

# THE INFLUENCE OF PHYSICAL ACTIVITY ON THE MOOD OF FIRST-YEAR UNIVERSITY STUDENTS

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**ABSTRACT. Objective:** This study aimed to examine the extent to which physical activity influences the mood of university students. **Methods:** The sample consisted of 37 first-year female students (mean age = 20.16 ± 0.45). Data were collected using the Profile of Mood States (POMS) questionnaire (Grove & Prapavessis, 2016). Statistical analyses were conducted using SPSS version 19. To compare pre- and post-intervention results, paired-sample t-tests were applied, with the level of significance set at  $p \leq 0.05$ . **Results:** Significant differences were observed between pre- and post-activity scores across multiple mood dimensions. Tension decreased significantly ( $t = 5.59$ ,  $df = 36$ ,  $p < 0.001$ ), as did anger ( $t = 6.24$ ,  $df = 36$ ,  $p < 0.001$ ) and fatigue ( $t = 4.05$ ,  $df = 36$ ,  $p < 0.001$ ). Similar patterns were found for depression ( $t = 4.28$ ,  $df = 36$ ,  $p < 0.001$ ), confusion ( $t = 5.47$ ,  $df = 36$ ,  $p < 0.001$ ), esteem ( $t = -3.20$ ,  $df = 36$ ,  $p = 0.003$ ), and vigor ( $t = -2.07$ ,  $df = 36$ ,  $p = 0.04$ ). Moreover, total mood disturbance scores were significantly lower after physical activity ( $t = 6.96$ ,  $df = 36$ ,  $p < 0.001$ ). **Conclusion:** Findings indicate that moderate physical activity—whether through fitness equipment, stationary cycling, or aerobic running—exerts positive effects on students' mood states. A single session of physical education reduced scores across all mood components, as well as the overall mood disturbance score.

**Keywords:** physical activity; mood state; students; mental health.

## INTRODUCTION

Recent research indicates a decline in students' overall well-being, reflected in reduced life satisfaction and a diminished sense of achievement compared to the general population (Morales Almeida & Nunes, 2024). University students face

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a variety of challenges that can compromise mental health, including academic stress, adjustment to new social environments, and performance pressures.

Physical activity interventions may reduce anxiety, it has been identified as a protective factor against mood disorders, increasing mental health (Andermo, et al., 2020; Balla et al., 2022).

Rahmati et al. (2024) emphasized its preventive role in mental health, noting that regular exercise stimulates neurotransmitters such as dopamine and endorphins, which contribute to improved mood and reduced depressive symptoms. Supporting this, Liu et al. (2025) found that physical activity enhances sleep quality in students by lowering rumination and depressive tendencies. Beyond its effects on mental health, physical activity also strengthens self-esteem and psychological capital. Wei et al. (2024) demonstrated that exercise alleviates depressive symptoms in students, mediated by improvements in self-esteem and positive psychological resources.

Importantly, physical activity has implications for academic performance. A longitudinal study in *BMC Public Health* revealed that active breaks and leisure-time exercise reduce functional and dysfunctional stress, improve recovery, and enhance perceptions of academic performance (Müller et al., 2024). Similarly, Al Sulaimi et al. (2022) reported that physical activity not only promotes general health but also reduces anxiety and stress while supporting academic success.

In addition, regular physical activity fosters confidence in academic abilities, regulates emotional experiences, and strengthens the sense of accomplishment—factors that increase satisfaction with student life (Romeo et al., 2021). It also enhances perceptions of social support, an essential component of academic satisfaction (Shu et al., 2024). Engagement in physical activities elicits a series of affective responses both during and after the activity (Hartman & Hernandez, 2023; Malagodi et al., 2024). Numerous studies have reported a positive association between physical activity and mental health (White et al., 2023). The enjoyment derived from performing certain physical exercises is accompanied by positive psychological states, which represents the main reason why individuals choose to participate in programs designed for physical activity (Rodrigues et al., 2021; Malagodi et al., 2024).

According to Jacobi et al. (2004), the first episodes of mental disorders typically occur between the ages of 20 and 30, a period in which young people are often pursuing their studies (Patel et al., 2018; Giurgiu et al., 2021). Mental disorders, including depression, reach their highest incidence between adolescence and early adulthood (Solmi et al., 2022), a period that coincides with the beginning of university studies. Auerbach et al. (2018) highlight that at least one-third of university students struggle with a mental health problem, while another study by Sheldon et al. (2021) shows that 25% of students report symptoms of depression.

