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Impact of Physical Activity Levels on College Student Depression, Anxiety, and Stress

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Abstract

A moderate to high prevalence of depression, anxiety, and stress have been found in undergraduate students. Physical activity has been shown to decrease anxiety, depression, and stress. Examining the impacts of physical activity on the mental health of college students might show to be beneficial. **PURPOSE:** To assess if self-reported physical activity levels impact depression, anxiety, and stress levels in college students. **METHODS:** A total of 92 college students from private institutions in central Minnesota completed an online survey. The survey collected demographics including age, gender, height, weight, and year in school. The International Physical Activity Questionnaire (IPAQ) was used to assess physical activity and the Depression Anxiety Stress Scale-21 (DASS21) was used to assess depression, anxiety, and stress. The IPAQ and DASS21 surveys were scored and participants were placed into three groups based on reported MET-minutes per week. Groups were categorized as low physical activity (LPA), moderate physical activity (MPA), and high physical activity (HPA). All three subscales of the DASS21 we utilized measuring depression, anxiety, and stress. A one-way ANOVA was used to evaluate the physical activity levels and depression, anxiety, and stress. A Fisher's Least Significant Difference (LSD) post-hoc test was conducted. **RESULTS:** There was a significant main effect of physical activity on depression, $F(2, 89) = 7.958, p < .001$, specifically between the LPA (11.4 ± 10.6) and HPA (5.5 ± 5.3) groups, $p < .05$ and between the MPA (11.3 ± 7.7) and HPA (5.5 ± 5.3) groups, $p < .001$. There was no statistical significance between groups for anxiety, $F(2, 89) = 1.127, p = .329$ or stress, $F(2, 89) = 1.520, p = .224$. **CONCLUSION:** Individuals who were in the HPA group reported the lowest depression scores, suggesting that if students participate in physical activity for approximately 3 days of vigorous

activity or 7 days of combined walking, moderate-intensity, and high intensity-intensity activities a week then they would have less depression symptoms.

Key words

Exercise; mental health; well-being; young adult; workout

Introduction

College students can experience anxiety, depression, eating disorders, attention-deficit hyperactivity disorder (ADHD), and other mental health challenges (Pedrelli et al., 2014). Approximately 35% of college students currently meet the diagnostic criteria for a mental health disorder (Friesen, 2022). For example, to meet the diagnostic criteria for depression, you must have five or more of the symptoms within a two-week period, and one of the symptoms must either be a depressed mood or a loss of interest or pleasure (American Psychiatric Association, 2013). The other symptoms are appetite or weight changes, sleep difficulties, lower ability to concentrate, feelings of worthlessness, and suicidal ideation (American Psychiatric Association, 2013). It was found that more than one in three undergraduate students reported “feeling so depressed it was difficult to function” at least once in the previous year (Hunt & Eisenberg, 2010). There are many things that contribute to college students’ mental health, such as high academic pressures, navigating social lives, living away from family, and balancing many activities and responsibilities (Pedrelli et al., 2014). Also, if someone is going to have a chronic mental disorder, they will likely experience their first sign of it by age 24, which is very close to the age of a typical college student (Hunt & Eisenberg, 2010). Another thing that particularly affects first-year college students is the transition from high school to college (Cleary et al., 2011). This transition leads to some students moving away from home, meaning less contact and interaction with family and friends. Students make new friends and become acquainted with their

new living situations. These students also experience things in college such as drugs, alcohol, and sexual activity (Cleary et al., 2011). All these factors can greatly impact the mental health of college students.

One diagnosis where poor mental health can show up in college students is depression. Depression rates are higher among college students than the general population (Zhou et al., 2022). Females are overall found to be more commonly reporting depression than men (Jenkins et al., 2020). Students who battle depression may also experience suicidal ideations. Depressive symptoms are the most important direct predictor of suicidal ideation (Zhou et al., 2022). Personality traits, such as neuroticism and extroversion, can also have an effect on suicidal ideation rates (Zhou et al., 2022). Neuroticism is a personality trait relating to the tendency toward anger, anxiety, irritability, and emotional instability (Widiger & Oltmanns, 2017). Extroversion is a personality trait that is associated with being energetic, outgoing, and enjoying being social (Merriam-Webster).

