction in doing something comes from seeing how good the finished product looks
13. It is no use playing a game when you are playing with someone as good as yourself
14. I get a sense of satisfaction out of being able to say I have done a very good job on a project
15. I find satisfaction in working as well as I can
16. I find satisfaction in exceeding my previous performance even if I don't outperform others
17. There is satisfaction in a job well done
18. Fear of anxiety in the following situations: Telephoning in public

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19. How would you rate your avoidance of the situation above?
20. Fear/anxiety in the following situation: Participating in small groups
21. How would you rate your avoidance of the situation above?
22. Fear/anxiety in the following situation: Eating in public places
23. How would you rate your avoidance of the situation above?
24. Fear/anxiety in the following situation: Drinking with others in public places
25. How would you rate your avoidance of the situation above?
26. Fear/anxiety in the following situation: talking to people in authority (boss, teacher, etc).
27. How would you rate your avoidance of the situation above?
28. Fear/anxiety in the following situation: Acting, performing or giving a talk in front of a large audience.
29. How would you rate your avoidance of the situation above?
30. Fear/anxiety in the following situation: going to a party (not knowing everyone)
31. How would you rate your avoidance of the situation above?
32. Fear/anxiety in the following situation: working while being observed
33. How would you rate your avoidance of the situation above?
34. Fear/anxiety in the following situation: writing while being observed
35. How would you rate your avoidance of the situation above?
36. Fear/anxiety in the following situation: calling someone you don't know very well
37. How would you rate your avoidance of the situation above?
38. Fear/anxiety in the following situation: talking with people you don't really know very well
39. How would you rate your avoidance of the situation above?
40. Fear/anxiety in the following situation: meeting strangers
41. How would you rate your avoidance of the situation above?
42. Fear/anxiety in the following situation: urinating in a public bathroom
43. How would you rate your avoidance of the situation above?

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44. Fear/anxiety in the following situation: entering a room when others are already seated
45. How would you rate your avoidance of the situation above?
46. Fear/anxiety in the following situation: being the center of attention (ex: telling a story to a group of people)
47. How would you rate your avoidance of the situation above?
48. Fear/anxiety in the following situation: speaking up at a meeting
49. How would you rate your avoidance of the situation above?
50. Fear/anxiety in the following situation: taking a written test
51. How would you rate your avoidance of the situation above?
52. Fear/anxiety in the following situation: expressing appropriate disagreement or disapproval to people you don't know very well
53. How would you rate your avoidance of the situation above?
54. Fear/anxiety in the following situation: looking at people you don't know very well in the eyes
55. How would you rate your avoidance of the situation above?
56. Fear/anxiety in the following situation: giving a report to a group
57. How would you rate your avoidance of the situation above?
58. Fear/anxiety in the following situation: trying to pick up someone (refers to single person attempting to initiate a relationship with a stranger)
59. How would you rate your avoidance of the situation above?
60. Fear/anxiety in the following situation: returning goods to a store where returns are normally accepted
61. How would you rate your avoidance of the situation above?
62. Fear/anxiety in the following situation: having an average party
63. How would you rate your avoidance of the situation above?
64. Fear/anxiety in the following situation: resisting a high-pressure salesperson
65. How would you rate your avoidance of the situation above?

WORKS CITED

Agarwal S. K. (2012). Cardiovascular benefits of exercise. *International journal of general medicine*, 5, 541–545.

Amatriain-Fernández, S., Murillo-Rodríguez, E. S., Gronwald, T., Machado, S., & Budde, H. (2020). Benefits of physical activity and physical exercise in the time of pandemic. *Psychological Trauma: Theory, Research, Practice, and Policy*, 12(S1), S264.

Babenko, O., Mosewich, A., Abraham, J., & Lai, H. (2018). Contributions of psychological needs, self-compassion, leisure-time exercise, and achievement goals to academic engagement and exhaustion in Canadian medical students. *Journal of educational evaluation for health professions*, 15, 2.

Bernecker, K., & Kramer, J. (2020). Implicit theories about willpower are associated with exercise levels during the academic examination period. *Sport, Exercise, and Performance Psychology*, 9(2), 216.

Deslandes, A., Moraes, H., Ferreira, C., Veiga, H., Silveira, H., Mouta, R., Pompeu, F. A., Coutinho, E. S., & Laks, J. (2009). Exercise and mental health: many reasons to move. *Neuropsychobiology*, 59(4), 191–198.

Cassidy, T., & Lynn, R. (1989). A multifactorial approach to achievement motivation: The development of a comprehensive measure. *Journal of Occupational Psychology*, 62, 301-312.

Let's Hit the Gym: An analysis of the relationship between exercise, achievement, and social anxiety

Honors Thesis for Angela LeBel

Plant, E. A., Ericsson, K. A., Hill, L., & Asberg, K. (2005). Why study time does not predict grade point average across college students: Implications of deliberate practice for academic performance. *Contemporary educational psychology, 30*(1), 96-116.

Esch, T., & Stefano, G. B. (2010). Endogenous reward mechanisms and their importance in stress reduction, exercise and the brain. *Archives of medical science: AMS, 6*(3), 447.

Gibbison, G. A., Henry, T. L., & Perkins-Brown, J. (2011). The chicken soup effect: The role of recreation and intramural participation in boosting freshman grade point average. *Economics of Education Review, 30*(2), 247-257.

Hillman, C. H., Erickson, K. I., & Kramer, A. F. (2008). Be smart, exercise your heart: exercise effects on brain and cognition. *Nature reviews neuroscience, 9*(1), 58-65.

Masia-Warner, C., Storch, E. A., Pincus, D. B., Klein, R. G., Heimberg, R. G., & Liebowitz, M. R. (2003). The Liebowitz social anxiety scale for children and adolescents: an initial psychometric investigation. *Journal of the American Academy of Child & Adolescent Psychiatry, 42*(9), 1076-1084.

Rimer, J., Dwan, K., Lawlor, D. A., Greig, C. A., McMurdo, M., Morley, W., & Mead, G. E. (2012). Exercise for depression. *Cochrane database of systematic reviews, 7*.

Schneier, F. R. (2006). Social anxiety disorder. *New England Journal of Medicine, 355*(10), 1029-1036.

Let's Hit the Gym: An analysis of the relationship between exercise, achievement, and social anxiety

Honors Thesis for Angela LeBel

Sleep basics: REM & NREM, sleep STAGES, good sleep habits & more. (n.d.). Retrieved

March 25, 2021, from <https://my.clevelandclinic.org/health/articles/12148-sleep-basics>

Taylor, C. B., Sallis, J. F., & Needle, R. (1985). The relation of physical activity and exercise to mental health. *Public health reports, 100*(2), 195.

US Department of Health and Human Services. (2008). US Department of Health and Human Services 2008 physical activity guidelines for Americans. *Hyattsville, MD: Author, Washington, DC, 2008*, 1-40.

Wingate, S., Crawford, L., Frith, E., & Loprinzi, P. D. (2018). Experimental investigation of the effects of acute exercise on memory interference. *Health promotion perspectives, 8*(3), 208.