



OPEN ACCESS

EDITED BY

Szabolcs Halasi,
University of Novi Sad, Serbia

REVIEWED BY

Stevo Popović,
University of Montenegro, Montenegro
Svetlana Buišić,
Univerzitet u Novom Sadu, Serbia
Francesca Greco,
University of Catanzaro Magna Graecia, Italy
Zoran Milic,
Educons University, Serbia
Bojana Marić,
College of Vocational Studies for the
Education of Preschool Teachers and Sports
Trainers, Serbia

*CORRESPONDENCE

Cihan Ayhan

✉ cihanayhan@subu.edu.tr

Laurentiu-Gabriel Talaghir

✉ gabriel.talaghir@ugal.ro

RECEIVED 07 August 2025

ACCEPTED 10 September 2025

PUBLISHED 07 October 2025

CITATION

Karakullukcu OF, Ayhan C, Guder F, Talaghir L-G, Cosoreanu DM and Bentea CC (2025) Understanding the moderating role of gender in physical activity enjoyment and mental well-being: evidence from university students' campus recreation participation. *Front. Public Health* 13:1679353. doi: 10.3389/fpubh.2025.1679353

COPYRIGHT

© 2025 Karakullukcu, Ayhan, Guder, Talaghir, Cosoreanu and Bentea. This is an open-access article distributed under the terms of the [Creative Commons Attribution License \(CC BY\)](https://creativecommons.org/licenses/by/4.0/). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.

Understanding the moderating role of gender in physical activity enjoyment and mental well-being: evidence from university students' campus recreation participation

Omur Fatih Karakullukcu¹, Cihan Ayhan^{2*}, Ferhat Guder³, Laurentiu-Gabriel Talaghir^{4*}, Dumitru Marius Cosoreanu⁴ and Cristina Corina Bentea⁴

¹Ministry of National Education, Ankara, Türkiye, ²Faculty of Sport Sciences, Sakarya University of Applied Sciences, Sakarya, Türkiye, ³Faculty of Sport Sciences, Bayburt University, Bayburt, Türkiye, ⁴Faculty of Physical Education and Sport, Dunarea de Jos University of Galati, Galati, Romania

Background: Participation in physical activity is considered an important factor not only for individuals' physical health but also for their psychological well-being. Developing physical activity habits, especially among university-aged individuals, plays a critical role in long-term health outcomes. In this context, the impact of physical activity enjoyment on individuals' mental well-being has become a topic of interest. However, the moderating role of individual differences, particularly gender, in this relationship has not yet been sufficiently clarified. The purpose of this study was to examine the relationship between physical activity enjoyment and mental well-being among university students and to reveal the moderating effect of gender on this relationship.

Method: The research was conducted using a relational screening model. The study group consisted of 392 university students (261 male and 131 female; mean age = 22.95 ± 2.58) from Sakarya University of Applied Sciences who participated in campus recreation activities. Data were collected via a face-to-face survey using the Physical Activity Enjoyment Scale and the Mental Well-being Scale. Descriptive statistics, Pearson correlation analysis, and regression-based moderation analysis using PROCESS Macro Model 1 were used in the statistical analysis.

Results: The level of enjoyment of physical activity was found to have a significant positive effect on mental well-being ($r = 0.427$, $p = 0.001$; $F = 50.388$, $p < 0.001$; $R^2 = 0.280$). Moderation analysis further showed that gender significantly moderated this relationship ($\Delta R^2 = 0.049$; $p < 0.001$). The effect of enjoyment on mental well-being was significant for both males ($\beta = 0.2693$; S.E. = 0.0348; $p < 0.001$; 95% CI [0.2010, 0.3377]) and females ($\beta = 0.7913$; S.E. = 0.0949; $p < 0.001$; 95% CI [0.6047, 0.9780]), with the effect being stronger among females.

Conclusion: The findings show that considering gender-sensitive approaches in physical activity programs to be implemented on university campuses has a potential impact on improving the psychological well-being of students.

KEYWORDS

campus recreation, mental well-being, outdoor recreation, physical activity, recreational benefit

1 Introduction

In Turkey, 37.6% of individuals aged 19 and over do not reach the physical activity level recommended by the World Health Organization for a healthy life (1). Furthermore, this situation becomes a more pronounced public health problem with increasing age (2). Inadequate physical activity is a significant risk factor for chronic diseases, including obesity, cardiovascular problems, type 2 diabetes, hypertension, several cancers, and mental health disorders such as depression and anxiety (3–5). Encouraging participation is therefore critical for both physical and mental health (6–8), and developing habits during young adulthood can be decisive for long-term outcomes. In addition to physical health, recent studies underline that the psychological mechanisms underlying participation, such as enjoyment and motivation, must be examined to explain why some individuals sustain activity while others discontinue (9).

Physical activity opportunities offered on university campuses play a significant role, particularly because lifestyle habits acquired in early adulthood have the potential to be carried into later life (10–12). Campus recreation programs are also associated with benefits such as stress reduction, holistic health, physical strength, and academic success (13–16). The enjoyment of these activities increases participation, boosts motivation, and helps them become long-term habits (17). Enjoyment is considered a critical affective determinant that predicts whether individuals transition from short-term participation to lifelong adherence, particularly during university years when autonomy increases but stress levels are also high (10). This suggests that, beyond general health outcomes, identifying the specific psychological and social mechanisms underlying activity participation is crucial for addressing concrete research gaps.

Physical activity enjoyment is defined as an individual's positive emotional experience as a result of physical activities, associated with feelings such as pleasure, joy, and fun. It is considered an important determinant of physical activity participation, especially for children and adolescents (18–23). Since positive affective experiences in physical activity are closely linked to broader psychological functioning, examining them alongside mental well-being provides a more comprehensive understanding of individuals' health and quality of life.

The concept of mental well-being is defined as the individual being aware of his/her own potential, being able to cope with the stress in his/her life, being a productive and useful individual and contributing to society; it is also explained as the individual being satisfied with his/her emotional, cognitive and environmental states and having inner peace in this context (24, 25).

Men and women may enjoy physical activities differently, and this can have different effects on their mental health (26, 27). It has been reported that male students generally gravitate towards competitive and high-intensity activities, while female students prefer activities focused on aesthetics, social interaction, and health (28). However, gender cannot be reduced to a fixed binary category. Instead, it is increasingly conceptualized as a socio-cultural construct shaped by psychological processes, cultural expectations, and institutional practices that influence how individuals perceive and experience physical activity (29, 30). These gender differences may moderate the relationship between physical activity enjoyment and mental well-being by altering the direction and strength of this relationship. In this context, the impact of physical activity on individuals is not limited to

physical competence; it also contributes to an individual's mental well-being. Further, Gender Schema Theory (GST) posits that gendered cognitive schemata shape how individuals interpret physical activity experiences, influencing both interpretation and emotional response in ways that go beyond binary categorizations (31).