Symptoms of anxiety are also very common mental health issues among college students (Friesen, 2022). Anxiety rates are found to be higher among college students than the general population (Zhou et al., 2022). Applicable anxiety disorders can consist of social phobia, post-traumatic stress disorder, generalized anxiety disorders, and panic disorders (Pedrelli et al., 2014). First-year students can experience attachment anxiety and thus experience higher level of loneliness, affecting their overall mental health (So & Fiori, 2022) Perfectionism has also been linked to higher anxiety in college students (Lamarre & Marcotte, 2021). Mindfulness can work to decrease perfectionism, and this could lead to decreased anxiety (Lamarre & Marcotte, 2021). Similar to depression, there is a gender difference with anxiety. Women experience higher

anxiety levels, but the effects of mindfulness on perfectionism is also greater for women (Lamarre & Marcotte, 2021).

College students can experience stress in many areas of their lives, including academics, finances, and relationships. Again, women were found to report greater amounts of stress, but also reported using more self-help and coping strategies (Brougham et al., 2009). There are many factors that can affect stress levels, such as personality traits. Higher stress levels are associated with people who have neuroticism scores (Fruth, 2022). People with higher resilience (ability to withstand difficulties) report lower levels of stress (Fruth, 2022), along with students who lived on campus (Ewing & Hamza, 2023). The presence or absence of a romantic relationship can influence stress. Romantic relationships have been found to affect stress both positively and negatively (Ewing & Hamza, 2023). Academic stressors may contribute significantly to stress experienced by students. Students with the highest stress were those experiencing the greatest number of stressors from their education (Ewing & Hamza, 2023). There have been some findings, however, that some students reported starting university with mental health concerns or having stress freshman year, but that it improved throughout college (Ewing & Hamza, 2023).

Physical activity has been shown to positively impact health (Vina et al., 2012). Physical activity is important for everyone's overall health, and it can help in the prevention of diseases including cardiovascular disease, metabolic disorders, type 2 diabetes, and cancer. Physical activity as light as walking decreases sedentary time and has been shown to have positive effects on health (Vina et al., 2012). Physical activity has not only been shown to have a positive impact on physical health, but also mental health. It has been found that greater amounts of aerobic exercise correlate with better mental health (Li, 2022). It is very important for current college students to get adequate amounts of physical activity to aid in their mental health (Cai, 2022).

Therefore, the purpose of this study is to assess if self-reported physical activity levels impact depression, anxiety, and stress levels in college students. It is hypothesized that individuals who achieve the highest amount of physical activity will have lower levels of reported stress, anxiety, and depression.

Methods

This study was approved by the Institutional Review Board (IRB) at the College of Saint Benedict and Saint John's University. The online survey was taken by 97 participants, ages 18 to 25 (20.6 ± 1.2) and due to outlying data, 5 were removed. All participants were from the College of Saint Benedict and Saint John's University and were recruited via email and word of mouth. Names and other identifying information were not collected, and all data was kept in a secure location that only the researcher could access. The survey collected demographics including age, gender, height, weight, and year in school. The International Physical Activity Questionnaire (IPAQ) was used to assess physical activity. This survey grouped them into three groups based on total MET-minutes per week: low physical activity (LPA), moderate physical activity (MPA), and high physical activity (HPA). MET-minutes per week are calculated based on weight and activity minutes of different intensities. This survey has been proven to be valid and reliable in clinical and non-clinical settings (Vasheghani-Farahani, 2011). The Depression Anxiety Stress Scale-21 (DASS21) was used to assess depression, anxiety, and stress levels. This survey contained 21 questions which were answered on a 4-point scale referring to the previous week of their lives. This survey has been proven to be valid and reliable in clinical and non-clinical settings (Stokowski, et. al., 2022). Once the data was collected and the surveys were scored, the researcher removed outliers (those who engaged in more than two standard deviations above the average of the sample of exercise minutes per week). For data analysis, the researcher conducted

a one-way ANOVA to evaluate the physical activity levels and depression, anxiety, and stress scores using SPSS (a statistical software). A Fisher's Least Significant Difference (LSD) post-hoc test was conducted.

Results

The respondent demographics are summarized in Table 1.

