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A systematic literature review on the impact of participation in sport and physical activities on psychological resilience

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ABSTRACT

Participation in sports and physical activity (PA) is often considered a potential contributor to psychological resilience due to its physical, cognitive, and social benefits. This review aims to synthesize an extensive overview of the existing knowledge landscape, shedding light on the mechanisms through which sport and PA may contribute to psychological resilience among students. Guided by the preferred reporting items for systematic reviews and meta-analyses (PRISMA) statement review method, we comprehensively searched key databases, including EBSCOhost and Scopus. Note that a total of 353 publications were initially determined. The final finding data concludes that 15 met the selection criteria. The findings were synthesized based on three themes: enhancing positive mental health, reducing negative emotions, and mitigating depression and anxiety. These outcomes highlight the transformative potential of sports and PAs in nurturing a robust psychological foundation among student populations. However, it calls for more robust and standardized research approaches. This is with implications suggesting the integration of sports and PA into comprehensive mental health programs, emphasizing their multifaceted benefits beyond psychological resilience. Tailoring interventions, recognizing the social aspects, and emphasizing the personalized approach can contribute to more effective mental health promotion strategies for students.

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1. INTRODUCTION

In current years, the field of mental health has witnessed a growing acknowledgment of the intricate relationship between physical activity (PA), particularly engagement in sports, and psychological resilience, among student populations. This recognition stems from the multifaceted benefits of participation in sports and PAs, encompassing physical, cognitive, and social dimensions. As mental health concerns become increasingly prevalent among students, understanding and harnessing the potential of sport and PA in fostering psychological resilience has gained prominence.

Psychological resilience represents an individual's capability to adapt, bounce back from adversity, as well as prosper in the face of life's obstacles [1], [2]. It provides individuals with cognitive as well as emotional tools to navigate stressors and emerge stronger and more resourceful [3], [4]. This resilience is particularly pertinent in the context of the student population, where individuals navigate a myriad of stressors, including academic demands, social transitions, and the pursuit of personal and professional growth can place

considerable strain on students' mental well-being [5]–[8]. Moreover, as students undergo significant life changes and encounter diverse stressors, understanding and bolstering their psychological resilience becomes imperative for their overall well-being [9], [10].

Sport and PA, in their myriad forms, have the potential to be catalysts for building psychological resilience [11], [12]. The inherent attributes of these activities encompass several critical facets that are instrumental in resilience development [13]. Additionally, regular engagement in PAs contributes to improved physical health, which, in turn, has a profound influence on emotional well-being [14]. Note that enhanced physical fitness is linked to heightened self-esteem, emotional stability, and self-efficacy, all of which underpin resilience [15]–[18]. Furthermore, sports and PA offer a structured and supportive environment that fosters social interactions, teamwork, and positive relationships [19]–[21]. These settings serve as platforms for individuals to develop strong social bonds and support networks [22], [23]. The camaraderie and shared objectives in sports often culminate in a wealth of emotional resources, equipping individuals to withstand the challenges life presents [21], [24]. Moreover, the skills acquired in the sporting arena, such as goal setting, discipline, and perseverance, translate seamlessly to the challenges of daily life [22].

Sport and PA are multifaceted experiences that extend beyond the realm of physical fitness. The benefits of exercise on cardiovascular health and muscular strength are well-established. Nevertheless, the psychological advantages, especially in terms of resilience, remain a subject of exploration [24], [25]. This review seeks to unravel the nuanced interplay between participation in sports, engagement in PAs, and the cultivation of psychological resilience among students. Hence, by systematically synthesizing the available evidence, we aim to provide an overview of the existing knowledge landscape, shedding light on the mechanisms through which sport and PA may contribute to psychological resilience among students. Understanding how students can harness the benefits of sport and PA to fortify their psychological resilience holds the potential to guide the development of targeted well-being programs within educational institutions. Thus, by elucidating this relationship, we aim to contribute to the holistic understanding of student mental health and offer evidence-based recommendations for promoting psychological resilience through engagement in sports and PA.