Self-Determination Theory (SDT) provides a valuable theoretical framework for understanding individuals' motivation toward physical activity. According to Ryan and Deci (32), intrinsic motivation refers to engaging in an activity for the inherent enjoyment and satisfaction it provides. The theory proposes that the fulfillment of three basic psychological needs—competence, autonomy, and relatedness—fosters intrinsic motivation, which subsequently enhances participation and well-being. In campus recreation settings, meeting these needs can directly influence students' enjoyment of physical activity. Students who choose activities freely, perceive themselves as competent, and experience social connectedness are more likely to report higher levels of enjoyment and mental well-being. This, in turn, enhances the quality of their motivation and supports sustained participation over time.

Furthermore, Ryan and Deci (33) conceptualize motivation not as a simple dichotomy of intrinsic versus extrinsic, but as a continuum of self-determination. This continuum ranges from amotivation, representing the lowest level of autonomy, through external, introjected, identified, and integrated regulation, ultimately culminating in intrinsic motivation. Such a perspective highlights that students' reasons for engaging in physical activity differ in the extent of autonomy they embody, and these differences shape how enjoyment translates into well-being. For instance, the experience of a student who participates only due to external pressure differs markedly from that of a student who exercises because it aligns with personal values or self-development goals.

Evidence from Teixeira et al. (9) further demonstrates that SDT offers a robust theoretical basis for explaining the role of enjoyment in sustaining long-term participation in physical activity. Accordingly, campus recreation programs that provide autonomy support, enhance competence, and foster social relatedness are more likely to promote not only short-term enjoyment but also the adoption of physical activity as a lasting lifestyle. Thus, SDT serves as a comprehensive framework to explain the link between physical activity enjoyment and mental well-being (9, 32, 33). In this framework, Bem's (34) GST posits that individuals construct schemas related to gender roles, which over time shape their self-concept. According to Bem, people internalize the culturally defined characteristics of masculinity and femininity and evaluate themselves against these standards. This process influences how individuals judge which activities are appropriate for them and which situations they find more enjoyable. Gender schemas act as cognitive filters that affect the way environmental stimuli are processed and simultaneously shape preferences for physical activity and the psychological satisfaction derived from such activities. Recent empirical evidence supports this view, indicating that gender influences not only behavioral preferences but also the cognitive mechanisms underlying activity-related decision-making (35).

For instance, the tendency of male students to enjoy competitive activities more in campus recreation, while female students gravitate toward aesthetic and socially interactive activities, can be explained by gender schemas formed in childhood and reinforced over time. As Starr and Zurbriggen (29) highlight, GST extends beyond behavioral

choices; it also shapes cognitive processing, memory, perception, and decision-making. Individuals are more likely to encode and recall gender-congruent information, and to make self-judgments more readily when aligned with their gender schemas. Similarly, studies on campus recreation environments have revealed that female students often experience lower comfort levels, particularly in weight-training spaces, reflecting the influence of schema-driven expectations and social norms (30).

Importantly, GST is not rooted in essentialist biological differences but in cultural constructions that are internalized through socialization and reinforced by societal institutions. From this perspective, avoiding essentialist assumptions is critical; gendered experiences in physical activity should be interpreted as socially constructed rather than biologically determined. Within this perspective, gender is not treated merely as a binary variable but as a socio-cultural process shaping how individuals experience physical activity and the mental well-being derived from it. Thus, GST provides a valuable conceptual lens for understanding why the relationship between physical activity enjoyment and mental well-being may differ between male and female students. At this point, the interaction arising from the intersection of SDT and GST is noteworthy. SDT argues that individuals experience higher levels of enjoyment and mental well-being when they participate in activities motivated by intrinsic motivation, while GST suggests that individuals' motivations and perceived preferences for these activities are socially shaped. In this context, individuals' intrinsic motivation levels interact not only with their psychological needs but also with gender-based cognitive structures. How men and women enjoy physical activities may vary depending on both the level of meeting their internal needs and socially internalized gender roles. This explains how the intrinsic motivation mechanism offered by SDT is shaped by GSs and why gender can be a moderating variable (32, 34). Therefore, this theoretical framework contributes to understanding why gender may play a moderating role in the relationship between physical activity enjoyment and mental well-being.

In recent years, the concept of physical activity in campus recreation activities has become an important research area in sports sciences (36–38), and physical activity is effective in preventing life-threatening diseases (39–42). Most of these studies have primarily focused on physical health outcomes and disease prevention, with relatively less attention given to psychological and affective dimensions. However, limited studies are addressing the relationship between physical activity and mental well-being (43, 44), these works have largely concentrated on general associations without investigating contextual factors such as enjoyment or socio-demographic moderators. However, no studies have examined the moderating role of gender in the relationship between physical activity enjoyment in campus recreation activities and mental well-being. Therefore, the lack of knowledge in this area indicates that it is an area that needs to be supplemented with new studies. In this context, understanding how the relationship between physical activity enjoyment and mental well-being differs across gender is becoming increasingly important in the sports sciences literature. Considering the dynamics of this differentiation, a deep understanding of the moderating role of gender and its effects on the well-being of university students is important to fill the gaps in the literature.

This study aims to understand the moderating role of gender in the relationship between physical activity enjoyment and mental

well-being in campus recreation activities. This research will contribute to filling a gap in the literature and guide future research. Practically, the study findings may guide the development of gender-sensitive physical activity programs on university campuses and contribute to the development of strategies to enhance students' mental well-being. Thus, they may contribute to the design of more inclusive, effective, and sustainable physical activity environments at universities. Based on these theoretical and empirical foundations, the hypotheses to be tested in this study are presented below.

H₁: Enjoyment of physical activity significantly and positively predicts individuals' mental well-being.

H₂: Gender has a significant moderating effect on the relationship between enjoyment of physical activity and mental well-being.

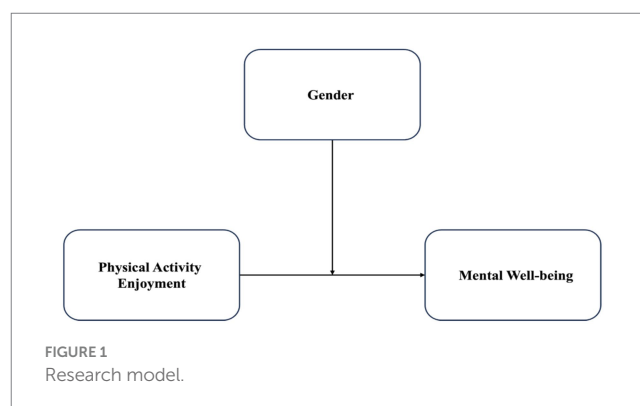
2 Method

2.1 Research model

This research was designed using the correlational screening model, a quantitative research method. The correlational screening model is an approach that aims to examine the relationships between variables without intervening in the current situation (45). The study examined the relationship between physical activity enjoyment and mental well-being, and the moderating role of gender in this relationship was tested. The research model is presented in Figure 1.

