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by Herri Yusfi

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The role of physical activity in the occurrence of depression, anxiety, and stress levels among high school students: A correlational study

^{2de}Herri Yusfi , ^{1abc}Arfa Desa Fitri , ^{*2abc}Wahyu Indra Bayu , ^{1ad}Destriana , & ^{1,3ad}Soleh Solahuddin 

¹Department of Physical Education and Health, Faculty of Teacher Training and Education, Universitas Sriwijaya, Palembang, Indonesia

²Department of Sport Education, Faculty of Teacher Training and Education, Universitas Sriwijaya, Palembang, Indonesia

³Doctoral Programme in Physical Education, Universitas Negeri Jakarta, Jakarta, Indonesia

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ABSTRACT

The COVID-19 pandemic has had a significant impact on physical activity levels, particularly in the context of physical education, leading to a decline in students' physical fitness. This decline in physical fitness may have implications for students, potentially increasing their vulnerability to stress, depression, and anxiety. Therefore, this study aimed to examine the relationship between physical activity and levels of anxiety, stress, and depression among students during the COVID-19 lockdown period. A descriptive quantitative research design was employed, utilizing a correlational method to explore the associations between physical activity and mental health outcomes. The International Physical Activity Questionnaire (IPAQ) and the Depression Anxiety Stress Scale (DASS 42) were used as research instruments. The study included students from Lubuk Linggau 3 State High School, with a sample size of 166 students selected through accidental sampling. Data analysis involved the implementation of Chi-squared and MANOVA tests using Excel and SPSS 25 software. Surprisingly, the study findings revealed no significant relationships between physical activity and depression, anxiety, or stress levels among the participants. Therefore, it can be concluded that physical activity alone may not directly cause depression, anxiety, and stress among students at Lubuk Linggau 3 State High School during the COVID-19 lockdown period. To enhance the generalizability of these findings, future studies should include a more diverse range of participants, such as students from urban areas. Furthermore, exploring additional factors that may contribute to mental health outcomes during the pandemic can provide a more comprehensive understanding of the complex interplay between physical activity and psychological well-being. By expanding the scope of research, valuable insights can be gained to develop tailored interventions and support systems aimed at promoting the overall mental well-being of students across diverse educational contexts.

Keywords: Physical activity; depression; anxiety; stress level; senior high school

***Corresponding Author**

Email: wahyu.indra@fkip.unsri.ac.id



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INTRODUCTION

COVID-19 has been spread all over the world and causes massive loss. Even though the pandemic has started to subside, it is not expected to completely vanish soon. Coronavirus or severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a very dangerous virus, it can attack the respiratory system and causes mild respiratory

problems, and the lungs can experience severe infections (Di Gennaro et al., 2020; Lauer et al., 2020; Lupia et al., 2020). According to the Indonesian Ministry of Health, corona virus is a large virus that can harm humans and animals. This virus can also cause serious diseases such as Middle East Respiratory Syndrome (MERS) and severe acute respiratory syndrome (SARS).

Since distance learning was implemented because of the COVID-19 pandemic, physical education subjects taught in schools have experienced problems related to the delivery of movement tasks to students, which resulted in a decrease in the number of students' physical activity (Basuki et al., 2021). This will impact the level of physical fitness of students who will experience a decline. In addition, the level of education, gender, and limited space for physical activity are factors for passive behavior (Martins et al., 2021; Merrill, 2020; Seet et al., 2021). A study in Brazil stated that the COVID-19 pandemic also affected the quality of life and produces symptoms of anxiety and depression (Silva et al., 2022).

Students are known to be stressful environments, causing students to be at risk of facing mental health problems, such as depression and anxiety (Samji et al., 2022; Xiao et al., 2020). A study showed that the prevalence of depression and anxiety among students was about one-third higher than the average population; especially in Asia (Puthran et al., 2016; Quek et al., 2019). During the pandemic, students not only had to adjust to the 'new normal' but were also forced to attend more online classes (Bayu et al., 2020; Windhiyana, 2020).

