

THE INFLUENCE OF PHYSICAL ACTIVITY ON THE LEVEL OF ANXIETY IN FEMALE STUDENTS

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Abstract: To examine the impact of physical activity (FA) on students' mental health, primarily on the manifestation of anxiety symptoms (DAS), a study was conducted on 116 females, aged, $21,37 \pm 5.70$ years. All respondents are undergraduate students of the Faculty of Sport and Psychology, TIMS, from Novi Sad, Serbia. For the purposes of this research, two measuring instruments were used, (DASS-21) and (GSLTPAK). The first of them is a shortened version of the scale of Depression, Anxiety and Stress, and the second is a short form of Godin's free time exercises. Analyzing the obtained results, it was possible to determine a significant negative correlation of light physical activity with the level of anxiety ($r = -0.379$, $p = 0.000$), but intense physical activity also showed a statistically significant correlation ($r = -0.257$, $p = 0.024$). Unlike them, moderate physical activity did not exhibit a statistically significant correlation ($r = -0.122$, $p = 0.121$). Using multiple regression analysis, it was determined that light physical activity is a statistically significant predictor of anxiety level (Unstd.Beta=-0623, $p=0.000$), and in that case the model explains 22.1% ($R^2_{\text{adjust}}=0.221$). The obtained results coincide with previous research that confirms the positive effects of physical activity on mental health. In this sense, the application of light physical activity can contribute to reducing anxiety among students.

Keywords: physical activity, mental health, anxiety, female students.

INTRODUCTION

Many benefits of physical activity have been proven before, including the fact that physical activity can significantly affect the mental health of students. The pressure of academic obligations, parental and environmental expectations, as well as the turbulence of the transition to adulthood in this population can cause high levels of stress, anxiety and depression. In that case, physical activity proved to be an excellent method for reducing the symptoms of negative pathological conditions. The aggravating circumstance for this population is precisely the fact that the most significant decline in physical activities occurs precisely in the period of beginning university studies (Kwan, Cairney, Faulkner & Pullenaiegun, 2012). Research has shown (Craft, Perna, 2004) that physical activities, in addition to improving health, also affect a better mood, reducing muscle tension, releasing endorphins, the so-called hormones of happiness or good feeling. At the same time, a large number of studies confirm the fact that regular physical activity can help reduce stress and anxiety (Anderson & Shivakumar, 2013, Vancampfort, Stubbs, Koianagi, 2017, Kandola & Stubbs, 2020, Singh, Olds, Curtis, et al., 2023). It has also been confirmed (Bayram & Bilgel, 2008) that young people are increasingly susceptible to anxiety disorders, with female students often reporting higher levels of stress and anxiety compared to their male counterparts. Anxiety as a negative psychological state is accompanied by a feeling of fear, worry and tension, which can often be without a clear or justified cause. Some of the symptoms of anxiety are "pounding" and rapid heartbeat, dizziness, fainting, sweating. If this condition is not treated in time, i.e. if it becomes excessive and long-lasting, it can significantly impair daily functioning and quality of life (American Psychiatric Association, 2013, National Institute of Mental Health, 2024). Further research (Grim, Hertz & Petosa, 2011) confirms that the biggest decline in physical activity occurs at the beginning of academic studies, which leads to a decrease in recommended physical activities after the age of 24. The situation is similar in Serbia (Stupar, Beretić & Mededović, 2023). Anxiety is particularly common among students, and several studies indicate that a significant portion of students experience anxiety symptoms while studying. The American College Health Association standardized the National College Health Assessment (NCHA) survey to determine a wide range of health problems that affect students and their academic achievement. Their data shows that 86% of respondents experienced moderate or high levels of stress in the past 12 months, where the most reported symptoms were anxiety (22%), depression 18%, which is in line

with the results from 2018 (American College Health Association, 2021). On the other hand, at universities in Serbia, during the COVID-19 pandemic, research showed that 33.6% of students had symptoms of anxiety, and in addition to the standard pressure from parents due to academic obligations, a stressful and uncertain period of time was cited as a special reason (Višnjić, Kok, Višnjić, Jovanović & Marković, 2023). In light of the aforementioned points, the purpose of this paper is to examine the impact of physical activity levels on different aspects of the mental health of students, particularly focusing on the reduction of anxiety symptoms in female students.