2.2 Study sample

The study sample consisted of individuals who participated in campus recreation activities organized on the Sakarya University of Applied Sciences campus. Participants were students who regularly took part in various campus recreation activities, including outdoor sports, fitness, football, basketball, and tennis. Within the scope of the research, participants were recruited using a convenience sampling method. The inclusion criterion for the study was that individuals had participated in at least one recreational activity organized within the university within the last month. After



eliminating incomplete or incorrectly completed forms from a total of 400 individuals, data from 392 participants were included in the study. Of the participants, 261 were male (66.6%) and 131 were female (33.4%). The mean age was 28.36 ± 7.31 for males and 27.46 ± 5.96 for females, while the overall mean age was 22.95 ± 2.58 , with the age distribution ranging from 18 to 29. Regarding weekly frequency of participation, 151 students (38.5%) reported attending once per week, 166 students (42.3%) twice per week, and 75 students (19.1%) three or more times per week. In terms of the purpose of participation, 82 students (20.9%) engaged primarily for physical health, 228 (58.2%) for mental health, and 82 (20.9%) for socialization. According to Sekaran (46), when the population exceeds 10,000,000, a minimum of 384 participants is considered sufficient, and sample sizes between 30 and 500 are generally appropriate. Therefore, the inclusion of 392 participants in this study meets these criteria and enhances the statistical power and generalizability of the findings. Descriptive statistics for the participants are given in Table 1.

2.3 Data collection tools

All participants were included in the study voluntarily, were informed in advance about the purpose of the study, and their consent was obtained following ethical principles. To collect data in the study, the Personal Information Form prepared by the researcher to determine the demographic characteristics of the participants, as well as the Physical Activity Enjoyment Scale and the Mental Well-being Scale, were used. Data were collected via a face-to-face survey, and each participant responded to the questions for an average of 5–7 min.

2.3.1 Personal information form

To determine the moderating effect of gender and to provide information about the average age of the sample to be suitable for the purpose of the research, only questions about the age and gender of the participants, as well as their weekly frequency of participation in campus recreational activities and their purpose of participation, were included in the Personal Information Form.

TABLE 1 Demographic characteristics of the participants.

Variable	Category	Frequency	(%)
Gender	Male	261	66.6
	Female	131	33.4
Participation (weekly frequency)	1 time	151	38.5
	2 times	166	42.3
	3 times or more	75	19.1
Purpose of participation	Physical health	82	20.9
	Mental health	228	58.2
	Socialization	82	20.9
Age	Category	Mean	S.D.
	Male	28.36	7.31
	Female	27.46	5.96
	Overall	22.95	2.58

2.3.2 Physical activity enjoyment scale

To measure the level of enjoyment from physical activity, the scale developed by Mullen et al. (47) and adapted into the Turkish language by Özkurt et al. (48) was used. The physical activity enjoyment scale has a single-factor structure and consists of eight items. Participants responded to these items on a 7-point Likert-type rating scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). High mean scores indicate a high level of enjoyment from physical activities, while low mean scores indicate a low level of enjoyment. In the adaptation of the scale to Turkish culture, the Cronbach's α reliability coefficient was reported as 0.955. In the current study, Cronbach's α was calculated as 0.939. This result demonstrates that the scale has a high level of internal consistency and reliability (49).

2.3.3 Mental well-being scale

To measure general mental well-being, the Warwick-Edinburgh mental well-being scale was developed by Tennant et al. (50) and adapted into the Turkish language by Keldal (51) was used. The mental well-being scale has a single-factor structure and consists of 14 items. Items were answered on a 5-point Likert-type scale ranging from 1 (Never) to 5 (Always) and do not include reverse-scored items. Higher scores indicate a higher level of mental well-being. In the Turkish adaptation study, Cronbach's α reliability coefficient was reported as 0.92. In the present study, Cronbach's α was found to be 0.885. These findings demonstrate that the scale has adequate internal consistency (49).

2.4 Ethical approval

This research was ethically approved by the Sakarya University of Applied Sciences Ethics Committee with decision number 39 taken at the meeting number 56 dated 07.05.2025 (Decision Number: 56/39).

2.5 Statistical analysis

The data obtained in the study were analyzed using the IBM SPSS Statistics 25.0 program and the PROCESS Macro v4.0 plug-in (52). Before the analysis, preliminary checks were conducted to assess the suitability of the data for statistical analysis. To determine whether the normal distribution assumption was met, the skewness and kurtosis values of the variables were examined between -2 and $+2$ (53). As a result of this evaluation, it was determined that the data showed a normal distribution, and parametric tests were applicable. During the data analysis process, firstly, descriptive statistics of the measurement tools used in the study, reliability coefficients (Cronbach's α), and Pearson correlation analysis were conducted to determine the level of relationships between the variables. Then, in line with the main objective of the study, the moderator role of gender in the relationship between enjoyment from physical activity and mental well-being was examined. For this purpose, a regression-based moderation analysis was applied using the Model 1 option of PROCESS Macro developed by Hayes (52). In the model, physical activity enjoyment was defined as the independent variable, mental well-being as the dependent variable, and gender as the moderator variable. Gender, used as the moderator variable in the moderation analysis, was converted to a dummy variable before the

analysis (0 = male, 1 = female). The Bootstrap method was used in the analysis, and significance was assessed with a 95% confidence interval over 5,000 samples. The fact that the confidence intervals obtained in this method do not include the value zero indicates that the effects are significant (54, 55). In addition, a simple slope analysis was performed on the PROCESS Macro outputs to detail the findings of the moderation analysis. Within the scope of this analysis, the effect of the enjoyment variable on mental well-being was examined separately for each level of gender (male and female).

3 Results

When the analysis results in Table 2 were examined, it was determined that there is a positive, moderately statistically significant relationship between enjoying physical activity and mental well-being ($p < 0.01$).

When the analysis results were examined, the regression model testing the relationship between physical activity enjoyment and mental well-being was found to be significant ($F = 50.388$; $p < 0.001$), and the model's explanatory power was 28.0% ($R^2 = 0.280$). The physical activity enjoyment variable was found to have a significant and positive effect on mental well-being ($\beta = 0.2693$; $p < 0.001$). The physical activity enjoyment variable was found to have a significant and positive effect on mental well-being ($\beta = 0.2693$; $p < 0.001$). Furthermore, the main effect of gender on mental well-being was statistically significant ($\beta = -3.5410$; $p < 0.001$). This result indicates that female individuals have lower levels of mental well-being than male individuals. The inclusion of the interaction term (enjoyment $\times$ gender) in the model significantly improved the model ($\Delta R^2 = 0.0494$; $p < 0.001$). This result indicates that gender has a moderating effect on the relationship between enjoyment and mental well-being. The regression coefficient for this interaction was also statistically significant ($\beta = 0.5220$; $p < 0.001$). This finding suggests that the effect of enjoyment on mental well-being differs by gender (Table 3).