2. METHOD

2.1. Search strategy and inclusion criteria for systematic review

In conducting this systematic review, a well-defined search strategy was employed to comprehensively explore the relevant literature. The preferred reporting items for systematic reviews and meta-analyses (PRISMA) flow diagram guided the systematic search and selection process, providing a transparent visualization of the study selection procedure. The primary databases utilized for this review were Scopus and EBSCOhost.

The inclusion criteria were meticulously established to ensure the relevance and quality of the selected studies. Articles had to be in English and published within the timeline of 2019 to 2023, with a focus exclusively on journal articles. The search results were thoroughly reviewed, considering the full contents, abstracts, and titles by the authors. The selection process prioritized articles that demonstrated a direct alignment with the subject matter, assessed the strength of evidence presented, and evaluated the potential contribution of each article to the overall review objectives. Rigorous scrutiny was applied to ensure that only studies meeting the predefined criteria were included in the final systematic review. This stringent selection process aimed to maintain the integrity and reliability of the synthesized evidence, contributing to a comprehensive and robust understanding of the impact of student participation in sports and physical activities on psychological resilience. As a result, 15 articles meeting the specified criteria have been retained for further review in the study.

2.2. Data extraction and analysis

For the data extraction and analysis phase of this systematic review, a meticulous approach was undertaken to ensure the thorough evaluation of the identified publications. Out of the initial pool, 15 publications successfully met the predefined criteria and were included in the final analysis. To maintain the integrity and relevance of the review, a stringent exclusion criterion was applied to eliminate records that did not align with the study's objectives. Several exclusion steps were employed during the process. Non-English publications were initially removed to ensure consistency and coherence in the language of the included studies. Additionally, a temporal criterion was applied, and publications with a timeline earlier than 2019 were excluded from the analysis. To focus exclusively on primary research, reviews, books, and conference proceedings were systematically excluded.

Further refinement occurred during the full-text review phase. Publications deemed to be out of the field, possessing an insignificant title, or presenting an irrelevant abstract concerning the study's objectives

were excluded. This rigorous full-text review process was integral to maintaining the quality and relevance of the included studies. The resulting dataset of 15 publications, subjected to a meticulous and systematic inclusion process, forms the foundation for the subsequent data analysis. The selected studies provide a robust and focused basis for extracting meaningful insights, contributing to a comprehensive synthesis of the impact of student participation in sports and physical activities on psychological resilience. Figure 1 visually illustrates the meticulous scrutiny undertaken by the authors across a compilation of 15 publications, with the purpose of extracting assertations and materials germane to the subject matter of the present study.