**MATERIAL AND METHODS**

37 students (mean age  $20.16 \pm 0.45$ ) completed the POMS before and after a moderate outdoor exercise session, with seven mood components scored and combined into a total mood disturbance score. The physical activity consisted of a moderate-intensity session, preceded by a 10-minute general warm-up. Students then engaged in fitness exercises with light weights, cycling on a stationary bike, or low-intensity aerobic running, conducted outdoors.

For data collection, we used the *Profile of Mood States* (POMS) questionnaire (Grove & Prapavessis, 2016), which was completed by the students both before the start of the activity and immediately after its completion. The instrument includes seven main mood state components: depression, fatigue, esteem, tension, anger, confusion, and vigor (Gibson et al., 2019).

Using SPSS (version 19), separate scores were calculated for each component of total mood disturbance (we mention here tension, anger, fatigue, depression, confusion, esteem, vigor) which were then combined to determine the *total mood disturbance* score. The p values used in our study was  $p \leq 0.05$ .

**RESULTS**

The table below presents the scores for tension, before physical activity (M = 7.19, SD = 4.64) and immediately after physical activity (M = 4.35, SD = 3.82) (Table 1).

**Table 1.** Scores of tension before and after physical activity

	Mean	N	Std. Deviation	Std. Error Mean
Tension before PA	7.19	37	4.642	.763
Tension after PA	4.35	37	3.824	.629

According to the statistical analysis, the scores differ significantly ( $t = 5.59$ ,  $df = 36$ ,  $p < 0.001$ ) (Table 2).

**Table 2.** Difference between mean scores of tension before and after physical activity

	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Tension before PA –	2.838	3.087	.507	5.592	36	.000
Tension after PA						

The situation regarding anger is presented in the table below. Before physical activity the mean score was ( $M = 6.03$ ,  $SD = 4.45$ ), and at the end of the activity the mean was ( $M = 3.16$ ,  $SD = 3.03$ ) (Table 3).

**Table 3.** Scores of anger before and after physical activity

	<b>Mean</b>	<b>N</b>	<b>Std. Deviation</b>	<b>Std. Error Mean</b>
Anger before PA	6.03	37	4.450	.732
Anger after PA	3.16	37	3.032	.499

As we can see in the data presented below, there is a statistically significant difference between the mean anger scores before and after physical activity ( $t = 6.24$ ,  $df = 36$ ,  $p < 0.001$ ) (Table 4).

**Table 4.** Difference between mean scores of anger before and after physical activity

	<b>Mean</b>	<b>Std. Deviation</b>	<b>Std. Error Mean</b>	<b>t</b>	<b>df</b>	<b>Sig. (2-tailed)</b>
Anger before PA –	2.865	2.790	.459	6.245	36	.000
Anger after PA						

Fatigue is also an item from the mood state evaluation. We can observe its scores before ( $M = 6.30$ ,  $SD = 3.58$ ) and after physical activity ( $M = 4.05$ ,  $SD = 2.74$ ) (Table 5).

**Table 5.** Scores of fatigue before and after physical activity

	<b>Mean</b>	<b>N</b>	<b>Std. Deviation</b>	<b>Std. Error Mean</b>
Fatigue before PA	6.30	37	3.589	.590
Fatigue after PA	4.05	37	2.748	.452

Between the mean fatigue scores before and after physical activity, there is also a statistically significant difference ( $t = 4.05$ ,  $df = 36$ ,  $p < 0.001$ ) (Table 6).

**Table 6.** Difference between mean scores of fatigue before and after physical activity

	<b>Mean</b>	<b>Std. Deviation</b>	<b>Std. Error Mean</b>	<b>t</b>	<b>df</b>	<b>Sig. (2-tailed)</b>
Fatigue before PA –	2.243	3.362	.553	4.059	36	.000
Fatigue after PA						

Analyzing the mean scores for depression ( $M = 5.41$ ,  $SD = 5.09$ ) before physical activity and ( $M = 3.14$ ,  $SD = 3.58$ ) after physical activity, we can observe a decrease (Table 7).

**Table 7.** Scores of depression before and after physical activity

	<b>Mean</b>	<b>N</b>	<b>Std. Deviation</b>	<b>Std. Error Mean</b>
Depression before PA	5.41	37	5.019	.825
Depression after PA	3.14	37	3.584	.589

Based on the statistical analysis of the depression scores, there is a statistically significant difference between the mean scores obtained before and after physical activity ( $t = 4.28$ ,  $df = 36$ ,  $p < 0.001$ ) (Table 8).