Anxiety is a natural human response to stress or perceived threats. Anxiety is a common disorder which refers to a significant and persistent fear of one or more social or performance situations (Arifin et al., 2022; Hebert et al., 2013; Kandola et al., 2018) and it usually begins during the period of adolescence (Chinawa et al., 2015). Students suffering from anxiety usually have fewer and poor quality friendships and delayed or impaired romantic relationships (Hebert et al., 2013). It develops when a person cannot handle their inner and outer feelings. When the stress becomes chronic or exceeds a certain level, it affects an individual's mental health and may lead to different psychological disorders, such as depression (Aldieri et al., 2021). Depression is a worldwide illness marked by feelings of sadness and the inability to feel happy or satisfied (Bourassa et al., 2017; Chen et al., 2022; Kim et al., 2021; Machaczek et al., 2022; Pearce et al., 2022; Rebar et al., 2015; Zalewska et al., 2021). Nowadays, it is a common disorder, increasing day by day. According to the World Health Organization (Abbas et al., 2014), depression was ranked third among the global burden of disease and is predicted to take over first place by 2030. Depression is characterized by the lack of enjoyment, isolation from friends or family, lack of motivation, failure intolerance, loss of libido, decreased or increased appetite and weight, reduced energy and early fatigue, sleep disorder, menstruation disorder, constipation, dry mouth, and headache (Li et al., 2016; Weiss-Wiesel et al., 2015). These findings are essential for new approaches that promote physically active habits.

Stress levels can vary from person to person and can fluctuate based on various factors and life circumstances. Stress is a normal response to challenging or demanding situations, and it can serve as a motivator or help us navigate through difficult times. However, excessive, or chronic stress can have negative effects on physical and mental well-being.

Previous studies have extensively explored the impact of the COVID-19 pandemic on mental health, highlighting an increased prevalence of depression, anxiety, and stress among individuals (Ortiz-Calvo et al., 2022; Wester et al., 2022; Zvolensky et al., 2022). Specifically, investigations have been conducted to assess the mental health implications

on student populations (Alam et al., 2022; Pandya & Lodha, 2022; Sipeki et al., 2022). However, there remains a significant gap in the literature concerning the specific role of physical activity in the occurrence of depression, anxiety, and stress levels among high school students during the COVID-19 pandemic. This gap necessitates further examination to enhance our understanding of the relationship between physical activity and mental health outcomes among this vulnerable population.

Therefore, the present study aims to address this research gap by conducting a correlational study to explore the role of physical activity in the occurrence of depression, anxiety, and stress levels among high school students during the COVID-19 pandemic. The urgency of this research lies in the potential implications for mental health interventions and support strategies. By elucidating the relationship between physical activity and mental health outcomes, particularly in the context of the ongoing pandemic, this study seeks to provide valuable insights that can inform the development of targeted interventions to mitigate the negative impact of depression, anxiety, and stress among high school students. Ultimately, this research endeavor has the potential to contribute to the overall well-being and resilience of students during these challenging times.

METHOD

This study used a quantitative descriptive method. The population of this study included students from the Lubuk Linggau 3 State High School, i.e., 166 active students. In this study, the sampling was performed by the accidental sampling technique. Accidental sampling technique is a sampling technique in which any subject who is met by the researcher can be used as a sample if that person happens to be a suitable source of data (Maksum, 2018). Data were collected using the International Physical Activity Questionnaire (IPAQ) to measure physical activity and the Depression Anxiety Stress Scales (DASS 42) questionnaire to measure depression, anxiety, and stress levels. The questionnaire was distributed online via WhatsApp using the Google form application. The data analysis in this study was conducted using the chi-square test to determine the relationship between physical activity and each variable (depression, anxiety, and stress levels). The multivariate analysis of variance (MANOVA) test was used to determine the relationship between physical activity and depression, anxiety, and stress levels in students, and SPSS version 25 was used to perform the calculation.

RESULTS AND DISCUSSION

The data in the study were obtained through questionnaires and are shown in Table 1. A hypothesis test performed out to determine the provisional assumptions in this study through the chi-squared test. The results of data analysis are shown in Table 1.

Table 1. Metabolic Equivalent of Task (METs) Distribution

No	Value	Category	Score	Frequency	Percentage
1	<600	Low	1	40	24%
2	<600- <3000	Moderate	2	54	33%
3	>3000	High	3	72	43%
Total				166	100%

Table 1 shows that the frequency is 166 students which was a combination of students from grades 10, 11, and 12. A total of 40 students had low physical activity with a value of <600; the obtained score is 1 with a percentage of 24%. A total of 54 students had moderate physical activity with a value between <600 and <3000, the obtained score is 2 with a percentage of 33%. A total of 72 students had high physical

activity with a value of >3000; the score is 3 with a percentage of 43%. Table 2 shows the distribution of the DASS 42 questionnaire to determine the level of depression of Lubuk Linggau 3 State High School students.

