



The Role of Physical Activity and Exercise in College Students' Mental Health: A Systematic Review

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ABSTRACT

The current review provides a comprehensive understanding of the links between physical activity and mental health outcomes. A total of 38 studies were included in this review. The PRISMA guideline was followed during the search and screening process. The main findings of the review indicate that physical activity and exercise were positively related to mental health outcomes, including subjective well-being, life satisfaction, and psychological well-being. Additionally, students' active engagement in physical activity and exercise was associated with reduced negative mental health outcomes, such as depression, stress, anxiety, and burnout. The review also identifies several psychosocial factors, such as self-efficacy, social support, emotional intelligence, and resilience, as potential mediators. The strengths, limitations, research gaps, and future research directions are also discussed.

Keywords: College students, mental health, physical activity, physical exercise, systematic review

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INTRODUCTION

Despite the unwavering commitment of colleges or universities to producing highly skilled and qualified students and thereby contributing to a knowledge-based national economy (Marginson, 2010; Trinh, 2023), the increasing global prevalence of mental health issues among college students remains a major concern. It is well-established in the existing literature that psychological problems such as depression, dissatisfaction, anxiety, burnout, stress, loneliness, and psychological distress are particularly worrisome (Campbell et al., 2022; Sheldon et al., 2021). For instance, a longitudinal study conducted in the United States from 2013 to 2021 found a 50% rise in mental health issues and a two-fold increase in poor mental health symptoms among college students (Lipson et al., 2022). Similarly, in Malaysia, the prevalence of psychological stress among undergraduate students was found to be 49.3% (Phang et al., 2015). Likewise, in Bangladesh, more than 40% of students experienced severe anxiety (Hossain et al., 2022), and one-third of the students have reported stress (Rois et al., 2021). Furthermore, a cross-sectional survey study in China with a large sample ($N = 22,983$) delineated that 59.9% of college students have experienced academic burnout (Liu et al., 2023). These empirical reports suggest that the prevalence of mental health issues among college students is alarming. As a result, identifying and understanding the factors that might mitigate these mental health challenges has become a central focus of academic research. Student mental health is complex, and it is influenced by various personal and situational factors. Physical activity is recognized as one of the effective personal strategies for promoting positive mental health outcomes and reducing negative experiences (Malagodi et al., 2024). The concept of physical activity is sometimes confused with other synonymous terms, such as physical exercise and physical fitness. However, the terms are conceptually distinct. While Physical activity is described as “any bodily movement produced by skeletal muscles that results in energy expenditure”, exercise is a “subset of physical activity that is planned, structured and repetitive, and has a final or intermediate objective, the improvement or maintenance of physical fitness” (Caspersen et al., 1985, p. 126). Daily life physical activity might involve different

domains such as commuting, occupational, sport, exercise, household, and leisure time, and these domains vary based on their intensity, duration, frequency, and the type of physical activity.

There is a growing body of research exploring the nature of the relationship between physical activity and mental health in students of higher education. Individual research studies suggest the positive effect of physical activity on student mental health (Ahsan & Abualait, 2025; Appelqvist-Schmidlechner et al., 2020; Herbert et al., 2020; Södergren et al., 2008). This means that students with regular physical activity tend to enjoy better physical and mental health. On the other hand, physically inactive students are more likely to be at greater risk of mental health problems. Physical activity not only promotes positive mental health but also functions as a protective resource against negative mental health outcomes (Rodriguez et al., 2022). Despite growing evidence of the positive impact of physical activity on college students' mental health, the critical and systemic analysis of these studies, aimed at providing a comprehensive understanding of the links among variables in the academic setting, remains limited (Rehman et al., 2024). Although several reviews exist, their scope was limited to studies conducted in specific regions such as China (Li et al., 2022). Additionally, a major limitation of a range of previous reviews is their lack of any particular target student population, as they include studies on the general population (e.g., Wang et al., 2023; White et al., 2024), children and youth (e.g., Hallal et al., 2006; Mahon et al., 2025; Michaela et al., 2020; Rodriguez-Ayllon et al., 2019), and professionals (Martland et al., 2024), making it difficult to generalize findings to specific groups like college students. Further, some reviews (e.g., Mahindru et al., 2023; Teferi, 2020) have not adhered to the guidelines of systematic analysis (e.g., PRISMA guidelines). Furthermore, recent reviews conducted by Huang et al. (2024) and Donnelly et al. (2024) focused solely on the effectiveness of physical activity interventions in improving the mental health of college students, without critically analyzing the dynamics of the interplay between physical activity and mental health outcomes. Moreover, although Rehman et al. (2024) recently conducted a systematic review and meta-analysis on the protective role of physical activity in the mental health of university students, the scope of the review was limited to negative emotional outcomes such as anxiety, depression, and stress, and the number of reviewed studies was small ($N = 8$). The review fails to incorporate positive mental health outcomes and potential mediators in the relationship between the variables. Therefore, the current paper aims to conduct a comprehensive systematic review of quantitative empirical studies on physical activity and college students' mental health, which have been published between 2014 and 2024 across different regions, using the PRISMA guideline.