According to the moderation analysis, the effect of physical activity enjoyment on mental well-being differs significantly by gender. The effect of enjoyment on mental well-being was found to

be statistically significant in males ($\beta = 0.2693$; S.E. = 0.0348; $p < 0.001$; 95% CI [0.2010; 0.3377]). This effect was higher in females ($\beta = 0.7913$; S.E. = 0.0949; $p < 0.001$; 95% CI [0.6047; 0.9780]) and was significantly higher. These findings suggest that increased enjoyment from physical activity positively impacts mental well-being in both genders, but this effect is stronger in women. Therefore, gender stands out as a moderating factor in the relationship between enjoyment of physical activity and mental well-being (Table 4).

Figure 2 visualizes the relationship between physical activity enjoyment and mental well-being by gender. Figure 2 shows that increasing enjoyment increases mental well-being in both gender groups. However, the slope of this relationship is steeper in women (blue line) than in men (red line). This finding suggests that the effect of enjoyment on mental well-being is stronger in women, indicating that gender significantly regulates this relationship (a moderator effect). Specifically, at lower levels of enjoyment, men have higher mental well-being scores, but as enjoyment increases, women's mental well-being scores increase more rapidly. This is also supported by the significant interaction term obtained in the analyses ($\beta = 0.5220$; $p < 0.001$).

4 Discussion

In this study, the relationship between physical activity enjoyment and mental well-being in individuals participating in campus recreation activities was examined and it was also evaluated whether gender had a moderating role in this relationship. The findings were interpreted, compared with similar studies in the literature, and a comprehensive discussion of the results was presented. With a specific focus on the moderating role of gender. The discussion emphasizes how these findings fit within motivational and socio-cultural theoretical frameworks.

When the analysis results were examined, a moderately positive and statistically significant correlation was identified between physical activity enjoyment and mental well-being ($p < 0.01$). This outcome indicates that physical activity contributes not only to physical health but also to psychological well-being. A comprehensive meta-analysis by Singh et al. (56) demonstrated that physical activity exerts significant positive effects on depression, anxiety, and psychological stress across diverse populations. In parallel, previous research has consistently shown that physical activity enhances subjective well-being while reducing adverse psychological states such as depression and anxiety (57–59).

The present study provides an additional perspective by emphasizing the role of enjoyment, suggesting that beyond the frequency of

TABLE 2 The relationship between enjoyment from physical activity and mental well-being.

Variable 1	Variable 2	<i>r</i>	<i>p</i>
Enjoyment	Mental well-being	0.427	0.001

TABLE 3 Moderation analysis: gender as a moderator between enjoyment and mental well-being.

Model	β	S.E.	<i>t</i>	<i>p</i>	LLCI	ULCI
Constant	2.2677	0.2121	10.6929	<0.001	1.8507	2.6846
Enjoyment	0.2693	0.0348	7.7457	<0.001	0.2010	0.3377
Gender	−3.5410	0.6179	−5.7307	<0.001	−4.7559	−2.3262
Enjoyment $\times$ Gender	0.5220	0.1011	5.1628	<0.001	0.3232	0.7208
Model-related values	R	R²	F	p		
	0.5295	0.2804	50.388	0.001		

ΔR^2 : 0.0494; $p < 0.001$.

participation, the affective experience of activity is a central determinant of psychological outcomes. Ekkekakis et al. (60) demonstrated that the pleasure experienced during physical activity significantly influences both psychological responses and long-term adherence. Consistent with this, Lewis et al. (61) reported that enjoyment was a stronger predictor of sustained physical activity behavior than self-efficacy. These findings highlight that enjoyment not only yields immediate affective benefits but also facilitates long-term participation, which is closely linked to improvements in mental well-being.

From a theoretical standpoint, SDT (62) posits that intrinsically motivated activities promote higher levels of psychological satisfaction. Empirical evidence supports this proposition: Lubans et al. (63) found that intrinsically motivating activities in young populations positively influenced cognitive and emotional health outcomes. Similarly, Zhang and Chen (64) underscored that physical activity enhances happiness across age groups, with such effects being closely tied to the emotional processes experienced during participation. Complementary findings by Ábrahám et al. (65) further indicated that the enjoyment of leisure activities, particularly those with social, intellectual, and introspective dimensions, makes a substantial contribution to psychological well-being. Collectively, these results reinforce the notion that the qualitative aspects of physical activity and the affective experiences they generate are crucial in explaining their impact on mental well-being.

When the relevant literature was examined, many studies supported the findings of this research. Eddolls et al. (66) report that physical activity and being fit were positively associated with mental health and quality of life in adolescents. Lindwall et al. (67) revealed that there is a two-way interaction between physical activity and

depression and that this relationship is also valid for older individuals. Similarly, Hawker (68) reported the positive effects of physical activity on mental health in nursing students. A growing body of research has emphasized that physical activity plays a significant role not only in physiological outcomes but also in psychological gains, and that individual differences shape this effect (69–76). The consistency of the research results with the current literature indicates that campus recreational activities could be associated with improvements in students’ physical, emotional, and cognitive well-being; however, these interpretations should be made cautiously given the methodological limitations of the study. The study conducted by Liu et al. (77) revealed that physical activity has positive effects on health behaviors, mental health, and psychological resilience, and quality of life plays a significant regulatory role in these relationships. This finding reveals the multifaceted nature of physical activity and supports the relationship between enjoyment from physical activity and mental well-being, which is an important finding of our research.

The results of the analysis regarding the moderating role of gender revealed that the relationship between physical activity enjoyment and mental well-being differed significantly. In the regression analysis, it was observed that including the interaction term (Enjoyment $\times$ Gender) in the model significantly improved the model and increased explanatory power. While the effect of physical activity enjoyment on mental well-being was significant in male participants, this effect was observed to be higher in females than in males. When Figure 2 was examined, it was seen that as the level of enjoyment increased, mental well-being scores also increased in both genders, with a relatively steeper slope for women. This suggests that the association between enjoyment and mental well-being may be stronger among female participants. However, this interpretation should be approached cautiously, as factors such as differences in duration or type of physical activity participation, which were not controlled in this study, may also contribute to this pattern. This finding indicates that individuals’ emotional responses to physical activity may be shaped not only by personal differences but also by socially constructed gender roles. Previous studies suggest that men and women often engage in physical activities in distinct ways, which can influence both the enjoyment derived

TABLE 4 Conditional effects of enjoyment on mental well-being by gender.