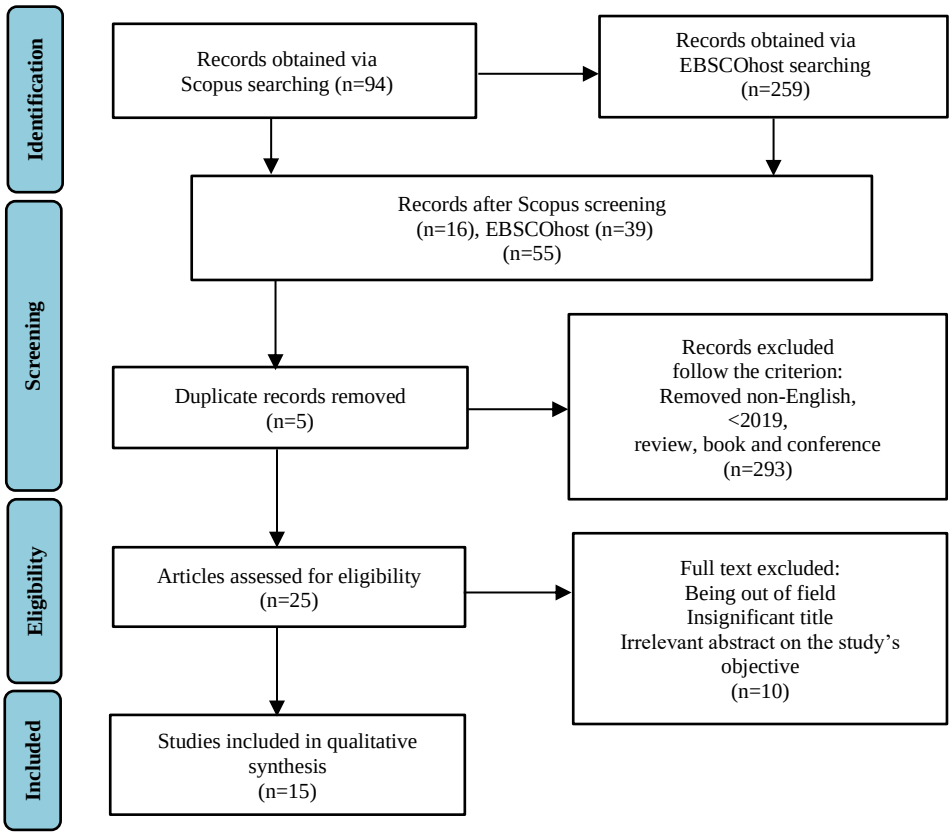

Figure 1. PRISMA flow diagram of the proposed search study [26]

3. RESULTS

The systematic review identified a total of 15 studies and extracted information on authors, article titles, methodology, samples, analysis and findings to guide the analysis on the students impact of participation in sport and PA on psychological resilience. Based on Table 1 (see appendix), we report results on methodological information of the studies and discussions, consisting of three main themes as discussed in the discussions section.

3.1. Methodological information of the studies

The methodological information of the studies included in this systematic review provides a comprehensive overview of the diverse approaches employed to investigate the relationship between participation in sports and physical activities and psychological resilience. Among the 15 studies reviewed, 10 studies adopted a quantitative research design [27]–[36] signifying a prevalent use of numerical data and statistical analyses in this body of literature. Notably, 5 of these studies explicitly stated that they utilized a cross-sectional study design [37]–[41] emphasizing a snapshot approach to examine the variables of interest at a single point in time.

The samples used across the studies were diverse and inclusive, encompassing a range of participant groups. Undergraduate students, voluntary participants, university students, primary and middle school students, college students, medical students, and adolescents constituted the study population. This diversity in samples reflects a broad exploration of the impact of sports and physical activities on psychological resilience across various educational levels. The sample sizes employed in these studies exhibited considerable

variability, ranging from 125 to 67,821 participants. This wide range underscores the heterogeneity in study sizes, with some focusing on smaller, more specific populations and others involving larger-scale investigations.

In terms of statistical analyses, the studies employed a rich array of methods to explore the relationships under investigation. These included traditional analyses such as one-way analysis of variance (ANOVA), t-test, correlation, and regression, providing a foundational understanding of associations. Additionally, more advanced techniques, such as mediation and moderation analyses were applied, shedding light on the intricate mechanisms at play. Two-level mixed effect models, linear regression, one-way ANCOVA, latent profile analysis, Mann Whitney, Kruskal Wallis, factor analysis, and MANCOVA were also utilized, demonstrating the methodological sophistication of the reviewed studies.

This methodological diversity contributes to a nuanced and comprehensive understanding of the complex interplay between sports, physical activities, and psychological resilience. The inclusion of various study designs, participant samples, and analytical approaches enhances the robustness and generalizability of the findings synthesized in this systematic review.

4. DISCUSSION

The selected studies collectively contribute to the three overarching themes that guide our analysis: enhancing positive mental health, reducing negative emotions, and mitigating depression and anxiety. Here, we comprehensively discuss the findings of these studies based on three themes.

4.1. Enhance positive mental health

Sport and PA emerged as a proactive strategy to prevent or delay mental disorders, recognized for its positive impact on mental health and in treating existing mental illnesses [27], [30], [41]. Regular exercise contributes to the prevention and delay of mental disorders through various mechanisms. In addition, the engaging, open, and competitive nature of sports provides an ideal environment for cultivating psychological resilience in students [33], [41]. Existing research recognizes physical exercise as a significant factor in enhancing psychological resilience, citing its capacity to reduce stress responses, improve physiological well-being as well as psychological, and act as a buffer against stress. Despite encountering short-term challenges such as pressure, competition, and frustration during PA, students who successfully navigate these obstacles with peer and teacher support develop a more flexible attitude and improved problem-solving abilities [33], [41]. We can conclude that successfully navigating obstacles in a supportive environment contributes to forming adaptive coping mechanisms.