The current review differs from previous reviews and extends their findings in several ways. First, while prior reviews primarily focused on children or general populations, this review specifically examines higher education students. Second,

whereas earlier reviews predominantly addressed negative mental health outcomes such as anxiety and depression, the present review considers both positive and negative mental health outcomes. Third, some prior reviews included only a small number of studies, and others were purely narrative literature reviews; in contrast, this review incorporates a substantial and up-to-date set of studies. Finally, this review enhances our understanding of the relationship between physical activity and mental health outcomes by identifying potential mediators, an aspect largely overlooked in previous reviews. Taken together, these features demonstrate that the present review extends prior work and makes a significant contribution to the literature on the role of physical activity and exercise in mental health outcomes.

Research Questions

The following questions were formulated to guide the current systematic review.

1. What is the trend in research on physical activity and college students' mental health between 2014 and 2024?
2. What is the relationship between physical activity and mental health in students among college students?
3. What potential factors mediate the link between physical activity and mental health?
4. What research gaps exist, and what future research directions can be identified?

METHODS

Search Strategy and Screening Process

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed to develop the search strategy and screening process. The initial information searches were conducted using the EBSCO Discovery Service search engine, which encompasses 85 databases. The search was conducted on February 26, 2025, using the keywords: “physical activity” OR “physical exercise” AND “mental health” OR “psychological well-being” OR “mental well-being” AND “college students” OR “university students” OR “higher education students.” Initially, the search identified 304 records. After removing 112 duplicates using Zotero reference management software, 192 records were retained for title and abstract screening. Zotero is a free, open-source reference management tool developed by the Center for History and New Media at George Mason University (Trinoskey et al., 2009). It helps users import, organize, and cite references, detect duplicates, and generate bibliographies in various formats (e.g., APA). In this review, Zotero was used to import references

from EBSCO Discovery Service and identify duplicates. Guided by the aim and research questions of the review, two authors performed the title and abstract selection process, removing 108 records at this stage. Consequently, 84 studies were retained for full-text screening. Finally, based on inclusion and exclusion criteria, 46 irrelevant studies were removed, and 38 that fully met the criteria were included in the current systematic literature review. The screening process is depicted in the PRISMA diagram (see Figure 1).