Gender	Effect β	S.E.	t	p	LLCI	ULCI
Male (0)	0.2693	0.0348	7.7457	<0.001	0.2010	0.3377
Female (1)	0.7913	0.0949	8.3351	<0.001	0.6047	0.9780

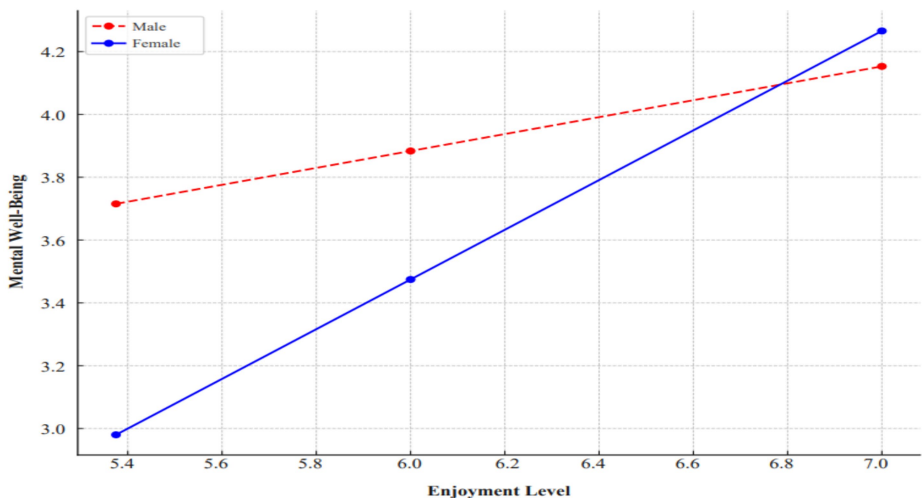


FIGURE 2 Interaction between enjoyment and mental well-being by gender.

from participation and how this enjoyment is reflected in their mental well-being (26, 28). These findings may be interpreted within the frameworks of SDT (32) and GST (34), although neither theory was directly tested in this study. According to SDT, higher levels of intrinsic motivation are associated with greater enjoyment and, in turn, better mental well-being (62). From the perspective of GST, socially constructed gender schemas may influence perceptions of which activities are considered appropriate and how satisfaction is derived (34). In line with previous research, women may be more likely to view physical activity as a means of social connection, stress relief, or self-care, which could help explain why increases in enjoyment are more strongly associated with improvements in mental well-being among female participants.

Many studies in the relevant literature supported our research findings. A study conducted by Tian et al. (78) examined the mediating role of subjective well-being and the moderating effect of gender in the relationship between physical activity and anxiety. According to the research results, physical activity was significantly associated with subjective well-being and anxiety. Furthermore, while subjective well-being played a mediating role in the relationship between physical activity and anxiety, the gender variable had a moderating effect in this model. It was noted that the path coefficients, particularly in the direct impact between physical activity and anxiety, differed significantly between male and female participants. This finding demonstrates that the psychological results of physical activity may vary depending on an individual's gender, and gender is an important variable to consider in the relationship between physical activity and psychological well-being. In an intervention study conducted by Medina et al. (79), it was suggested that the effects of moderate-to-vigorous exercise programs on anxiety sensitivity may vary by gender, and male participants were observed to benefit more from exercise. It was noted that men experienced a more significant decrease in anxiety sensitivity compared to women in the first week of the study, but this difference disappeared after the two-week intervention. This finding suggests that psychological responses to physical activity may differ based on gender in the short term. In the current study, a more significant increase in mental well-being was observed in women as their enjoyment of physical activity increased. Although Medina et al. (79) reported a faster response rate in men, both studies shared a common point that gender served as a decisive moderator. In other words, it suggests that psychological responses to physical activity may be shaped by gender-specific characteristics, social roles, and individual experiences. In the study conducted by Abós et al. (80), it was revealed that female students reported more negative motivational outcomes in response to internally controlling teaching behaviors compared to male students. This finding suggests that women's psychological responses in physical activity contexts may be more strongly influenced by how the activity is perceived and delivered. These results are consistent with our findings, which indicate that increases in enjoyment of physical activity are more strongly associated with improvements in mental well-being among female participants.

5 Conclusion

This study highlights the significant role of physical activity enjoyment in enhancing individuals' mental well-being, particularly in university students participating in campus recreation activities. The findings confirm that enjoyment is not only a motivational factor

but also a crucial emotional component that contributes to psychological health. Furthermore, the moderating effect of gender indicates that this relationship differs between men and women, with women experiencing a greater positive impact on mental well-being as their enjoyment increases. These results suggest that both intrinsic motivational factors, as emphasized by SDT, and socially shaped perceptions related to gender, as outlined in GST, play an important role in shaping psychological outcomes in physical activity contexts.

5.1 Limitations and strengths of the study

As the sample of this study was drawn from a single university and selected through convenience sampling, the generalizability of the findings is limited. This study offers significant contributions to the literature by examining the relationship between physical activity enjoyment and mental well-being among university students participating in campus recreation activities, and the moderating role of gender in this relationship. However, the study has several limitations. First, the research data were obtained from a student sample from only one university and did not include participants from different university types (public and/or private) or sociocultural contexts. This limits the generalizability of the findings. Furthermore, because the data were collected through self-report, it was not possible to eliminate participants from influences such as social desirability bias or respondent bias. Furthermore, the study considered the gender variable as a binary (female–male) variable, excluding the cultural and psychosocial dimensions of gender. This situation has limited our ability to gain a more in-depth understanding of the impact of gender on individuals' physical activity experiences. Another limitation of this study is that the duration of participants' engagement in physical activity was not measured. Some individuals may have recently started participating in campus recreation activities, while others may have been active for a longer period. Such variability in the duration of participation could influence both the level of enjoyment and the perceived mental well-being, and thus may partly account for the observed differences between male and female participants. In addition, the age distribution of the participants (18–29 years) was relatively narrow, which may restrict the applicability of the results to other age groups. Finally, the higher number of male participants compared to female participants constitutes a limitation that should be taken into account when interpreting the findings. However, the robustness check conducted by equalizing group sizes showed that the results were consistent with the main analysis.

Despite these limitations, the study also has some strengths. In particular, its examination of the impact of physical activity enjoyment on mental well-being within the context of gender makes the study original and fills a gap in the literature. In this context, the study's foundation in theoretical foundations such as SDT and GST allowed for a theoretical discussion of the relationships between variables. Furthermore, the inclusion of moderation analysis to test the moderating role of gender and the use of advanced statistical analysis techniques such as PROCESS macro strengthen the study's methodological quality. Finally, obtaining findings that will guide practices to support the mental health of university students increases the practical value of the study as well as its theoretical contribution.

5.2 Recommendations for future studies and practitioners

While this study demonstrates the moderating role of gender in the relationship between physical activity enjoyment and mental well-being, future studies should adopt different methodological approaches to develop a more holistic perspective. Longitudinal studies, in particular, will provide a more robust analysis of the direction and dynamics of change in these relationships over time. In addition, future research should include samples from different universities and regions to allow for comparative analyses across diverse socio-cultural contexts, thereby enhancing the generalizability of the findings. Furthermore, gender should be considered not solely as a biological category but rather in conjunction with gender roles, identities, and their cognitive and psychological implications. Furthermore, comparative studies examining the impact of cultural differences will contribute to a contextual understanding of the psychological effects of physical activity on individuals. Quantitative findings can be more comprehensively supported by in-depth examinations of individuals' physical activity experiences through qualitative or mixed-method research.

