Motivation for physical activity practice and anxiety levels in adolescent schoolchildren

Motivación para la actividad física y niveles de ansiedad en escolares adolescentes

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Abstract

Introduction: Regular physical activity is associated with physical and mental health benefits, including reduced anxiety symptoms. Understanding the motivational factors that influence this practice is essential for developing effective strategies to promote adolescent well-being.
Methodology: A cross-sectional study was conducted with 254 adolescents, aged 12 to 18 years, of both sexes, enrolled in public schools in Campos Novos, SC, Brazil. Anxiety levels and motivational factors, including perceived autonomy, competence, and social bonds, were assessed using validated questionnaires. Data were analyzed using descriptive statistics and comparative tests between groups.
Results: Physically active adolescents presented lower anxiety levels, with intrinsic motivation being the main factor associated with physical activity engagement. Gender differences were observed, with girls showing higher levels of moderate and severe anxiety compared to boys. Higher perceptions of autonomy, competence, and social bonds were associated with lower anxiety levels and greater participation in physical activity.
Conclusion: The findings highlight the positive relationship between intrinsic motivation and regular physical activity, as well as the protective role of perceived competence and social bonds against anxiety. School- and family-based interventions should focus on enhancing intrinsic motivation and fostering autonomy, competence, and social connections to reduce anxiety levels in adolescents, particularly girls, and to promote long-term engagement in physical activity.

Keywords

Anxiety; motivation; physical activity.

Resumen

Introducción: La actividad física regular se asocia con beneficios para la salud física y mental, incluida la reducción de los síntomas de ansiedad. Comprender los factores motivacionales que influyen en esta práctica es fundamental para desarrollar estrategias efectivas que promuevan el bienestar en los adolescentes.
Metodología: Se realizó un estudio transversal con 254 adolescentes, de ambos sexos, con edades entre 12 y 18 años, matriculados en escuelas públicas de Campos Novos, SC, Brasil. Los niveles de ansiedad y los factores motivacionales, incluyendo la percepción de autonomía, competencia y vínculos sociales, se evaluaron mediante cuestionarios validados. Los datos se analizaron utilizando estadísticas descriptivas y pruebas comparativas entre grupos.
Resultados: Los adolescentes físicamente activos presentaron menores niveles de ansiedad, siendo la motivación intrínseca el principal factor asociado con la práctica de actividad física. Se observaron diferencias de género, con las chicas mostrando mayores niveles de ansiedad moderada y severa en comparación con los chicos. Una mayor percepción de autonomía, competencia y vínculos sociales se asoció con menores niveles de ansiedad y mayor participación en la actividad física.
Conclusiones: Los hallazgos destacan la relación positiva entre la motivación intrínseca y la actividad física regular, así como el papel protector de la percepción de competencia y los vínculos sociales frente a la ansiedad. Las intervenciones escolares y familiares deben centrarse en potenciar la motivación intrínseca y fomentar la autonomía, la competencia y las conexiones sociales para reducir los niveles de ansiedad en los adolescentes, especialmente en las chicas, y promover la participación a largo plazo en la actividad física.

Palabras clave

Actividad física; ansiedad; motivación.

Introduction

Adolescence is a crucial phase for physical and emotional development, characterized by profound transformations and challenges. In this context, physical activity emerges as a significant protective factor for the mental health of young people. Studies show that regular physical activity is associated with a reduction in anxiety symptoms, contributing to the promotion of emotional well-being (Biddle et al., 2019; Lubans et al., 2016; Romero-Carazas et al. 2025). Similar findings were reported by Heredia García (2024) in *Revista Retos*, highlighting that regular engagement in physical activity among adolescents is linked to improved psychological well-being and lower prevalence of anxiety symptoms. The release of neurotransmitters such as serotonin and endorphins during physical exercise plays a key role in this process, acting as a defense mechanism against emotional disorders (Cotman et al., 2007; Alberti et al., 2024).

Research shows that physically active adolescents have a lower prevalence of mental health issues, indicating that regular physical activity may be an effective strategy to prevent and treat anxiety (Bursnall, 2014; Hu et al., 2020). On the other hand, the lack of physical activity is a risk factor that can exacerbate this disorder, highlighting the importance of encouraging healthy habits from childhood (Costello et al., 2005). The World Health Organization recommends that adolescents engage in at least 150 minutes of moderate to vigorous physical activity per week, reinforcing the need for interventions targeted at this age group (World Health Organization, 2020).