**Table 8.** Difference between mean scores of depression before and after physical activity

	<b>Mean</b>	<b>Std. Deviation</b>	<b>Std. Error Mean</b>	<b>t</b>	<b>df</b>	<b>Sig. (2-tailed)</b>
Depression before PA	2.270	3.220	.529	4.288	36	.000
- Depression after PA						

Regarding the item Esteem-related affect, we can observe an increase in scores. Before physical activity the mean was ( $M = 14.14$ ), and after physical activity the mean was ( $M = 16.03$ ) (Table 9).

**Table 9.** Scores of Esteem-related Affect before and after physical activity

	<b>Mean</b>	<b>N</b>	<b>Std. Deviation</b>	<b>Std. Error Mean</b>
Esteem-related Affect before PA	14.14	37	4.211	.692
Esteem-related Affect after PA	16.03	37	4.304	.708

According to the statistical analysis, they differ significantly ( $t = -3.20$ ,  $df = 36$ ,  $p = 0.003$ ) (Table 10).

**Table 10.** Difference between mean scores of Esteem-related Affect before and after physical activity

	<b>Mean</b>	<b>Std. Deviation</b>	<b>Std. Error Mean</b>	<b>t</b>	<b>df</b>	<b>Sig. (2-tailed)</b>
Esteem-related Affect before	-1.892	3.596	.591	-3.200	36	.003
PA - Esteem-related Affect after PA						

For the item Vigor, we observe that the values improve, from ( $M = 7.27$ ) before, to ( $M = 8.59$ ) after physical activity (Table 11), and the difference is statistically significant ( $t = -2.07$ ,  $df = 36$ ,  $p = 0.04$ ) (Table 12).

**Table 11.** Scores of Vigor before and after physical activity

	<b>Mean</b>	<b>N</b>	<b>Std. Deviation</b>	<b>Std. Error Mean</b>
Vigor before PA	7.27	37	3.314	.545
Vigor after PA	8.59	37	3.632	.597

**Table 12.** Difference between mean scores of Vigor before and after physical activity

	<b>Mean</b>	<b>Std. Deviation</b>	<b>Std. Error Mean</b>	<b>t</b>	<b>df</b>	<b>Sig. (2-tailed)</b>
Vigor before PA –	-1.324	3.888	.639	-2.072	36	.045
Vigor after PA						

The last item considered in determining the mood state score was Confusion. In the table below, we can observe a decrease in the mean score for confusion, from (M = 6.38) before physical activity to (M = 3.81) after engaging in physical activity (Table 13).

**Table 13.** Scores of confusion before and after physical activity

	<b>Mean</b>	<b>N</b>	<b>Std. Deviation</b>	<b>Std. Error Mean</b>
Confusion before PA	6.38	37	3.562	.586
Confusion after PA	3.81	37	3.170	.521

According to the statistical analysis, they differ significantly ( $t = 5.47$ ,  $df = 36$ ,  $p < 0.001$ ) (Table 14).

**Table 14.** Difference between mean scores of Confusion before and after physical activity

	<b>Mean</b>	<b>Std. Deviation</b>	<b>Std. Error Mean</b>	<b>t</b>	<b>df</b>	<b>Sig. (2-tailed)</b>
Confusion before PA –	2.568	2.853	.469	5.474	36	.000
Confusion after PA						

The table below presents the scores for Total Mood Disturbance, as in the previous cases, before and after engaging in physical activity (Table 15). The data show a decrease in this score, from (M = 110.62) to (M = 95.70).

**Table 15.** Scores of Total Mood Disturbance before and after physical activity

	<b>Mean</b>	<b>N</b>	<b>Std. Deviation</b>	<b>Std. Error Mean</b>
Total Mood Disturbance before PA	110.62	37	21.361	3.512
Total Mood Disturbance after PA	95.70	37	18.382	3.022

We can observe, from the data analysis, a statistically significant difference ( $t = 6.96, df = 36, p < 0.001$ ) (Table 16).