Table 1

Respondent demographics

Variable	n	Mean	SD
Age		20.6	1.2
Height (in cm)		171.6	9.3
Weight (in kg)		72.6	13.6
Female	64		
Male	27		
Non-binary	1		
First-year	10		
Sophomore	12		
Junior	19		
Senior	51		

A one-way ANOVA was conducted to determine the effects of physical activity on depression, anxiety, and stress levels. There was a significant main effect of physical activity on depression, $F(2) = 7.9, p < 0.001$. Post hoc testing (LSD) found significance between the LPA (11.4 ± 10.6) and HPA (5.5 ± 5.3) groups, $p < 0.05$ and between the MPA (11.3 ± 7.7) and HPA (5.5 ± 5.3) groups, $p < 0.001$. There was no statistical significance between groups for the anxiety category, $F(2) = 1.1, p = 0.3$ or stress category, $F(2) = 1.5, p = 0.2$. This data is listed in Table 2. Statistical significance was accepted at the $p < 0.05$ level.

Table 2
LSD Test for Dependent Variables

Dependent Variable	Physical Activity Category	Physical Activity Category	Mean Difference	Standard Error	Significance	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Stress Score	LPA	MPA	-2.3	2.9	0.4	-7.9	3.4
		HPA	0.8	2.8	0.8	-4.7	6.3
	MPA	LPA	2.3	2.9	0.4	-3.4	7.9
		HPA	3.1	1.8	0.1	-0.5	6.6
	HPA	LPA	-0.8	2.8	0.8	-6.3	4.7
		MPA	-3.1	1.8	0.1	-6.6	0.5
Anxiety Score	LPA	MPA	-2.4	2.8	0.4	-7.9	3.2
		HPA	0.2	2.7	0.9	-5.2	5.5
	MPA	LPA	2.4	2.8	0.4	-3.2	7.9
		HPA	2.5	1.7	0.2	-0.9	6.0
	HPA	LPA	-0.2	2.7	0.9	-5.5	5.2
		MPA	-2.5	1.7	0.2	-6.0	0.9
Depression Score	LPA	MPA	0.1	2.5	0.9	-4.8	5.1
		HPA	5.9	2.4	0.02*	1.1	10.7
	MPA	LPA	-0.1	2.5	0.9	-5.1	4.8
		HPA	5.8	1.6	<.001*	2.7	8.9
	HPA	LPA	-5.9	2.4	0.02*	-10.7	-1.1
		MPA	-5.8	1.6	<.001*	-8.9	-2.7

Note. Significance at the * 0.05 level; LPA=Low Physical Activity, MPA=Moderate Physical Activity, HPA=High Physical Activity

Discussion

Mental health disorders, including depression, anxiety, and stress levels, among college students are greater than the general population (Zhou et al., 2022). It is important for these students to be able to manage their mental health, so they can succeed. This study found that individuals who were in the HPA group reported the lowest depression scores, suggesting that if students participate in physical activity for approximately three days of vigorous activity or seven days of combined walking, moderate-intensity, and high-intensity activities a week then they would have fewer depressive symptoms.

These results are supported by many other studies. Most studies have found that physical activity has a positive impact on well-being. (Vina et al., 2012) A study done by Li (2022), found

that greater amounts of exercise correlated with better mental health reports (Li, 2022). Physical activity has also been found to positively impact the mental health of specifically the college student population. (Cai, 2022) Depression rates could decrease due to the physiological mechanism of endorphins and hormones being released during exercise. Dopamine and serotonin are endorphins that are associated with exercise and mental health. When these are released, they can increase happiness and well-being feelings in the brain. The dose response relationship is not clear; however, so we are not able to conclude that there is a linear relationship between increased physical activity and decreased mental health issues.

Although the results were not statistically significant, physical activity could have an impact on the stress and anxiety levels of college students. Past research has found physical activity to positively affect anxiety symptoms. (Dong et al., 2022) For this study, anxiety and stress could have not been statistically significant for many reasons, such as the survey being taken at the end of the semester and the study being very upperclassmen heavy.

This study included some limitations, such as the subjectiveness of the surveys. People might not realize how much they sit every day or overestimate the amount of exercise they get, so this could have skewed the data. It was limited to certain colleges, so this sample does not accurately represent the entire population. The sample was also only college-aged individuals.

Conclusion

This study concluded that physical activity has a positive impact on depression scores in college students but had no statistical significance on stress and anxiety levels. Physical activity had the most impact on depression levels when in the highest physical activity category. These results both agreed and disagreed with past research, so further research is still needed. It would be beneficial for future research to not use all self-reported data to make sure all data is reliable.

Physical activity could be measured using wearable fitness trackers, for example. Future research could be the same study but getting a higher participant population and more varied samples.

Future research could also examine the relationship between different types of physical activity, including aerobic versus anaerobic exercise, and mental health reports. It would also be useful to collect these measurements throughout many parts of the semester, instead of just one collection period.

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