The multifaceted benefits of sport and PA extend beyond psychological resilience, including enhanced sleep quality, attention orientation, cognitive function, and emotional regulation [34], [36]. Moreover, regular engagement in challenging physical practices strengthens the body and shapes personality. It also fosters teamwork, interpersonal communication skills, and problem-solving techniques, particularly those requiring skill acquisition and decision-making, and fosters cognitive flexibility [36]. This adaptability in thinking is crucial for resilience, allowing individuals to approach challenges with a more open and problem-solving mindset. Overall, physical exercise contributes significantly to the holistic development of students, improving their social adaptation skills and reducing externalized problem behaviors [35].

Note that sports and PA offer numerous mental health benefits. Hence, it is essential to emphasize that they are not standalone solutions. Professional mental health care is crucial for comprehensive and individualized treatment. However, the type and intensity of exercise may vary among individuals, and a personalized approach, considering the specific needs and preferences of each person, is key [31], [34]. Frequent exercise serves as an effective health promotion strategy [32], suggesting that the quantity and intensity of PA play crucial roles, with higher resilience associated with a minimum of 75 minutes of vigorous activity weekly and increased grit observed in participants reporting at least 300 minutes per week. Meanwhile, the research findings suggest that promoting muscle-strengthening exercise (MSE) in children and adolescents could potentially enhance positive mental health [37]. Furthermore, engagement in PA, known to improve adolescents' well-being, aligns with the notion that increased MSE participation could contribute to better mental outcomes. Additionally, MSE exhibits a negative association with mental health disorders. These studies highlight the multifaceted benefits of regular sport and PA in fortifying psychological resilience and promoting well-being.

4.2. Reduce negative emotion

Engaging in regular PA is associated with a positive coping mechanism for dealing with boredom during leisure time [28]. This effect includes increased positive moods, reduced risk of depression, and improved cognitive and mental health [27]. Note that the reduction of negative emotional states provides a

multifaced approach to emotional well-being [30]. PA contributes to this positive impact, which acts as a natural mood enhancer and enhances emotional regulation ability [40]. Hence, this emotional regulation is integral to building resilience and helping students cope with academic and personal stressors.

The study by Zhang *et al.* [40] revealed a positive and significant association between adolescents' participation in PA, particularly organized PA and their subjective well-being. Regular engagement in organized PA is highlighted as a key factor in enhancing adolescents' subjective well-being, contributing to increased positive emotions as well as life satisfaction. The study underscored the importance of school-based or organized PA in fostering external development assets. Furthermore, this includes school connectedness, which, in turn, positively affects adolescents' subjective well-being. The findings emphasize the significance of adolescents engaging in desired activities in supportive environments, with school-based interventions like physical education classes and guidance from physical education teachers playing a pivotal role in establishing a positive and enriched environment.

Furthermore, PA provides an opportunity for social interaction, especially in group or team-based activities, fostering a sense of community and support [31]. Social connections play a vital role in emotional well-being, and the camaraderie built through shared PAs can contribute to a more positive emotional state [40]. Notably, the act of engaging in exercise not only addresses the physical aspects of health but also serves as a powerful tool for managing and reducing negative emotional states, offering individuals a holistic approach to emotional well-being. Moreover, PA provides individuals with a positive emotional experience that can significantly alleviate emotional stress [35]. This positive emotional experience contributes to the long-term enhancement of psychological resilience, representing an increased ability to withstand negative emotions [36]. Consequently, this improvement in psychological resilience serves to enhance overall mental health for the individual.

4.3. Reduce depression and anxiety

On a psychological level, participating in sports and PAs provides a healthy outlet for stress and pent-up energy, promoting a sense of accomplishment and overall well-being [36]. It could serve as a buffer against stress and stress-related disorders. Note that regular exercise can serve as a form of mindfulness, allowing individuals to be present in the moment and divert their focus from anxious thoughts. Additionally, the social aspect of many sports and PAs fosters a sense of community and support, which can be instrumental in combating feelings of isolation and anxiety [27]. Therefore, continuous social connections through sport and PA act as a crucial emotional support system, providing students with avenues to cope effectively with obstacles [31]. These connections foster a sense of belonging and understanding, key elements in fortifying psychological resilience. Hence, shared experiences within social networks contribute to developing adaptive coping mechanisms, reducing anxiety, and promoting emotional well-being [27].