**Table 16.** Difference between mean scores of Total Mood Disturbance before and after physical activity

	<b>Mean</b>	<b>Std. Deviation</b>	<b>Std. Error Mean</b>	<b>t</b>	<b>df</b>	<b>Sig. (2-tailed)</b>
Total Mood Disturbance before PA	14.919	13.035	2.143	6.962	36	.000
- Total Mood Disturbance after PA						

## DISCUSSION

The objective of this study was to gain an understanding of how engaging healthy first-year students in one hour of moderate physical activity influences their general mood state. One of the reviewed studies found that submaximal effort decreases total mood disturbance, whereas supramaximal effort leads to an increase in total mood disturbance (Teixeira Guimaraes et al., 2014). Another study indicated that performing exercises as part of a functional moderate-intensity training session or during an aerobic training session has a positive influence on mood and affectivity (Malagodi et al., 2024). An individual’s energy level is negatively affected by sedentary behavior, while it is positively influenced by light physical activity and moderate-to-vigorous physical activity (Giurgiu et al., 2021). Statistically significant differences were reported for all POMS components — Tension, Depression, Anger, Fatigue, Confusion, Vigor — as well as for total mood disturbance, compared with pre-exercise data (Hallgren et al., 2021).

The results obtained through the application of the POMS questionnaire highlight that moderate physical activity has a significant positive impact on students’ mood. These data are consistent with the findings of Hallgren et al. (2021), who showed that physical exercise reduces negative states such as anxiety and depression, while enhancing positive affect immediately after effort.

Moreover, Malagodi et al. (2024) confirmed that moderate-intensity exercises, regardless of type (aerobic or functional), contribute to lowering the score for “total mood disturbance,” meaning a reduction in overall mood disorder. The results of the present study align with these findings, showing statistically significant decreases in indicators such as tension, anger, fatigue, depression, and confusion, along with increases in vigor and self-esteem. An interesting aspect is the confirmation of the theory that “physical activity has a direct influence on neurotransmitters involved in mood regulation” (White et al., 2023). This

explains the almost immediate positive effect of moderate exercise on mood — a crucial factor especially for the student population, where psychological challenges are frequent. It is also important to mention that “energy levels and cognitive capacity” can be influenced by physical activity. According to Giurgiu et al. (2021), sedentary behavior is associated with impaired mood and reduced energy, whereas light or moderately intense physical activity has clear beneficial effects in this regard. The results obtained through the POMS questionnaire further emphasize that moderate physical activity has a significant positive impact on students’ mood. These findings are supported by a recent meta-analysis published in the *Asian Journal of Sport and Exercise Psychology*, which demonstrated that physical exercise has a moderate effect in reducing symptoms of depression and anxiety among university students (Yuan et al., 2023). Another meta-analysis (Zhang et al., 2024) highlighted that exercise interventions lasting at least 12 weeks, with sessions of 30–60 minutes at least three times per week, had a significant impact on reducing depressive symptoms. In addition, a study published in *Frontiers in Psychology* (Xie et al., 2025) showed that moderate-intensity exercises, such as strength training, are particularly effective in reducing anxiety and increasing vigor among young adults. These findings are further supported by a study published in *PeerJ* (Zhu et al., 2024), which demonstrated that moderate physical activity improves emotional regulation in students, reducing anxiety levels through enhanced cognitive reappraisal. More recently, Liu and Liu (2025) showed that moderate physical activity not only improves mental health but also increases students’ life satisfaction, body image, and self-esteem.

## CONCLUSIONS

The data from this study highlights that moderate physical activity, whether performed on fitness equipment, a stationary bicycle, or through aerobic running, has positive effects on students’ mood state. Physical activity during a physical education session reduced students’ scores on all mood state components (Tension, Depression, Anger, Fatigue, Confusion), while also decreasing the total mood disturbance score. Nowadays, even though students generally display a reserved or slightly dismissive attitude toward physical education sessions, it is important for teachers to encourage their active participation not only for the beneficial effects of movement on physiological parameters but also for its positive impact on mood state. It is worth emphasizing that lowering the total mood disturbance score may also positively affect how students engage cognitively in the courses and seminars following physical activity. By participating in this

study, students were able to become aware of the benefits of physical activity on their mental state, which may encourage them to turn physical activity into a long-term, consistent habit in their free time.

In conclusion, the results of this study confirm the effectiveness of moderate physical activity as a non-pharmacological intervention for improving students' overall mood. A significant reduction in general mood disturbance was observed, along with improvements in negative affective components (tension, anger, depression, fatigue, confusion) and increases in positive ones (vigor, self-esteem). These conclusions support the importance of promoting physical education in the university environment not only from a physiological perspective but also from a psychological one, as it has the potential to positively influence students' well-being and academic performance. For the future, it is recommended to extend research on larger and more diverse samples, as well as to investigate the long-term effects of regular physical activity on mood and mental health.

#### **AUTHOR CONTRIBUTIONS**

All the authors contributed equally to the writing of the manuscript. All authors have read and agreed to the published version of the manuscript.

#### **CONFLICT OF INTEREST**

There are no conflicts of interest to declare concerning this study.

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