MATERIAL AND METHODS

Sample of respondents

All respondents, 116 of them, are undergraduate female students at the Faculty of Sport and Psychology, TIMS, based in Novi Sad, Serbia. Their average age was 21.37 years (SD=5.70), average height 167.31 m (SD=6.50), and average body weight 59.50 kg (SD=7.86). In relation to physical activities, the majority of respondents reported engaging in light physical activities with an average score of 3.88 (SD=2.53), on a scale from 0 to 7, followed by moderate physical activity with an average of 2.77 (SD=2.13), and finally intense physical activity with an average score of 0.94 (SD=1.86), as the least exercise. The anxiety level had an average score of 6.25 (SD=5.46), which indicates a high variability of the observed population, given that the range was from 0 to 25.

Sample of measures

The measuring instruments used were (DASS-21) and (GSLTPAK).

(DASS-21) is a 21-item self-report scale of depression, anxiety, and stress dimensions, with each dimension consisting of 7 items, on a scale from 0 (not at all applicable to me) to 3 (completely applicable on me). The symptoms of feeling worthless, loss of interest and lack of satisfaction were used to assess the depression subscale. The anxiety subscale assesses symptoms such as autonomic arousal, skeletal muscle effects, subjective feelings of distress, and situational anxiety. The stress subscale focuses on symptoms of chronic tension, irritability, and inability to relax (Lovibond & Lovibond, 1995). Scores on each subscale are summed and then multiplied by two to obtain a composite score, with higher scores indicating greater symptom intensity. This scale is well validated and widely used in the young adult population to assess psychological status.

The Godin Questionnaire for Physical Activity in Leisure Time (GSLTPAK) is a questionnaire that measures the level of physical activity in leisure time. Participants assessed the frequency of strenuous, moderate and mild activities in which they engaged during a week. (GSLTPAK) is Godin's questionnaire that determines the level of physical activities in free time, where the participants estimate the frequency of light, moderate and intensive activities they engaged in during a week. To calculate the total amount of physical activity, each activity category was multiplied by the following values: Strenuous physical activity: number of days multiplied by 9, Moderate physical activity: number of days multiplied by 5, Mild physical activity: number of days multiplied by 3. The resulting values were then summed to obtain a weekly leisure time physical activity score (Godin, 2011). This questionnaire is practical for assessing the level of physical activity and provides information about different intensities of activity.

Statistical analysis

Descriptive statistics were used to describe the baseline characteristics of the sample of subjects, including age (AGE), body height (BH), body mass (BM), level of light (LIGHTACT), moderate (MEDACT), and vigorous physical activity (INTACT), as well as level anxiety (ANXLEVEL). Arithmetic mean (Mean) and standard deviation (SD), as well as minimum and maximum values were calculated for each variable. Pearson's correlation analysis was used to examine the relationship between the intensity of physical activity (LIGHTACT, MEDACT, INTACT) and the level of anxiety (ANXLEVEL). The Pearson correlation coefficient (r) was used to measure the strength and direction of the linear relationship between two variables. P-values (p) were used to assess the statistical significance of these correlations, with a value of $p < 0.05$ considered statistically significant. In order to identify significant predictors of anxiety level, multiple regression analysis was applied using the backward method (ANXLEVEL). In this analysis, all variables were initially included in the model and then gradually eliminated until the optimal model was reached. The data analysis involved utilizing the Statistical Package for Social Sciences (SPSS) version 26.0 by SPSS Inc. in Chicago, IL, USA.

RESULTS

Table 1. Distribution of respondents according to the level of physical activity (Godin, 2011).

Godin Scale Score	Interpretation	Number of respondents	% Number of respondents
24 units or more	Active	20	17.24%
14 – 23 units	Moderately Active	33	28.44%
Less than 14 units	Insufficiently Active/Sedentary	63	54.32%
		116	100 %

The classification of the level of physical activity in relation to the total score of respondents is given in Table 1. Formula for calculating Total leisure activity score= (9 × Strenuous) + (5 × Moderate) + (3 × Light).

Table 2. Pearson's correlation coefficient between intensity of physical activity and anxiety level (n = 116).