Table 2. Depression Questionnaire Distribution

No	Value	Category	Score	Frequency	Percentage
1	0-9	Normal	1	97	58%
2	10-13	Low	2	33	20%
3	14-20	Medium	3	16	10%
4	21-27	Severe	4	14	8%
5	>28	Acute	5	6	4%
Total				166	100%

Based on Table 2, the results of the distribution of the DASS 42 questionnaire which is used, to determine the level of depression of Lubuk Linggau 3 State High School students, show that 97 students were in the normal category with a value of 0-9, the obtained score was 1 with a percentage of 58%. A total of 33 students were in the low category with a score of 10-13, the obtained score was 2 with a percentage of 20%. A total of 16 students were in the medium category with a score of 14-20, the obtained score was 3 with a percentage of 10%. A total of 14 students were in the severe category with a score of 21-27, the obtained score was 4 with a percentage of 8%. A total of 6 students were in the acute category with a value of > 28, the obtained score was 5 with a percentage of 4%. Based on the data on physical activity and depression, the results of the cross-tabulation are shown in Table 3.

Table 3. Physical Activity and Depression Cross-tabulation

		Depression Level					Total
		Normal	Low	Medium	Severe	Acute	
Physical Activity	Low	28	6	3	1	2	40
	Moderate	29	9	6	7	3	54
	High	40	18	7	6	1	72
Total		97	33	16	14	6	166

Table 4. Anxiety Questionnaire Distribution

No	Value	Category	Score	Frequency	Percentage
1	0-7	Normal	1	58	35%
2	8-9	Low	2	17	10%
3	10-14	Medium	3	32	19%
4	15-19	Severe	4	35	21%
5	>20	Acute	5	24	15%
Total				166	100%

Based on Table 4, the results of the distribution of the DASS 42 questionnaire which is used, to determine the level of anxiety of Lubuk Linggau 3 State High School students, show that 58 students were in the normal category with a value of 0-7, the obtained score is 1 with a percentage of 35%. A total of 17 students were in the low category with a score of 8-9, the obtained score was 2 with a percentage of 10%. A total of 32 students were in the medium category with a score of 10-14, the obtained score was 3 with a percentage of 19%. A total of 35 students were in the severe category with a score of 15-19, the obtained score was 4 with a percentage of 21%. 24 students were in the acute category with a value of > 20, the obtained score was 5 with a percentage of 15%. From the data on physical activity and anxiety, the results of the cross-tabulation are shown in Table 5.

Table 5. Physical Activity and Anxiety Crosstabulation

		Anxiety Level					Total
		Normal	Low	Medium	Severe	Acute	
Physical Activity	Low	16	5	6	10	3	40
	Moderate	19	5	9	10	11	54
	High	23	7	17	15	10	72
Total		58	15	32	35	24	166

Table 6. Stress Questionnaire Distribution

No	Value	Category	Score	Frequency	Percentage
1	0-14	Normal	1	98	59%
2	15-18	Low	2	22	13%
3	19-25	Medium	3	24	15%
4	26-33	Severe	4	17	10%
5	>34	Acute	5	5	3%
Total				166	100%

Based on Table 6, the results of the distribution of the DASS 42 questionnaire, which is used to determine the level of stress of Lubuk Linggau 3 State High School students, show that 98 students were in the normal category with a value of 0-14, the obtained score was 1 with a percentage of 59%. A total of 22 students were in the low category with a score of 15-18, the obtained score was 2 with a percentage of 13%. A total of 24 students were in the medium category with a score of 19-25, the obtained score was 3 with a percentage of 15%. A total of 17 students were in the severe category with a score of 26-33, the obtained score is 4 with a percentage of 10%. A total of 5 students were in the acute category with a value of > 34, the obtained score was 5 with a percentage of 3%. From the data on physical activity and anxiety, the results of the cross-tabulation are shown in Table 7.

Table 7. Physical Activity and Stress Crosstabulation

		Stress Level					Total
		Normal	Low	Medium	Severe	Acute	
Physical Activity	Low	30	3	3	3	1	40
	Moderate	27	10	6	8	3	54
	High	41	9	15	6	1	72
Total		98	22	24	17	5	166

In hypothesis testing, if the significant value is <0.05 then there is a relationship between the variables, however if the significant value is >0.05 then there is no relationship between the variables. In this study, hypothesis testing used the chi-squared test and MANOVA tests. The results of hypothesis testing are as follows.