In addition to physical activity, factors such as motivation and social support are key determinants of engagement in healthy behaviors. Self-Determination Theory suggests that intrinsic motivation, which involves the pursuit of pleasure and personal satisfaction, is crucial for long-term adherence to physical activity (Deci & Ryan, 2000). Furthermore, Self-Determination Theory posits that human behavior is regulated by three basic psychological needs: competence, autonomy, and social connection/belonging, which operate interdependently. The perception of competence refers to an individual's ability to perform a task; the perception of autonomy relates to the level of volition and personal choices made by the individual; and the perception of social connection is linked to the sense of connectivity with others or the environment. Satisfying these needs results in regulatory behaviors, which can lead to intrinsic motivation when actions are self-initiated in an autonomous way, or extrinsic motivation when actions are regulated by external factors (Deci & Ryan, 2000). Adolescents who are intrinsically motivated and have high perceptions of their basic psychological needs for competence, autonomy, and social connection tend to engage more in physical activity, which in turn reflects in better mental health outcomes.

However, gender differences may influence anxiety levels among adolescents. Studies indicate that girls are more vulnerable to mental health conditions, possibly due to hormonal and social factors that make them more susceptible to stress (Chaplin et al., 2009). This higher incidence of emotional disorders among adolescent females requires special attention in intervention strategies.

Schools play a crucial role in promoting mental health and physical activity among adolescents. A school environment that encourages sports and physical education can contribute to the development of self-esteem and social skills, which are fundamental for mental health (De Rezende et al., 2015). Programs that promote physical activity in an inclusive and engaging manner can be effective in reducing symptoms of anxiety.

Therefore, this study aims to analyze the motivational factors for physical activity participation and anxiety levels in adolescents. Understanding these aspects is crucial for developing interventions that promote emotional and physical well-being during this critical phase of life. By identifying the motivations that drive young people to engage in physical activities, more effective strategies can be developed to encourage healthy behaviors and improve mental health.

This study aligns with SDG 3 – Health and Well-being by examining the motivational factors for physical activity and anxiety levels in adolescents. Understanding these aspects is essential for developing interventions that promote emotional and physical well-being during this critical life stage.

Method

Participants

The study population consisted of 1,216 adolescents aged 12 to 18 from the municipality of Campos Novos (SC), enrolled in the state public school system. The sample size was calculated using G*Power software (version 3.1.9.2), with a 5% margin of error and a 95% confidence interval, based on the population of 1,216 adolescents, resulting in a minimum sample of 293 adolescents. Although the estimated sample size indicated a minimum of 293 participants, the final sample consisted of 254 adolescents. This shortfall resulted from constraints imposed by the school calendar and unforeseen health-related issues affecting the lead researcher. Despite the reduced sample size, the final number still represents a substantial proportion (20.9%) of the total eligible population and exceeds the minimum threshold required to detect medium effect sizes (Cohen's d = 0.35) with 80% power at α = 0.05, as confirmed through a post hoc power analysis.

Instruments

To determine the motivational profile and its regulations, the Perceived Locus of Causality Questionnaire (PLOCQ) (Goudas & Biddle, 1994), translated and validated for the Brazilian population, was used. This questionnaire consists of twenty items, subdivided into five dimensions: intrinsic motivation (e.g., "Because physical education is fun"); identified regulation (e.g., "Because I want to learn sports skills"); introjected regulation (e.g., "Because I want the teacher to think I'm a good student"); external regulation (e.g., "Because it's mandatory"); amotivation (e.g., "I do it, but I feel like I'm wasting my time"). The items are preceded by the statement "I take physical education classes..." and are scored on a 7-point Likert scale, ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). The reliability test for the scale was conducted considering each dimension, with Cronbach's alpha values as follows: 0.86 for intrinsic motivation items, 0.70 for identified regulation, 0.62 for introjected regulation, 0.70 for external regulation, and 0.70 for amotivation.

To assess the satisfaction of Basic Psychological Needs, the adapted version for physical education of the Psychological Needs State Scale (Huyghebaert-Zouagh et al., 2020; Moreno-Murcia, 2022) was used, focusing on the dimensions of autonomy, competence, and relatedness satisfaction. Responses were presented on a Likert scale with scores ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). A reliability test was carried out for the scale, considering each dimension, and Cronbach's Alpha was 0.70 for the autonomy items, 0.83 for the competence items and 0.88 for the relatedness items.