The result of the current study affirms a strong correlation between regular PA and enhanced resilience [40], [41]. Regular exercise not only increases an individual's capability to navigate challenges as well as adapt effectively but also contributes to overall well-being and a reduced prevalence of mood and anxiety disorders. It also improves emotional processing abilities to alleviate depression and anxiety. This heightened resilience, in turn, aids individuals in coping positively with challenging circumstances and helps cultivate positive psychological qualities, leading to positive changes in mental and emotional states. The findings underscore the importance of consistent PA in boosting personal competence in physical tasks and fortifying the ability to cope with psychological challenges. This positive impact extends to self-efficacy and psychological resilience across various aspects of life. Resilience tends to be linked to a heightened level of self-efficacy, as those possessing a robust belief in their abilities are inclined to confront challenges with assurance and perseverance, accordingly.

Sports and PA inherently involve overcoming challenges, be it physical or mental. Successfully navigating these challenges, especially with the support of peers and coaches, contributes to the development of resilience skills. Moreover, learning to cope with setbacks and failures in a controlled environment prepares individuals to face life's difficulties with greater adaptability. We believe that achieving goals in sports and PA, whether personal or team-oriented, instills a sense of accomplishment. This sense of achievement can counter feelings of helplessness and enhance self-esteem, reducing symptoms of depression and anxiety. In addition, regular engagement in these activities offers a holistic approach to mental well-being, empowering individuals to manage and overcome challenges while building a foundation of psychological resilience.

In light of the compelling evidence presented in this systematic review, the implications and suggestions for further research and practical applications are profound. Firstly, educational institutions and policymakers should consider integrating sports and PAs into comprehensive mental health programs for students, recognizing them as proactive strategies to prevent or delay mental disorders. This includes promoting organized PAs within schools and emphasizing their role in fostering external development assets, such as school connectedness, significantly contributing to students' subjective well-being. Therefore, tailoring interventions, such as physical education classes and guidance from physical education teachers, can play a pivotal role in creating supportive environments that positively impact students' psychological well-being.

Furthermore, the results highlight the significance of recognizing the multifaceted benefits of sports and PAs beyond psychological resilience. Enhanced sleep quality, attention orientation, cognitive function, emotional regulation, and overall well-being are integral aspects that should be considered in designing holistic interventions. The positive correlation between regular PA and improved emotional processing abilities to alleviate depression and anxiety underscores the potential of exercise as a form of mindfulness and stress reduction.

Additionally, the social aspect of sports and PAs should be leveraged in mental health promotion efforts. Educational institutions can facilitate social connections through sports, creating a crucial emotional support system for students. The shared experiences within social networks contribute significantly to developing adaptive coping mechanisms, reducing anxiety, and promoting emotional well-being. Hence, incorporating these social elements into mental health interventions can enhance their effectiveness in fortifying psychological resilience.

Building on the foundation of this systematic literature review, there are several avenues for future research that can further enhance the understanding of the relationship between student participation in sports and PAs and psychological resilience. One key recommendation is to incorporate a robust methodology, such as conducting a meta-regression analysis on the research results cited in the references. This meta-regression analysis could systematically examine the varying impact of different sports and activity types, duration, and intensity on psychological resilience. The inclusion of advanced analytical techniques, such as structural equation modelling may offer deeper insights into the complex relationships between variables. These methods could provide a more nuanced understanding of the mechanisms linking sports, physical activities, and psychological resilience.

Additionally, future studies may explore the moderating effects of demographic factors, such as age, gender, and socio-economic status, to provide a more nuanced understanding of the relationship. Furthermore, adopting a longitudinal approach to assess the long-term effects of sports and physical activities on psychological resilience would contribute valuable insights. By implementing these methodological enhancements, researchers can contribute to the refinement of statistical procedural validity and reliability, advancing the field's understanding of the effectiveness of sports and physical activity interventions in promoting psychological resilience among students.