Table 8. Chi-squared Test Results on Physical Activity and Depression

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-square	7.992	8	0.434
Likelihood ratio	8.604	8	0.377
Linear by linear association	0.239	1	0.625
N of valid cases	166		

Table 8 shows that the calculated SPSS 25 Pearson chi-squared value was 0.434 > 0.005, which means that there was no relationship between physical activity and depression level in Lubuk Linggau 3 State High School students.

Table 9. Chi Square Test Results on Physical Activity and Anxiety

	Value	Df	Asymp.Sig. (2-sided)
Pearson Chi-square	5.143	8	0.742
Likelihood ratio	5.249	8	0.731
Linear by linear association	0.682	1	0.409
N of valid cases	166		

Table 9 shows that the calculated SPSS 25 Pearson chi-squared value was $0.742 > 0.05$, which means that there was no relationship between physical activity and anxiety level in Lubuk Linggau 3 State High School students.

Table 10. Chi Square Test Results on Physical Activity and Stress

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-square	11.945	8	0.154
Likelihood ratio	11.833	8	0.159
Linear by linear association	0.942	1	0.332
N of valid cases	166		

Table 10 shows it is found that the calculated SPSS 25 Pearson chi-squared value was $0.154 > 0.05$ which means that there was no relationship between physical activity and stress level in Lubuk Linggau 3 State High School students.

Table 11. MANOVA Test Results between Physical Activity and Depression, Anxiety, and Stress Levels

Effect		Value	F	Hypothesis Df	Error Df	Sig
Intercept	Pillai's trace	0.787	198.344 ^b	3.000	161.000	0.000
	Wilks'lambda	0.213	198.344 ^b	3.000	161.000	0.000
	Hotelling's trace	3.696	198.344 ^b	3.000	161.000	0.000
	Roy's largest root	3.696	198.344 ^b	3.000	161.000	0.000
X	Pillai's trace	0.039	1.066	6.000	324.000	0.383
	Wilks'lambda	0.961	1.066 ^b	6.000	324.000	0.383
	Hotelling's Trace	0.040	1.066	6.000	324.000	0.383
	Roy's largest root	0.036	1.955 ^c	3.000	162.000	0.123

In Table 11 the MANOVA test on the independent variable of physical activity (X) and the dependent variable of depression (Y1), anxiety (Y2), and stress (Y3) level shows a significant value in Pillai's trace of $0.383 > 0.05$. Thus, there was no relationship between physical activity and depression, anxiety, and stress levels in Lubuk Linggau 3 State High School students.

In this study, the obtained chi-squared test result was $\text{sig} = 0.434 > 0.05$, which indicated that there was no relationship between physical activity and depression in Lubuk Linggau 3 State High School students. Depression is a mental disorder that affects how a person feels, thinks, and acts. Individuals who experience depression tend to feel sad and lose interest in doing usual activities. This condition can cause various emotional and physical problems and reduce performance. Depression can be caused by a family history of mental health disorders and can also be caused by one's own personality, e.g., having a pessimistic nature, dependence on others, and being too harsh on oneself. In addition, depression can also be influenced by deep sadness and failure of doing something. Depression can be caused by a lack of positive desire to interact with the environment and preferring to stay at home rather than interacting outside the home (Herawati & Deharnita, 2019). Furthermore, depression can also be caused by the trauma of a separation, the loss of a significant person in life and the person being difficult to accept reality. So, it can be concluded that depression can be caused by many

factors but physical activity. Previous study by [Amana et al. \(2021\)](#) showed that there was no relationship between physical activity and depression in university students. Low levels of physical activity cannot be called the sole cause of depression because there are many other factors that can affect a person's mood which were not evaluated in this study, such as biological, psychological/personality factors, coping mechanisms, and social factors ([Dirgayunita, 2016](#); [Ngasa et al., 2017](#)).

In this study, the obtained chi-squared test result was $\text{sig} = 0.742 > 0.05$, which indicated that there was not a relationship between physical activity and anxiety in Lubuk Linggau 3 State High School students. Anxiety is an excessive worry about a threat, which can happen to anyone. When experiencing anxiety, a person cannot focus on things, which can interfere with someone's mental state. An unsettling emotional state can be said to be an anxiety, for example feeling depressed when someone is in trouble and has feelings of worry, concern, and fear about certain situations ([Darisman et al., 2021](#)). Anxiety can be caused by fear, for example, it is easy to panic in the face of a problem ([Kumbara et al., 2019](#)). The factor that most often causes anxiety in the academic field, is about facing an exam ([Walean et al., 2021](#)). Several previous studies about relationship between physical activity and anxiety show conflicting results. [Nafisa et al. \(2022\)](#) found that there was a relationship between the level of physical activity and the level of anxiety during the COVID-19 pandemic. On the contrary [Oktaviana et al. \(2022\)](#), shows that there is no relationship between physical activity and anxiety levels in university students in their final year.