The Physical Activity Level was evaluated using the Physical Activity Questionnaire for Adolescents (QAFA), validated by Farias et al. (2012). The questionnaire consists of a list of 24 moderate to vigorous physical activities (≥ 3METs), with the possibility for the adolescent to add two more activities. When completing the questionnaire, adolescents reported the frequency (days/week) and duration (hours/minutes/day) of the physical activities practiced in the last week. The physical activity level was determined by summing the product of the time spent on each activity and the respective frequency of practice, following the procedure described in the attachment. Adolescents who engaged in physical activity for 300 minutes or more per week were considered sufficiently active, while others were classified as insufficiently active (Biddle et al., 1998).

To assess anxiety levels, the Hamilton Anxiety Scale (HAM-A) was used, the first scale developed to evaluate anxiety. It consists of a semi-structured scale focusing on both psychological and somatic symptoms. It has high reliability and can be used with adults, adolescents, and children (Gorenstein et al., 2015). The scale includes 14 symptom groups, subdivided into two categories: seven related to psychological anxiety, associated with anxious mood symptoms, and seven related to somatic anxiety, associated with physical symptoms of anxiety. Each item is rated on a scale ranging from 0 to 4, based on the severity of the symptom (0 = absent, 2 = mild, 3 = moderate, 4 = maximum). The sum of the scores obtained for each item results in a total score, ranging from 0 to 56. Its development was based on the principle that the more severe the manifestation of a pathology, the greater the number of characteristic symptoms presented (Souza et al., 2008). A reliability test was carried out for the categories, and the items in the psychological anxiety category had a Cronbach's alpha value of 0.82, while the items in the anxious mood symptoms category had a Cronbach's alpha value of 0.80.

Demographic questions of interest for the study, such as address, age, sex, and other information, will be collected through a questionnaire with closed-ended questions.

Procedure

The questionnaires were administered in the classrooms of the schools attended by the adolescents during morning and afternoon class periods. The researchers responsible for the study conducted the administration and were present to clarify any doubts that arose while the adolescents completed the questionnaires. Data collection occurred between August and October 2023.

The project was submitted to the Research Ethics Committee (CEP) at Unoesc and was approved under number 6,210,491 on July 31, 2023.

Data Analysis

The data were analyzed using the JASP 0.19.03 program, with descriptive statistics such as mean, median, standard deviation, minimum, and maximum values. Subsequently, the data were categorized and assessed using the chi-square test. A significance level of $p < 0.05$ was adopted. In the comparison between variables and their groupings, the t-test was used, considering variables such as physical activity level, the dimensions of basic psychological needs (autonomy, competence, and social bonds), motivational regulations (intrinsic motivation, identified regulation, introjected regulation, external regulation, and amotivation), and anxiety levels.

Results

This study included 254 adolescents aged between 12 and 18 years (M=16; SD=1.0), with 142 females and 112 males. When analyzing the anxiety classification among the adolescents, it was found that most participants fell within the normal anxiety range as proposed in the inventory (n=113; 44.48%). When comparing anxiety levels between genders, a statistically significant difference was observed in the levels of Moderate Anxiety (SR=4.147) and Severe Anxiety (SR=3.339), which were more frequently observed in females, and the level of Normal Anxiety (SR=5.384), which was more frequently observed in males (Table 1).

Table 1. Association between anxiety level and gender of adolescents

Anxiety Level	Gender			p
	Female (n=142)	Male (n=112)	Total (254)	
Normal	42 (29,57%)	71 (63,39%)	113 (44,48%)	<0,001
Mild	18 (12,67%)	19 (16,96%)	37 (14,56%)	
Moderate	41 (28,87%)	13 (11,60%)	54 (21,26%)	
Severe	41 (28,87%)	9 (8,03%)	50 (19,68%)	

Note: * p < .05

When analyzing the physical activity level classification among adolescents, those who met the recommendation from the Ministry of Health in the Physical Activity Guide for the Brazilian Population (Ministério da Saúde do Brasil, 2021), which suggests at least 300 minutes of physical activity per week, no statistically significant differences were observed between genders. The majority of participants were classified as physically active (Table 2).

Table 2. Association between physical activity level and gender of adolescents

Physical Activity Level	Gender			p
	Female (n=142)	Male (n=112)	Total (254)	
Active	66 (46,48%)	68 (58,04%)	131 (51,58%)	0,067
Insufficiently Active	76 (53,52%)	47 (41,96%)	123 (48,42%)	

Note: * p < .05

When evaluating the relationships between physical activity levels and anxiety levels among adolescents, no significant associations were found (Table 3).