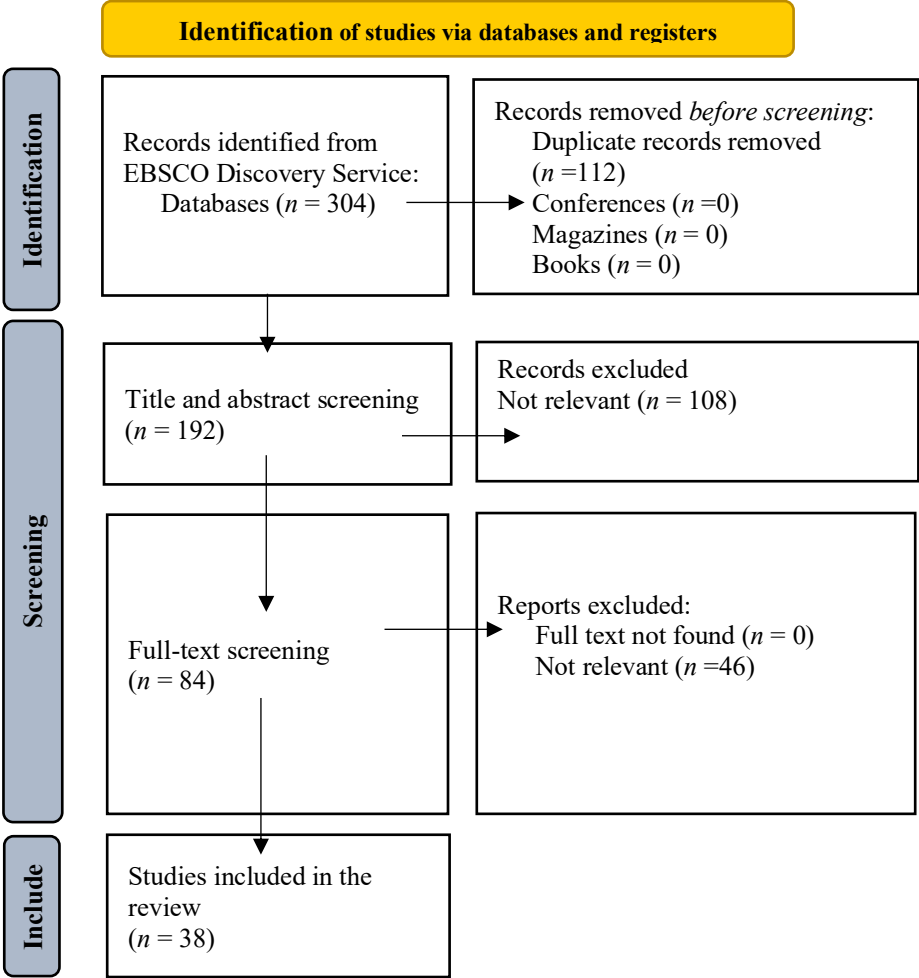


Figure 1
PRISMA Diagram

Inclusion and Exclusion Criteria

The final 38 studies included in the review were evaluated against the following inclusion and exclusion criteria. The inclusion criteria are: 1) quantitative empirical studies, 2) studies written in English, 3) studies conducted among higher education student populations, 4) articles published in peer-reviewed journals, 5) studies that specifically focus on the relationship between physical activity and mental health outcomes, and 6) articles published between 2014.01.01 and 2024.12.31. On the other hand, the exclusion criteria were: 1) qualitative and non-empirical articles such as book chapters, conference proceedings, reviews, and books, 2) studies conducted among non-university students such as the general population or children, 3) studies that did not focus on exploring the relationship between physical activity and mental health outcomes, 4) studies published in languages other than English, and 5) studies published before 2014 or after 2024. The summary of the inclusion and exclusion criteria is presented in Table 1.

Table 1
Summary of the Inclusion and Exclusion Criteria

Criteria Type	Inclusion Criteria	Exclusion Criteria
Sample	Higher education students	Non-higher education students
Article type	Full-length empirical articles	Review articles, books, book chapters, conference proceedings, theses, and dissertations.
Research approach	Quantitative studies	Qualitative, mixed
Language	Articles written in English	Non-English languages
Main topic	Physical activity and mental health	Other general studies
Timeline	Published between 2014 and 2024	Published outside 2014 and 2024
Region	Studies conducted in any country	None

Data Analysis and Extraction

Content analysis of the included studies was conducted by the first and second authors. Initially, they extracted key methodological characteristics, including publication year, geographic location, journal of publication, sample size, sampling strategies, data analysis techniques, and theoretical frameworks. Based

on these extracted characteristics, both authors independently assessed the methodological quality of each study, resolving any discrepancies through discussion. Guided by the research questions, the main findings were then organized into three thematic categories: 1) physical and positive mental health, 2) physical activity and negative mental health, and 3) potential mediators or moderators in the relationship between physical activity and mental health outcomes.

RESULTS

Basic Characteristics of Included Studies

Geographic distribution of the included studies

The geographic distribution of the reviewed studies is presented in Figure 2. The studies were conducted across 21 countries. The majority of the studies were carried out in China ($n = 18$), followed by Germany ($n = 2$) and Spain ($n = 2$). The study sites for the remaining studies were in various countries, including the USA, Brazil, Russia, Japan, India, Nigeria, Ukraine, Australia, Croatia, Canada, Malaysia, Mexico, Italy, the Philippines, Norway, South Korea, Thailand, and Ireland. The continental distribution of the studies was as follows: Asia ($n = 23$), North America ($n = 3$), Europe ($n = 8$), Oceania ($n = 1$), Africa ($n = 1$), and Latin America ($n = 1$). The total number of studies appears to be 40 because one study was conducted in four different countries.