Variables	ANXLEVEL	p
LIGHTACT	-0.379	0.000
MEDACT	-0.122	0.121
INTACT	-0.257	0.024

Light activity (LIGHTACT), Medium activity (MEDACT), Intensive activity (INTACT), level of anxiety (ANXLEVEL), $p < 0.05$ was considered statistically significant

Research reports (Table 2) clearly show a strong negative correlation between light physical activity and anxiety levels, with greater intensity of light physical activity associated with lower levels of anxiety. Also, a p-value of 0.000 indicates a statistically significant correlation. Again, the correlation between moderate physical activity and the level of anxiety was determined, which is negative, but weak and not statistically significant ($p > 0.05$). This means that moderate physical activity in this sample has no significant effect on the level of anxiety. At the same time, the analysis of the obtained results found that there is a negative correlation between intense physical activity and the level of anxiety, i.e. that higher intensity of intense physical activity is associated with lower levels of anxiety. At the same time, the strength of this correlation is statistically significant, but also weaker compared to that of light physical activity with a p-value of 0.024. Therefore, the findings imply that higher levels of light and intense physical activity could be beneficial in reducing anxiety levels.

Table 3. Backward method multiple-regression analysis of the anxiety level with significant predictor variables (n = 116).

Variables	Unstd.Beta	Beta	t	p	R	R ² _{adjust}	Std.Err.Est.	F	P
LIGHTACT	-0.623	-0.379	-3.948	0.000	0.471	0.221	5.402	8.793	0.000

Light activity (LIGHTACT), Unstd.Beta = Unstandardized regression coefficients values, Beta = Standardized regression coefficients values, t = Standardized regression coefficients significance test, p = Standardized regression coefficients level of significance, R = Multiple correlation coefficient, R²_{adjust} = Adjusted determination coefficient, Std. Err. Est. = Standard error of the estimate, F = Multiple regression analysis significance tests, P = Multiple correlation level of significance.

The obtained results (Table 3), above all the negative coefficient (Unstd Beta) in the statistical model show that increased light physical activity is associated with decreased anxiety. Also, the Beta coefficient shows the relative contribution of this variable in the model, which further emphasizes the importance of the relationship between light physical activities and anxiety levels. Furthermore, the statistical significance ($p = 0.000$) emphasizes the strong predictive power of light physical activity on anxiety levels. The results obtained from the multiple regression analysis reveal a noteworthy finding: there is a significant negative correlation between light physical activity and anxiety levels. The resulting model shows that it explains 22.1% of the variability in anxiety levels, which is a fairly signifi-

cant contribution. At the same time, this means that there are other factors that should be investigated as potential predictors of anxiety levels.

DISCUSSION

Based on an examination of these results in conjunction with prior correlational analyses, it becomes clear that both light and intense forms of physical activity may have a profound impact on reducing anxiety levels. This suggests the potential for further research to explore the mechanisms behind this impact and to consider practical applications that can use these insights to develop strategies aimed at reducing anxiety through the promotion and encouragement of physical activity.

Comparison with Recent Studies

The results of this research are consistent with similar ones that confirm that physical activity can have a positive effect on mental health. Earlier research also confirms that it can be very effective in reducing symptoms of anxiety and depression in the student population as well (Liu & Shi, 2023, Liu et al, 2024). The group of authors Kandola et al. (2020), have just researched that topic and concluded that light and moderate physical activities, such as walking and yoga, led to a statistically significant reduction in anxiety in a large group of young adults. This implies that light physical activity that is not too physically and mentally demanding, and at the same time can be easily organized and integrated into everyday life, actually has the most significant impact on mental health. The same conclusions were reached by the authors Schuch et al. (2019), who through a meta-analysis, aimed to determine the effects of exercise on anxiety, confirmed that both light and vigorous physical activities can contribute to mental health, with the best effects observed with less intense exercises. All these findings follow the results obtained in this research, where a statistically significant correlation was obtained between light physical activities and lower levels of anxiety in female students who engaged in the same more regularly.

This is consistent with the significant correlation between light physical activity and lower anxiety levels observed in this study, where students who engaged in more frequent light activities reported reduced anxiety. The non-significant relationship between moderate physical activity and anxiety observed in this study contrasts with some recent research. For example, (Liu & Shi, 2023) found that moderate-intensity physical activity significantly reduced anxiety among university students. Additionally, our finding that intense physical activity had a weaker but still significant negative correlation with anxiety is supported by Meyer et al. (2020). They found that while intense physical activity was beneficial for reducing stress and anxiety, its effects were less pronounced compared to light or moderate exercise.