5. CONCLUSION

In conclusion, the systematic exploration of the impact of participation in sport as well as PA on psychological resilience highlights the multifaceted benefits of exercise for mental health. Moreover, the reduction of negative emotional states, the positive effects on mental health, as well as the alleviation of depression and anxiety collectively emphasize the therapeutic potential of PA. Hence, integrating these findings into research and practice can pave the way for comprehensive mental health interventions, emphasizing the role of exercise in fostering resilience and promoting overall well-being. As the field continues to evolve, ongoing research and collaborative efforts between mental health and fitness professionals will contribute to a more nuanced understanding and effective application of the synergies between PA and psychological resilience.

APPENDIX

Table 1. The summary table of studies (*Continue*)

Article title, author	Methodology	Sample	Analysis	Findings
Analysis and Research on the Rehabilitation Effect of Physical Exercise on College Students' Mental Depression Based on Multidimensional Data Mining [27]	Quantitative	23,146 undergraduate students	One-way analysis of variance	• Throughout the control phase of the intervention, maintaining ongoing connections with peers may motivate university students to actively utilize their internal resources when facing challenges and setbacks. Acting as a protective factor, psychological resilience can effectively diminish the link between life's risk factors and anxiety, providing relief from anxious feelings. • Physical exercise may delay or prevent mental disorders and can treat mental illness.
COVID-19 in Turkey: Leisure Boredom, Psychological Resilience, Physical Activity and Emotional State [28]	Quantitative	2,214 voluntary participants	T-test Correlation Regression	• Individuals experienced negative emotional states during this period. • A correlation emerged between PA and psychological resilience. As individuals increased their participation in PA, their levels of psychological resilience also increased, and they reported a reduced perception of boredom during leisure time.

Table 1. The summary table of studies (*Continue*)

Article title, author	Methodology	Sample	Analysis	Findings
Mediating Role of Resilience in the Relationships of Physical Activity and Mindful Self-awareness with Peace of Mind (PoM) among College Students [29]	Quantitative	436 students	Path analysis Mediation	• Resilience was identified as a significant factor in predicting PoM, suggesting that individuals with greater resilience levels are more prone to experience a greater sense of peace of mind. • The results indicated that both mindful self-awareness and PA predict an individual's level of resilience. • This finding emphasized the importance of resilience in cultivating one's mental well-being, particularly in terms of PoM.
Moderating Effect of Physical Exercise between the Relation of Psychological Resilience and Negative Emotions of University Students in Iraq [30]	Quantitative	University students	Path analysis Moderation	Physical health indeed played a significant moderating role in the relationship between psychological resilience as well as negative emotions among university students in Iraq.
Physical Activity and Resilience among College Students: The Mediating Effects of Basic Psychological Needs [31]	Quantitative	2,375 college students	Correlation Regression Mediation	• Findings indicated a positive correlation between PA and resilience, with the three fundamental needs acting as significant mediators in the relationship between PA and resilience. The impact of the need for competence was notably more pronounced compared to the needs for autonomy and relatedness, with the indirect effect being particularly significant.
Physical Activity is Associated with Grit and Resilience in College Students: Is Intensity the Key to Success? [32]	Quantitative	244 undergraduate students	Linear regression One-way ANCOVA	• The vigorous PA demonstrated a positive association with overall resilience as well as the perseverance of effort grit domain in college students. • There is a negative correlation with the level of persistence in the domain of consistent interest and grit. • Increased levels of vigorous physical activity were associated with notable improvements in grit and resilience. • Grit and resilience scored vary significantly based on the intensity of PA, with a notable impact observed for vigorous activity.
Psychological Resilience in Student-Athletes and Competitive University Students [33]	Quantitative	274 students	Mann Whitney Kruskal Wallis	• Results suggested a substantial difference between male athletes' psychological resilience and sports age, while female athletes' resilience is not significantly different. • Individuals engaged in individual sports display greater psychological resilience than those involved in team sports. • The psychological endurance level may vary under different circumstances.
The Mediating Role of Resilience in the Effect of Physical Exercise on College Students' Negative Emotion during the COVID-19 Epidemic [34]	Quantitative	1,214 college students	Correlation Mediation	• The findings demonstrated a negative relationship between engaging in physical exercise as well as experiencing negative emotions. • Increased levels of physical exercise were linked to a reduction in negative emotions. • According to the structural equation model utilized in the research, physical exercise acts as a predictor for lower levels of negative emotions. • The noteworthy direct impact observed suggests that the prevalence of anxiety and depressive symptoms among college students studying from home during the COVID-19 pandemic might be influenced by insufficient levels of physical activity.
The Relationship between Physical Exercise and School Adaptation of Junior Students: A Chain Mediating Model [35]	Quantitative	930 junior middle school students	Correlation Mediation	• Physical exercise demonstrates a significant and direct influence on school adjustment. • The connection between physical exercise as well as school adaptation involves intermediary factors such as psychological resilience and motivation for sports learning. • Psychological resilience and sports learning motivation collaboratively act as mediators, forming a chain in the relationship between physical exercise and school adaptation.