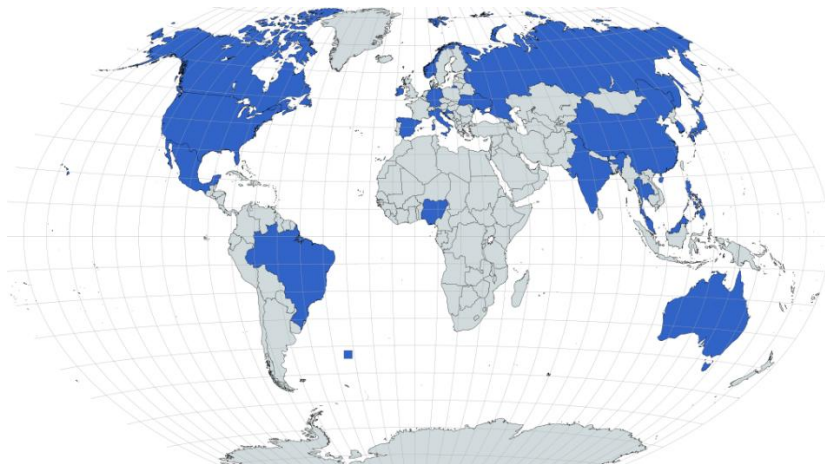


Figure 2
Geographic Distribution of the Reviewed Studies.

Publication Trends of the Included Studies

The publication trends of the selected studies are illustrated in Figure 3. The majority of studies were published between 2020 and 2024 ($n = 27$), while the remaining studies ($n = 11$) were published between 2014 and 2020. Specifically, the trend remained relatively stable from 2014 to 2019, followed by a slight increase between 2020 and 2022. A notable surge in publications occurred in 2023 and 2024.

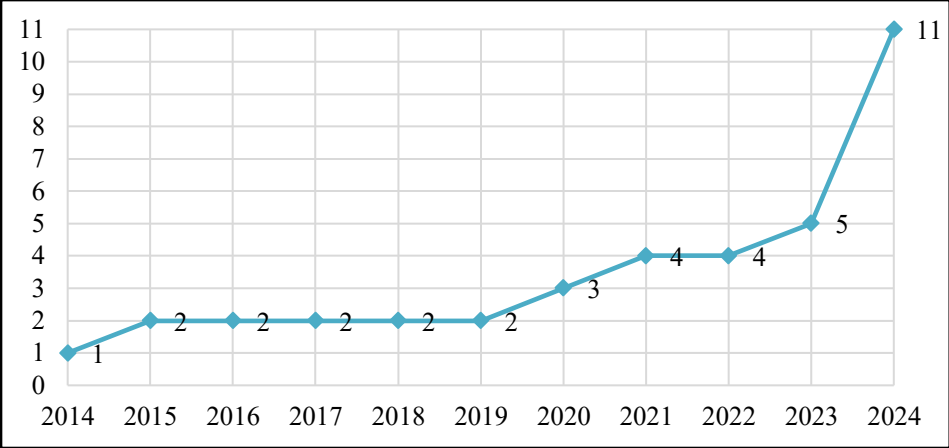


Figure 3
Publication Trends of the Selected Studies

Methodological Characteristics and Theoretical Frameworks of the Included Studies

Most studies employed a correlational research design ($n = 34$), while only four used a longitudinal design. Regarding sampling strategies, many studies did not explicitly report their techniques. However, convenience sampling, random sampling, snowball sampling, and cluster random sampling were among the most commonly used methods. The sample sizes of the included studies ranged from 64 to 50,054 participants, with a total of 132,111 students across all studies. As shown in Figure 4, most of the reviewed studies recruited sample sizes between 250 and 2500 ($N = 28$). Additionally, five studies had sample sizes greater than 2500, while only one study had a sample size of less than 100. The majority of the studies utilized self-report questionnaires for data collection, predominantly administered through online surveys. Common data analysis techniques included descriptive statistics, correlation analysis, linear regression, multivariate linear regression, path analysis, structural equation modeling, logistic regression, mediation analysis, chi-square tests, independent sample t-tests, and one-way ANOVA. The review also found that the included studies used several statistical software programs, such

as SPSS, PROCESS Macro for SPSS, Stata, R, AMOS, and SAS, for data analyses. Most of the included studies did not explicitly state the theoretical frameworks guiding their research. However, among those that did, several theories were identified, including Self-Determination Theory, Cognitive Appraisal Theory, Social Cognitive Theory, the Self-Control Model, Life Course Theory, and Cognitive Behavioral Theory. Among these theories, Self-Determination Theory emerged as one of the most commonly used frameworks, frequently applied to explain the relationship between physical activity and mental health outcomes.