Various institutions, especially universities, should consider gender-based differences when planning physical activity programs. Because men and women derive different satisfaction from physical activity, the content and presentation of the activities offered should be diversified. Considering the emotional and social bonding orientation of females, aesthetic, group-based and/or relaxing activities can be more encouraged. For men, programs focused on competition, performance, and physical strength can increase enjoyment. Furthermore, participant-centered physical activity environments should be created to support students' intrinsic motivation, and structures that meet individuals' needs for autonomy, competence, and relatedness should be prioritized. In this context, programs developed based on SDT will be more effective in supporting both the physical and mental well-being of students.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors without undue reservation.

Ethics statement

The studies involving humans were approved by Sakarya University of Applied Sciences Ethics Committee. The studies were conducted in accordance with the local legislation and institutional

requirements. The participants provided their written informed consent to participate in this study.

Author contributions

OFK: Data curation, Investigation, Methodology, Writing – original draft, Writing – review & editing. CA: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. FG: Data curation, Formal analysis, Investigation, Writing – original draft, Writing – review & editing. L-GT: Funding acquisition, Methodology, Writing – original draft, Writing – review & editing. DMC: Funding acquisition, Methodology, Writing – original draft, Writing – review & editing. CCB: Funding acquisition, Methodology, Writing – original draft, Writing – review & editing.

Funding

The author(s) declare that no financial support was received for the research and/or publication of this article.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The authors declare that no Gen AI was used in the creation of this manuscript.

Any alternative text (alt text) provided alongside figures in this article has been generated by Frontiers with the support of artificial intelligence and reasonable efforts have been made to ensure accuracy, including review by the authors wherever possible. If you identify any issues, please contact us.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

References

1. Ministry of Health, Republic of Türkiye. General Directorate of Public Health, Türkiye Nutrition and Health Survey (TNHS). Ankara: Yayın (2019) No: 1132.
2. Türkmen M, Ozkan A, Murat K, Bozkus T. Investigation of the relationship between physical activity level and healthy life-style behaviors of academic staff. *Educ Res Rev.* (2015) 10:577–81. doi: 10.5897/ERR2015.2083
3. Aktuğ ZB, İri R, Demir NA. COVID-19 immune system and exercise. *J Hum Sci.* (2020) 17:513–20. doi: 10.14687/jhs.v17i2.6005
4. Cicek G, Ozcan O, Akyol P, Isik O, Novak D, Küçük H. The effect of aerobic and high-intensity interval training on plasma pentraxin 3 and lipid parameters in overweight and obese women. *PeerJ.* (2024) 12:e18123. doi: 10.7717/peerj.18123