Table 3. Association between physical activity level and anxiety among adolescents

Anxiety classification	Physical activity level		Total	p
	Active	Active Insufficiently		
Severe Anxiety	21 (16,03%)	29 (23,57%)	50 (19,68%)	
Moderate Anxiety	27 (20,61%)	27 (21,95%)	54 (21,26%)	
Mild Anxiety	21 (16,03%)	16 (13,01%)	37 (14,56%)	0,427
Normal Anxiety	62 (47,32%)	51 (41,46%)	113 (44,48%)	
Total	131 (100%)	123 (100%)	254 (100%)	

Note: * p < .05

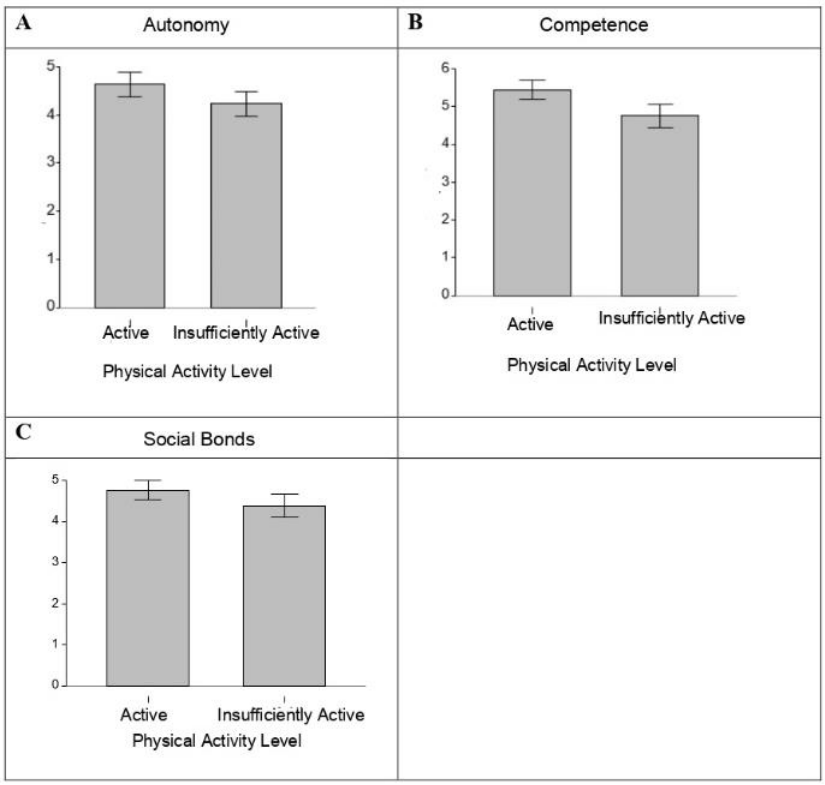
When observing the motivational variables, the results are shown in Table 4, indicating that adolescents have a good perception of autonomy, with an average of 4.439 points (on a scale of 1 to 7), competence, with an average of 5.115 points (on a scale of 1 to 7), and social bonds, with an average of 4.575 points (on a scale of 1 to 7). They also show high scores for intrinsic motivation, with an average of 5.151 points (on a scale of 1 to 7).

Table 4. Descriptive values of the motivational variables measured in the study sample.

	n	Scale	Mean	SD
Autonomy	254	1-7	4.439	1.467
Competence	254	1-7	5.115	1.622
Social Bonds	254	1-7	4.575	1.493
Intrinsic Motivation	254	1-7	5.151	1.630
Identified Regulation	254	1-7	4.889	1.718
Introjected Regulation	254	1-7	3.434	1.452
External Regulation	254	1-7	2.760	1.435
Amotivation	254	1-7	2.573	1.632