In this study, the obtained chi-squared tests result was $\text{sig} = 0.154 > 0.05$, which indicated that there was no relationship between physical activity and stress in Lubuk Linggau 3 State High School students. Stress is a tension that occurs because of a mismatch between expectations and reality. Stress in students can be caused by several factors such as, high academic demands, inappropriate test results, number of assignments, and bad environment ([Barseli et al., 2017](#)). Stress can be caused by internal factors and external factors. Internal factors are factors that come from within the individual such as physical condition, motivation, and own personality type. While external factors are factors that come from outside the individual such as family, friends, environment, and others. Previous studies on the relationship between physical activity and stress show conflicting results. Furthermore, several studies have shown that there was no relationship between physical activity and stress levels in students during the COVID-19 pandemic ([Han et al., 2023](#); [Lipert et al., 2021](#); [López-Valenciano et al., 2021](#); [Marconcin et al., 2022](#); [Puccinelli et al., 2021](#)).

Regular physical activity has many benefits for the body, both physically and spiritually. Maintaining a healthy body both physical and mental health is important. Mental health disorders in a person (e.g., depression, anxiety, and stress) can be caused by various factors including biological, personality, psychological, and environmental factors. The results of this study indicate that there is no relationship between physical activity and depression, anxiety, and stress levels of Lubuk Linggau 3 State High School students, and this is in line with previous studies.

Psychological disorders (e.g., depression, anxiety, and stress) can happen to anyone; however, these disorders usually don't suddenly appear and are caused by several factors. According to [Lubis et al. \(2016\)](#) depression can be caused by physical and psychological factors. Physical factors include genetic factors, age, gender, lifestyle, physical illness, drugs, illegal drugs, lack of sunlight. Psychological factors which include personality, thought patterns, self-esteem, and stress. According to [Heinen et al. \(2022\)](#), the anxiety experienced by the public about COVID-19 is caused by the lack of knowledge, psychosocial and mental health disorders, as well as fear, worry, work and

ego factors. Handayani et al. (2020) stated that stress can be caused by several factors such as work from home, limited food, income, and alcohol consumption. Stress can also be caused if an individual is under a lot of pressure, has worries about something, has responsibilities that are considered very heavy, is faced with uncertainty, and does not have control over a situation. This study has some limitations. For example, the sample was obtained only from one high school in a district in South Sumatera and may not fully represent all high schools in the district or in South Sumatera Province. Further studies can explore a wider scope of participants or include participants from other regions.

CONCLUSION

Based on the findings of this study, it can be concluded that physical activity is not a direct cause of depression, anxiety, and stress among students. The results of the chi-squared test indicated no significant relationships between physical activity and depression, anxiety, or stress levels in students. Furthermore, the MANOVA test results revealed no significant relationships between physical activity and the mentioned mental health outcomes among students at Lubuk Linggau 3 State High School. It is important to note that this research was conducted specifically in schools located in rural areas, which may limit the generalizability of the findings. Therefore, future studies should consider including samples from schools in urban areas to provide a more comprehensive understanding of the relationship between physical activity and mental health outcomes among students.

Given the limitations of this study, several recommendations can be made for future research. Firstly, it is advisable to increase the sample size and include participants from diverse educational settings, such as schools located in urban areas. This would allow for a more representative and broader examination of the relationship between physical activity and mental health outcomes. Additionally, incorporating objective measures of physical activity, such as wearable devices or activity trackers, could provide more accurate data and reduce the potential bias associated with self-reported measures.

Moreover, it would be beneficial to investigate other factors that may contribute to mental health outcomes during the COVID-19 pandemic. The complex interplay between various socio-environmental, psychological, and contextual factors should be considered to gain a more comprehensive understanding of the relationship between physical activity and psychological well-being in the specific context of lockdown periods. This could inform the development of tailored interventions and support systems to promote the overall mental well-being of students.

In summary, this study suggests that physical activity alone may not directly cause depression, anxiety, and stress among students during the COVID-19 lockdown period. Future research should address the limitations by including a more diverse sample and exploring additional factors that may influence mental health outcomes. By expanding the scope of the investigation, valuable insights can be gained to inform strategies aimed at supporting the mental well-being of students across different educational contexts.

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CONFLICT OF INTEREST

The authors state that this research does not have a conflict of interest with any party.

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