5. Morrow JR Jr, Jackson AW, Bazzarre TL, Milne D, Blair SN. A one-year follow-up to physical activity and health: a report of the surgeon general. *Am J Prev Med.* (1999) 17:24–30. doi: 10.1016/S0749-3797(99)00030-6
6. Schultchen D, Reichenberger J, Mittl T, Weh TR, Smyth JM, Blechert J, et al. Bidirectional relationship of stress and affect with physical activity and healthy eating. *Br J Health Psychol.* (2019) 24:315–33. doi: 10.1111/bjhp.12355
7. Ströhle A. Physical activity, exercise, depression and anxiety disorders. *J Neural Transm.* (2009) 116:777–84. doi: 10.1007/s00702-008-0092-x
8. Yılmaz A, Ağgön E. Aktif spor yapan üniversite öğrencilerinin beden memnuniyeti, mental iyi oluş ve özgüven düzeylerinin incelenmesi. *Spor ve Performans Araştırmaları Dergisi.* (2023) 14:31–42. doi: 10.17155/omuspd.1185626
9. Teixeira PJ, Carraça EV, Markland D, Silva MN, Ryan RM. Exercise, physical activity, and self-determination theory: a systematic review. *Int J Behav Nutr Phys Act.* (2012) 9:78:1–30. doi: 10.1186/1479-5868-9-78
10. Granero-Jiménez J, López-Rodríguez MM, Dobarrío-Sanz I, Cortés-Rodríguez AE. Influence of physical exercise on psychological well-being of young adults: a quantitative study. *Int J Environ Res Public Health.* (2022) 19:4282. doi: 10.3390/ijerph19074282
11. Huang CY, Carleton B. The relationships among leisure participation, leisure satisfaction, and life satisfaction of college students in Taiwan. *J Exerc Sci Fit.* (2003) 1:129–32.
12. Yayla M. Üniversite Öğrencilerinin Rekreasyonel Engel Tercih ve Taleplerinin İncelenmesi: Selçuk Üniversitesi Ali Akkanat Kampüsü Örneği. Konya: Yüksek Lisans Tezi, Selçuk Üniversitesi Sağlık Bilimleri Enstitüsü (2022).
13. Bullo V, Bergamin M, Gobbo S, Sieverdes JC, Zaccaria M, Neunhaeuser D, et al. The effects of Pilates exercise training on physical fitness and well-being in the elderly: a systematic review for future exercise prescription. *Prev Med.* (2015) 75:1–11. doi: 10.1016/j.ypmed.2015.03.002
14. Huang H, Humphreys BR. Sports participation and happiness: evidence from US microdata. *J Econ Psychol.* (2012) 33:776–93. doi: 10.1016/j.joep.2012.02.007
15. Lower LM, Turner BA, Petersen JC. A comparative analysis of perceived benefits of participation between recreational sport programs. *Recreat Sports J.* (2013) 37:66–83. doi: 10.1123/rsj.37.1.66
16. Van Dijk M, De Groot R, Savelberg H, Van Acker F, Kirschner P. A. (2013). Physical activity, cognitive performance, and academic achievement: an observational study in Dutch adolescents using accelerometers. Paper presented at ICO National Fall School, Maastricht, Netherlands.
17. Ayhan C, Yalçın İ, Soyer F. Serbest zaman tatmininin fiziksel aktivite tutumu üzerine etkisi. *Kafkas Üniversitesi Spor Bilimleri Dergisi.* (2023) 3:115–25.
18. Chen C, Weyland S, Fritsch J, Woll A, Niessner C, Burchartz A, et al. A short version of the physical activity enjoyment scale: development and psychometric properties. *Int J Environ Res Public Health.* (2021) 18:11035. doi: 10.3390/ijerph182111035
19. Gao Z, Zhang T, Stodden D. Children's physical activity levels and psychological correlates in interactive dance versus aerobic dance. *J Sport Health Sci.* (2013) 2:146–51. doi: 10.1016/j.jshs.2013.01.005
20. Greule C, Sudeck G, Thiel A, Kastner L, Janssen P, Niess A, et al. Correlates of physical activity enjoyment in children and adolescents for a new perspective on the treatment of overweight: a systematic literature review. *Obes Rev.* (2024) 25:e13655. doi: 10.1111/obr.13655
21. Hagberg LA, Lindahl B, Nyberg L, Hellenius ML. Importance of enjoyment when promoting physical exercise. *Scand J Med Sci Sports.* (2009) 19:740–7. doi: 10.1111/j.1600-0838.2008.00844.x
22. Latorre Roman PA, García Pinillos F, Navarro Martínez AV, Izquierdo Rus T. Validity and reliability of physical activity enjoyment scale questionnaire (PACES) in children with asthma. *J Asthma.* (2014) 51:633–8. doi: 10.3109/02770903.2014.898773
23. Nahas MV, Goldfine B, Collins MA. Determinants of physical activity in adolescents and young adults: the basis for high school and college physical education to promote active lifestyles. *Phys Educ.* (2003) 60:42.
24. World Health Organisation. Promoting mental health: Concepts, emerging evidence and practice (summary report). Geneva: World Health Organisation (2004).
25. Sawyer MG, Arney FM, Baghurst PA, Clark JJ, Graetz BW, Kosky RJ, et al. The mental health of young people in Australia: key findings from the child and adolescent component of the national survey of mental health and well-being. *Aust N Z J Psychiatry.* (2001) 35:806–14. doi: 10.1046/j.1440-1614.2001.00964.x
26. Aydın İ. Serbest zaman ilgilenimi ve yaşam doyum ilişkisinde etkinlik doyumunun kısmi aracılık etkisi: rekreasyonel koşucular örneği. *Spor ve Performans Araştırmaları Dergisi.* (2022) 13:55–74. doi: 10.17155/omuspd.911751
27. Hardin M, Greer JD. The influence of gender-role socialization, media use and sports participation on perceptions of gender-appropriate sports. *J Sport Behav.* (2009) 32:207.
28. Doyle CB, Khan A, Burton NW. Recreational physical activity context and type preferences among male and female Emirati university students. *Int Health.* (2019) 11:507–12. doi: 10.1093/inthealth/ihz002
29. Starr CR, Zurbriggen EL. Sandra Bem's gender schema theory after 34 years: a review of its reach and impact. *Sex Roles.* (2017) 76:566–78. doi: 10.1007/s11199-016-0591-4
30. Wilson OW, Barnett TA, Colabianchi N. Gender differences in college students' comfort using campus recreation facilities: a mixed-methods analysis. *J Am Coll Heal.* (2022) 70:1367–75. doi: 10.1080/07448481.2020.1804388
31. Waka TY, Umucyo D, Nishimwe A, Yoon AJ, Neil KL. The influence of gender-based perceptions on females joining a bachelor of medicine, bachelor of surgery in Rwanda. *BMC Med Educ.* (2025) 25:133. doi: 10.1186/s12909-025-06714-w
32. Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *Am Psychol.* (2000) 55:68–78. doi: 10.1037/0003-066X.55.1.68
33. Ryan RM, Deci EL. Intrinsic and extrinsic motivation from a self-determination theory perspective: definitions, theory, practices, and future directions. *Contemp Educ Psychol.* (2020) 61:101860. doi: 10.1016/j.cedpsych.2020.101860
34. Bem SL. Gender schema theory: a cognitive account of sex typing. *Psychol Rev.* (1981) 88:354–64. doi: 10.1037/0033-295X.88.4.354
35. Park SH, Kim YJ. Relationships between university students' gender and cognitive processes in exercise-related decision making. *Percept Mot Skills.* (2022) 129:221–38. doi: 10.1177/00315125211060187
36. Peker H, Teke C, Çakar B, Kabadaş Y, Caner N. Fiziksel aktiviteden keyif alma, tekrar katılma niyeti ve mutluluk arasındaki ilişki: Kampüs rekreasyonuna katılan üniversite öğrencileri örneği. *Uluslararası Güncel Eğitim Araştırmaları Dergisi.* (2023) 9:206–20. doi: 10.61087/IntJCES.2023.8
37. Sert EM, Onay B. Üniversite Öğrencilerinin Rekreasyonel Gereksinimlerinin Kano Modeliyle Sınıflandırılması: Ahmet Necdet Sezer Kampüsü Örneği. *Kent Akademisi.* (2025) 18:735–52. doi: 10.35674/kent.1444129
38. Wilson OW, Colinear C, Guthrie D, Bopp M. Gender differences in college student physical activity, and campus recreational facility use, and comfort. *J Am Coll Heal.* (2022) 70:1315–20.
39. Bek N. Fiziksel aktivite ve sağlığımız. Ankara: Fiziksel Aktivite Bilgi Serisi (2008).
40. Bulut S. Sağlıkta sosyal bir belirleyici; fiziksel aktivite. *Türk Hijyen ve Deneysel Biyoloji Dergisi.* (2013) 70:205–14. doi: 10.5505/TurkHijyen.2013.67442
41. Donnelly JE, Blair SN, Jakicic JM, Manore MM, Rankin JW, Smith BK, et al. Appropriate physical activity intervention strategies for weight loss and prevention of weight regain for adults. *Med Sci Sports Exerc.* (2009) 41:459–71. doi: 10.1249/mss.0b013e3181949333
42. Hendelman D, Miller K, Baggett C, Debold E, Freedson P. Validity of accelerometry for the assessment of moderate intensity physical activity in the field. *Med Sci Sports Exerc.* (2000) 32:S442–9.
43. Harris MA. The relationship between physical inactivity and mental well-being: findings from a gamification-based community-wide physical activity intervention. *Health Psychol Open.* (2018) 5:1–8. doi: 10.1177/2055102917753853
44. Henderson KA, Ainsworth BE. Enjoyment: a link to physical activity, leisure, and health. *J Park Recreat Adm.* (2002) 20:130–46.
45. Karasar N. Bilimsel araştırma yöntemi. 23. Basım ed. Ankara: Nobel Akademik Yayıncılık (2012).
46. Sekaran U. Research methods for business: A skill-building approach. 2nd ed. New York: John Wiley & Sons (1992).
47. Mullen SP, Olson EA, Phillips SM, Szabo AN, Wójcicki TR, Mailey EL, et al. Measuring enjoyment of physical activity in older adults: invariance of the physical activity enjoyment scale (paces) across groups and time. *Int J Behav Nutr Phys Act.* (2011) 8:103. doi: 10.1186/1479-5868-8-103
48. Özkurt B, Küçükibiş HF, Eskiler E. Fiziksel aktivitelerden keyif alma ölçeği (FAKÖ): Türk kültürüne uyarlama, geçerlik ve güvenilirlik çalışması. *Anemon Muş Alparslan Üniversitesi Sosyal Bilimler Dergisi.* (2022) 10:21–37. doi: 10.18506/anemon.976300
49. Salvucci S, Walter E, Conley V, Fink S, Saba M. Measurement error studies at the National Center for Education Statistics (NCES). Washington, DC: U.S. Department of Education (1997).
50. Tennant R, Hiller L, Fishwick R, Platt S, Joseph S, Weich S, et al. The Warwick-Edinburgh mental well-being scale (WEMWBS): development and UK validation. *Health Qual Life Outcomes.* (2007) 5:50–63. doi: 10.1186/1477-7525-5-63
51. Keldal G. Warwick-Edinburgh mental iyi oluş ölçeği'nin Türkçe formu: Geçerlik ve güvenilirlik çalışması. *J Happiness Well-Being.* (2015) 3:103–15.
52. Hayes AF. Introduction to mediation, moderation, and conditional process analysis: a regression-based approach. 3rd ed. New York: The Guilford Press (2022).
53. George D, Mallery P. IBM SPSS statistics 23 step by step. New York: Routledge (2016).
54. Gürbüz S. Sosyal bilimlerde aracı, düzenleyici ve durumsal etki analizleri. Ankara: Seçkin Yayıncılık (2019).
55. Hayes AF. Introduction to mediation, moderation, and conditional process analysis: a regression-based approach. New York: The Guilford Press (2015).
56. Singh B, Olds T, Curtis RG, Dumuid D, Virgara R, Watson A, et al. Effectiveness of physical activity interventions for improving depression, anxiety and distress: an overview of systematic reviews. *Br J Sports Med.* (2023) 57:1203–9. doi: 10.1136/bjsports-2022-106195