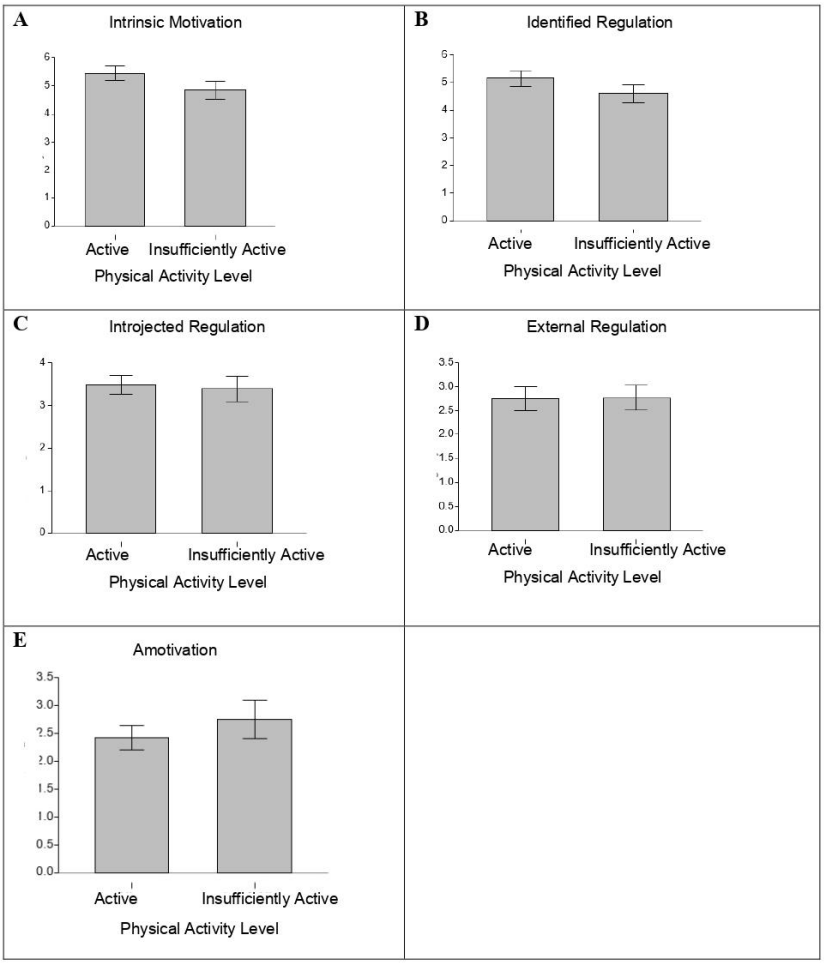
To analyze the motivational profiles for physical activity practice among adolescents, a t-test was performed, initially considering the Physical Activity Level grouping variable. In the dimensions of basic psychological needs (autonomy, competence, and social bonds) (Figure 1), the "Active" group scored significantly higher (Autonomy: t=2.199, p=0.029; Competence: t=3.446, p<0.001; Social Bonds: t=2.031, p=0.043).

Figure 1. Relationship between basic psychological needs and physical activity level, and comparison between the active and insufficiently active groups.



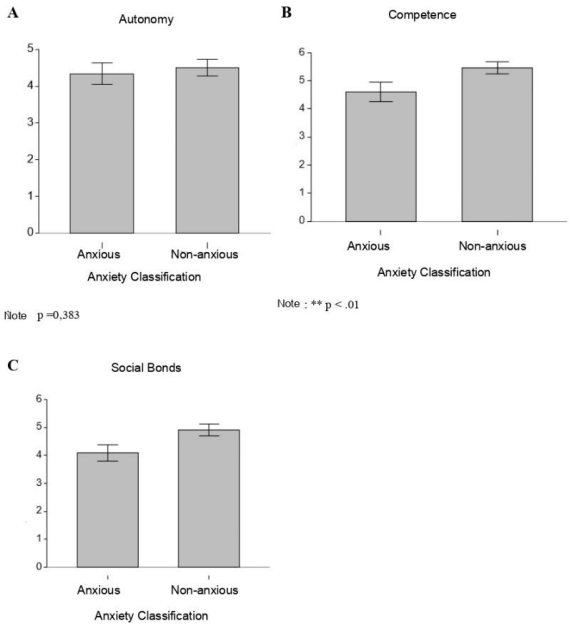
In the dimensions of motivational regulations (intrinsic motivation, identified regulation, introjected regulation, external regulation, and amotivation) (Figure 2), the "Active" group scored significantly higher in the more self-determined motivations (Intrinsic Motivation: t=3.020, p=0.003; Identified Motivation: t=2.608, p=0.010). For introjected regulation, external regulation, and amotivation, no significant differences were found.

Figure 2. Relationship between motivational regulations and physical activity level, and comparison between the active and insufficiently active groups.