Interpretation of Findings

Research has shown that there is a fairly strong connection between mainly light physical activities and a lower level of anxiety in female students. This can be explained by the fact that walking or leisurely cycling, which belong to light physical activities, are closer to students who meet academic requirements. In addition, this type of physical activity does not require too much mental stress or fatigue, which is why they are more interesting for students. The ability to reduce cortisol levels while exercising and create a feeling of relaxation without overexertion is the main advantage of light physical activities over others (Kandola et al., 2020).

Similar research results, which indicate that intense physical activity had a weaker but statistically significant correlation with anxiety, were also obtained in the work of (Meir et al., 2020). In their work concerning the mental health of students during the COVID-19 pandemic, it was confirmed that intense physical activities had the effect of reducing anxiety and stress, but compared to light and moderate physical activities, the effects were smaller. The main problem they see is that high-intensity exercise requires serious engagement, which in conditions where they are exposed to academic pressures, can limit their ability to engage regularly, thereby reducing their overall impact on mental health. The importance of high-intensity exercises is also discussed by the author's research (Schuch et al., 2019), who believe that these exercises can initially increase the level of stress, but if practiced over a longer period of time, they can improve emotional resilience. This is in line with the results of this research, where intense activity showed a weaker, although significant, effect on anxiety.

On the other hand, the analysis of the data obtained in this research revealed the lack of a statistically significant relationship between moderate physical activity and anxiety, which is not in accordance with some recent studies.

Thus, in the research of (Liu & Shi, 2023), confirm the exact opposite thesis, namely that moderate physical activity has a significant positive effect on reducing anxiety among students. At the same time, this difference can be attributed to the very definition of moderate activities that are measured through studies or to differences in the student population. In the mentioned research, moderate activity was observed as part of an organized and well-structured program, which resulted in a reduction of anxiety. Also, the reason for not obtaining a statistically significant correlation between moderate physical activities and anxiety may also be a consequence of irregular exercise, i.e. exercising them. Only well-structured moderate activities such as fitness classes can ultimately contribute to better health outcomes (Meier et al., 2020). If moderate activities are less pleasant and sporadic, then in that case they will not cause a positive effect like light physical activities.

In a post-pandemic study (Liu & Shi, 2023), regular physical activity was shown to be associated with lower levels of anxiety, which could be explained by the adoption of positive coping styles among college students and improved psychological resilience. Other authors (Atalay & Gencoz, 2008) emphasize that physical activity plays a key role in reducing anxiety and strengthening self-confidence regarding body appearance. This especially applies to young women who are exposed to various influences of society and the environment. It has already been mentioned that numerous studies have confirmed that the transition from high school to college represents a period of decline in physical activity (McMaster University, 2011), and this is also confirmed by a study published in the *International Journal of Behavioral Nutrition and Physical Activity* (Aira, et al 2021). In this sense, this research also confirmed the significant impact of physical activities, in this case light, but also intense, on reducing the level of anxiety of female students.

Implications

The obtained results indicate the importance of light physical activities, and we should think in that direction, and this type of activity, which includes walking, yoga, light running, should be used as effective interventions to reduce anxiety among students. Considering the simple organization of these types of activities, it would be good if they were included in all universities and available to all students during their studies.

Limitations of the Study

Certainly, subjectivity when filling in data on physical activity and the level of intensity thereof, as well as memory bias can be considered as a limitation. It should also be emphasized that longitudinal research would certainly provide more data for the analysis of this problem.

CONCLUSION

Based on the obtained results and their analysis, it could be concluded that engaging in primarily light and intense activities had a statistically significant impact on reducing the level of anxiety among female students. Light physical activity appeared as the most significant predictor, as shown by statistically negative correlations and regression coefficients. Also, intense physical activity showed a statistically significant negative correlation with anxiety levels, while moderate physical activity did not show a statistically significant effect. In this sense, this research also confirmed that physical activities can really affect the reduction of anxiety in students, especially in female students. In this sense, it is necessary to work on the promotion and availability of physical activities to the student population.

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