57. Penedo FJ, Dahn JR. Exercise and well-being: a review of mental and physical health benefits associated with physical activity. *Curr Opin Psychiatry*. (2005) 18:189–93. doi: 10.1097/00001504-200503000-00013
58. Rebar AL, Stanton R, Geard D, Short C, Duncan MJ, Vandelandotte C. A meta-meta-analysis of the effect of physical activity on depression and anxiety in non-clinical adult populations. *Health Psychol Rev*. (2015) 9:366–78. doi: 10.1080/17437199.2015.1022901
59. Stanton R, Happell B, Reaburn P. The mental health benefits of regular physical activity, and its role in preventing future depressive illness. *Nurs Res Rev*. (2014) 4:45–53. doi: 10.2147/NRR.S41956
60. Ekkekakis P, Parfitt G, Petruzzello SJ. The pleasure and displeasure people feel when they exercise at different intensities. *Sports Med*. (2011) 41:641–71. doi: 10.2165/11590680-000000000-00000
61. Lewis BA, Williams DM, Frayeh A, Marcus BH. Self-efficacy versus perceived enjoyment as predictors of physical activity behaviour. *Psychol Health*. (2016) 31:456–69. doi: 10.1080/08870446.2015.1111372
62. Deci EL, Ryan RM. Intrinsic motivation and self-determination in human behavior. New York: Springer (1985).
63. Lubans DR, Richards J, Hillman CH, Faulkner G, Beauchamp MR, Nilsson M, et al. Physical activity for cognitive and mental health in youth: a systematic review of mechanisms. *Pediatrics*. (2016) 138:e20161642. doi: 10.1542/peds.2016-1642
64. Zhang Z, Chen W. A systematic review of the relationship between physical activity and happiness. *J Happiness Stud*. (2019) 20:1305–22. doi: 10.1007/s10902-018-9976-0
65. Ábrahám J, Velenczei A, Szabo A. Perceived determinants of well-being and enjoyment level of leisure activities. *Leis Sci*. (2012) 34:199–216. doi: 10.1080/01490400.2012.669677
66. Eddolls WTB, McNarry MA, Lester L, Winn CON, Stratton G, Mackintosh KA. The association between physical activity, fitness and body mass index on mental well-being and quality of life in adolescents. *Qual Life Res*. (2018) 27:2313–20. doi: 10.1007/s11136-018-1883-1
67. Lindwall M, Larsman P, Hagger MS. The reciprocal relationship between physical activity and depression in older European adults: a prospective cross-lagged panel design using SHARE data. *Health Psychol*. (2011) 30:453–62. doi: 10.1037/a0023268
68. Hawker CL. Physical activity and mental well-being in student nurses. *Nurse Educ Today*. (2012) 32:325–31. doi: 10.1016/j.nedt.2011.06.005
69. Barham WT, Buysse DJ, Kline CE, Kubala AG, Brindle RC. Sleep health mediates the relationship between physical activity and depression symptoms. *Sleep Breath*. (2022) 26:1341–9. doi: 10.1007/s11325-021-02496-9
70. Feuerhahn N, Sonnentag S, Woll A. Exercise after work, psychological mediators, and affect: a day-level study. *Eur J Work Organ Psychol*. (2014) 23:62–79. doi: 10.1080/1359432X.2012.709965
71. Fisher HM, Jacobs JM, Taub CJ, Lechner SC, Lewis JE, Carver CS, et al. How changes in physical activity relate to fatigue interference, mood, and quality of life during treatment for non-metastatic breast cancer. *Gen Hosp Psychiatry*. (2018) 49:37–43. doi: 10.1016/j.genhosppsych.2017.05.007
72. Görgülü E, Bieber M, Engerof T, Zabel K, Etyemez S, Prvulovic D, et al. Physical activity, physical self-perception and depression symptoms in patients with major depressive disorder: a mediation analysis. *Eur Arch Psychiatry Clin Neurosci*. (2021) 271:1205–15. doi: 10.1007/s00406-021-01299-z
73. Hou B, Wu Y, Huang Y. Physical exercise and mental health among older adults: the mediating role of social competence. *Front Public Health*. (2024) 12:1385166. doi: 10.3389/fpubh.2024.1385166
74. Kikkawa M, Shimura A, Nakajima K, Morishita C, Honyashiki M, Tamada Y, et al. Mediating effects of trait anxiety and state anxiety on the effects of physical activity on depressive symptoms. *Int J Environ Res Public Health*. (2023) 20:5319. doi: 10.3390/ijerph20075319
75. Li Z, Huang F. Mechanisms of the impact of sports participation on college students' psychological well-being. *Soc Behav Pers*. (2024) 52:13119E–26E. doi: 10.2224/sbp.13119
76. Walsh RFL, Smith LT, Klugman J, Titone MK, Ng TH, Goel N, et al. An examination of bidirectional associations between physical activity and mood symptoms among individuals diagnosed and at risk for bipolar spectrum disorders. *Behav Res Ther*. (2023) 161:104255. doi: 10.1016/j.brat.2023.104255
77. Liu R, Menhas R, Saqib ZA. Does physical activity influence health behavior, mental health, and psychological resilience under the moderating role of quality of life? *Front Psychol*. (2024) 15:1349880. doi: 10.3389/fpsyg.2024.1349880
78. Tian J, Yu H, Austin L. The effect of physical activity on anxiety: the mediating role of subjective well-being and the moderating role of gender. *Psychol Res Behav Manag*. (2022) 15:3167–78. doi: 10.2147/PRBM.S384707
79. Medina JL, DeBoer LB, Davis ML, Rosenfield D, Powers MB, Otto MW, et al. Gender moderates the effect of exercise on anxiety sensitivity. *Ment Health Phys Act*. (2014) 7:147–51. doi: 10.1016/j.mhpa.2014.08.002
80. Abós Á, Burgueño R, García-González L, Sevil-Serrano J. Influence of internal and external controlling teaching behaviors on students' motivational outcomes in physical education: is there a gender difference? *J Teach Phys Educ*. (2022) 41:502–12. doi: 10.1123/jtpe.2020-0316