To analyze motivation for physical activity and its relationship with anxiety, participants with severe and moderate anxiety levels were grouped as "anxious," while those with normal and mild anxiety levels were grouped as "non-anxious." In the dimensions of basic psychological needs (autonomy, competence, and social bonds) (Figure 3), the "Anxious" group scored significantly lower on the basic psychological needs of Competence (t=-4.226, p<0.001) and Social Bonds (t=-4.446, p<0.001), with no significant difference found for Autonomy (t=-0.874, p=0.383).

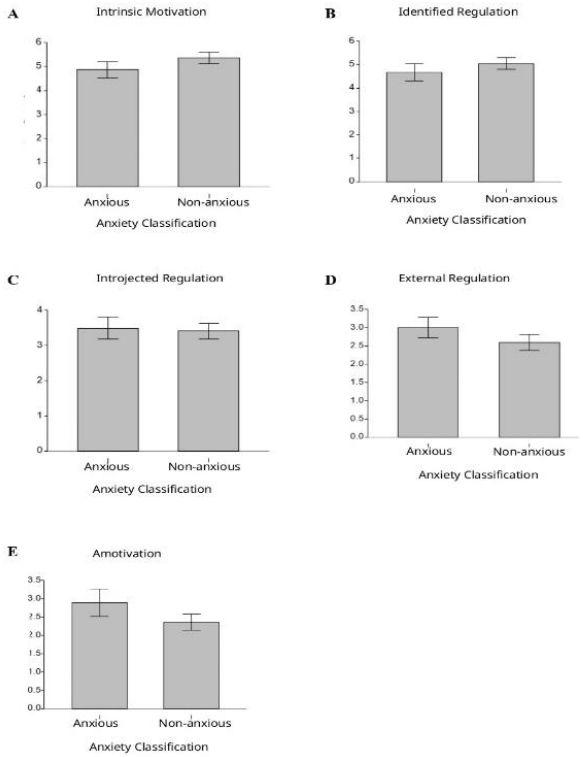
Figure 3. Relationship between basic psychological needs and anxiety level among the anxious and non-anxious groups.



Note: ** p < .01

In the dimensions of motivational regulations for physical activity (Figure 4), the "Anxious" group scored significantly lower in intrinsic motivation (t=-2.339, p=0.020), with no significant differences observed for identified regulation (t=-1.678, p=0.095) and introjected regulation (t=0.442, p=0.659). The "Anxious" group scored significantly higher in external regulation (t=2.256, p=0.025) and amotivation (t=2.625, p=0.009).

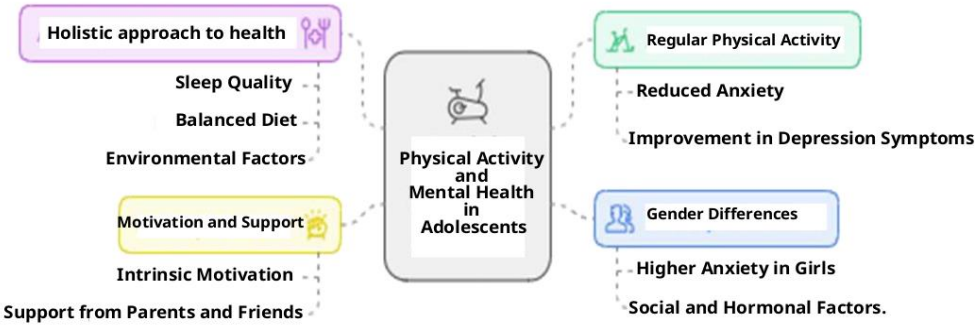
Figure 4. Relationship between motivational regulations and anxiety level among the anxious and non-anxious groups.



Discussion

The results of this study support existing evidence regarding the relationship between physical activity and mental health in adolescents. It was observed that those who engage in regular physical activity have reduced levels of anxiety. This finding aligns with research highlighting the positive role of physical activity in promoting psychological well-being, demonstrating that exercise can act as a defense mechanism against emotional disorders (Biddle et al., 2019; Lubans et al., 2016; Romero-Carazas et al. 2025). For example, a study by Hu et al. (2020) shows that regular physical activity is associated with significant improvements in depression and anxiety symptoms in young people.

Figure 5.