Table 1. The summary table of studies (*Continue*)

Article title, author	Methodology	Sample	Analysis	Findings
The Influence of Physical Exercise on College Students' Negative Emotions: The Mediating and Regulating Role of Psychological Resilience [36]	Quantitative	1,500 college students	Correlation Mediation Moderation	• Positive predictions and analyses for autonomy and stamina, while adverse predictions and analyses were noted for depression, anxiety, and stress. • Independence and psychological resilience played a significant role in yielding 26.78% and 31.33% of the overall benefits, respectively. • The cultivation of a sports culture in training positively impacted college students' self-efficacy and mental toughness, effectively averting and decreasing adverse emotions.
Muscle-strengthening Exercise and Positive Mental Health in Children and Adolescents: An Urban Survey Study [37]	Cross-sectional	67,821 primary and middle school students	Two level-mixed effect models	• Positive association between the frequency of MSEs as well as the mental health outcomes of Chinese children and adolescents. • The findings suggested a positive association between increased participation in MSEs and elevated levels of subjective well-being and enhanced psychological resilience among the participants. • Subjective well-being demonstrated a significant positive correlation with the frequency of MSE, with higher levels of MSE associated with greater subjective well-being. • Psychological resilience was positively correlated with MSE frequency, meaning those who engaged in MSE more frequently demonstrated stronger psychological resilience.
Physical Activity Participation and Mental Health Profiles in Canadian Medical Students: Latent Profile Analysis using Continuous Latent Profile Indicators [38]	Cross-sectional	125 Canadian medical students	Latent profile	• People with high mental health profiles participated in less intense physical activity, with an average of 144.28 minutes per week for milder activities and 195.86 minutes per week for moderate-to-vigorous activities, as opposed to students in the moderate and low mental health profiles. • There is no significant difference in PA intensity.
Research on the Relationship between Physical Activity, Sleep Quality, Psychological Resilience, and Social Adaptation among Chinese College Students: A Cross-sectional Study [39]	Cross-sectional	1,622 college students	Correlation Mediation	• A substantial negative correlation was identified between PA as well as sleep quality, emphasizing the impact of exercise on the quality of sleep. • PA can positively predict psychological resilience and social adaptation. • Psychological resilience emerged as a key factor influencing sleep quality, with a negative predictive relationship, while also positively predicting social adaptation. • Social adaptation negatively predicted sleep quality.
The Association between Physical Activity and Subjective Well-being among Adolescents in Southwest China by Parental Absence: A Moderated Mediation Model [40]	Cross-sectional	3,143 adolescents	Correlation Mediation Moderation	• The result suggested a positive and statistically significant impact of PA, school connectedness, and resilience on the subjective well-being of adolescents. • School connectedness played a mediating role in translating the influence of PA into subjective well-being. • Resilience emerged as a moderator, affecting both the direct impact of PA and its direct effects through school connectedness on subjective well-being.
The Impact of Regular Exercise, Competition Experience and Self-efficacy on Psychological Resilience [41]	Cross-sectional	329 participants	Factor analysis Correlation MANOVA	• Regular exercisers demonstrated improved emotional impulse control, heightened positive emotions, improved communication skills, enhanced empathy, as well as greater self-improvement in comparison to non-exercisers. • These results underscored the positive impact of consistent PA on aligning with previous research demonstrating exercise's stress-reducing, strengthening psychological resilience, as well as resilience-enhancing effects.

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