The study reveals significant gender differences in anxiety levels. Adolescent girls demonstrated a higher prevalence of moderate and severe anxiety compared to adolescent boys. This vulnerability among girls can be attributed to hormonal and social factors that influence mental health, as evidenced by Lewinsohn et al. (1998) and supported by other studies showing that social pressure and cultural expectations are key determinants of female emotional well-being (Chaplin et al., 2009). This gender difference in mental health is a critical issue that requires specific interventions.

The analysis of physical activity levels also revealed that, although most participants were classified as sufficiently active, a significant proportion was considered insufficiently active. Sedentary behavior is a well-established risk factor for the development of both mental and physical health problems, and the World Health Organization recommends that adolescents engage in at least 150 minutes of moderate to vigorous physical activity per week (World Health Organization, 2020). This suggests that effective strategies to encourage physical activity are essential for the mental health of young people.

Furthermore, the study highlighted the importance of motivation in adhering to physical activity. Adolescents who reported higher intrinsic motivation and identified regulation were more likely to engage in regular physical activity. Self-Determination Theory, which argues that intrinsic motivation is vital for maintaining healthy behaviors, is crucial in this context (Deci & Ryan, 2000). Research indicates that motivation can be a critical predictor of engagement in physical activities, reflecting mental health and quality of life (De Rezende et al., 2015), as advocated by SDG 2 of the UN 2030 agenda.

On the other hand, the analysis showed that adolescents with higher anxiety levels had lower scores in dimensions such as competence and social bonds. This result suggests that a negative perception of one's physical abilities and difficulty in forming social connections may contribute to the maintenance of anxiety. The literature confirms that the school environment and physical education play a key role in supporting the development of self-esteem and interpersonal relationships among young people (De Rezende et al., 2015).

The inclusion of social support, such as encouragement from family members and educators, also proved relevant to physical activity adherence. Studies indicate that adolescents who receive support from their parents, friends, and teachers are more likely to maintain healthy habits, even with moderate levels of intrinsic motivation (Bursnall, 2014; Farias et al., 2012). This evidence reinforces the

importance of a collaborative approach between school and family in promoting mental health and physical activity and may be one of the concrete ways to achieve SDG 3.4, which aims to reduce premature mortality from non-communicable diseases by one-third through prevention and treatment, and to promote mental health and well-being by 2030.

Moreover, the dose-response relationship between the amount of time spent on physical activity and the reduction of anxiety and depression symptoms deserves attention. Adolescents who exercise for longer periods show improvements in anxiety levels. This relationship has been observed in several systematic reviews that confirm the benefits of regular physical activity for mental health (Brown et al., 2013; Santos et al., 2023).

Finally, it is crucial to recognize that, although physical activity plays an important role in mental health, other factors such as sleep quality, diet, and psychosocial support must also be considered. Furthermore, environmental issues, such as exposure to contaminants, including pesticides, have been identified in research as factors that influence mental health. Studies show the relationship between exposure to these chemicals and the development of mental disorders, highlighting the importance of addressing these issues comprehensively when considering mental well-being (Guo et al., 2024; James & Oshaughnessy, 2023). Interventions that integrate physical activity with actions aimed at promoting a healthy, nutrient-rich, balanced diet free from contaminants like pesticide residues and good sleep hygiene may result in more significant improvements in adolescent mental health (El Miedany et al., 2024). Therefore, future mental health intervention strategies should consider a holistic approach, encompassing multiple dimensions of health care, as human health is directly linked to plant and environmental health, which are interconnected and interdependent, as advocated by the One Health principles.

Conclusions

The results of this study reinforce the fundamental role of physical activity in promoting mental health among adolescents, and demonstrate a significant reduction in anxiety levels among those who engage in regular physical activity. Furthermore, the higher prevalence of anxiety among adolescent females highlights the need for gender-sensitive approaches that take into account hormonal and social factors. At the same time, the positive influence of intrinsic motivation, as proposed by Self-Determination Theory, proves crucial for maintaining healthy behaviors, especially in the practice of physical activities.

However, it is necessary to recognize that, while physical activity is an important protective factor, its interaction with other aspects of lifestyle, such as sleep quality, a healthy diet free from contaminants, and social support, also plays a significant role in mental health. Future interventions should consider an integrated approach to these human, environmental, and plant factors, aiming at the One Health approach, to promote physical activity alongside actions aimed at improving these other factors in order to maximize the benefits for adolescents' mental health.

Finally, the results point to the importance of school and family intervention programs that encourage healthy habits and take into account the diversity of factors influencing emotional well-being.

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