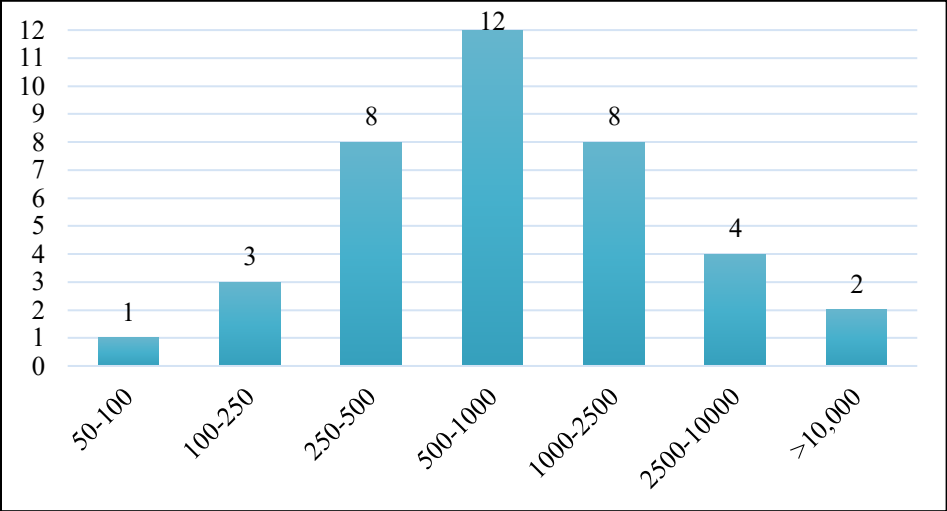


Figure 4
Range of the sample size of the included studies

Quality Assessment of Methods of the Included Studies

The quality assessment of the included studies was conducted by two authors using a Quality Assessment and Validity Tool for Correlational Studies, adapted from previously published reviews. The tool is appropriate for assessing studies that focus on exploring the relationship between two or more variables. Since the main aim of the current review was to analyze studies examining relationships between physical activity and mental health outcomes, this tool was found to be appropriate for assessing the methodological quality of the included studies. The tool comprises a total of 13 items designed to measure four methodological domains: research design (2 items), sample (4 items), measurement (5 items), and statistical analysis (2 items). The items are rated using a dichotomous answer format, and a total of 14 scores can be assigned for the 13 criteria. While twelve items are rated and scored as 0 (not met) or 1 (met), one item, which assesses the outcome variable measurement, is rated out of two (0 = not met; 2 = met). Based

on the total scores assigned to the 13 items, the articles can be categorized into three methodological quality levels: low (0–4), medium (5–9), and high (10–14). The assessment results of the included studies in the current review indicated that the quality of the studies ranged between medium and high (see Table 2). Nearly two-thirds of the studies scored high ($n = 26$), while the remaining one-third were classified as medium quality ($n = 12$).

Table 2
Summary of Quality Assessment of Included Studies ($N = 38$)

Criteria	Number of studies	
	Yes	No/Not Reported
Design		
Was the independent-outcome relationship explored?	38	0
Was probability sampling used?	21	17
Sample		
Was the sample size justified?	17	21
Was the sample drawn for more than one site?	26	12
Was anonymity protected?	37	1
Was the response rate was more than 60%?	24	14
Measurement		
Was the independent variable measured reliably?	38	0
Was the independent variable measured using a valid instrument?	38	0
Was the dependent variable measured using a valid instrument?	38	0
If a scale was used for measuring the dependent variable, was the internal consistency $\geq .70$?	30	8
Was a theoretical framework used for guidance?	14	24
Statistical analysis		
If multiple independent variables were studied, are correlations analyzed?	27	11
Were outliers managed?	10	28

Main Findings

The primary purpose of the review was to unravel the dynamics of the relationship between physical activity and mental health. Therefore, the main findings of the review can be organized into three sections: 1) the role of physical activity in fostering positive mental health, 2) the role of physical activity in

reducing negative mental health experiences, and 3) potential mediators in the relationship between physical activity and mental health.

The Relationship Between Physical Activity and Positive Mental Health Outcomes

Several studies included in the current review have examined the role of physical activity and exercise in fostering positive mental health outcomes such as positive affect, life satisfaction, health-related quality of life, perceived health, positive mood, self-efficacy, self-esteem, emotional regulation, happiness, subjective well-being, personal relationships, coping, psychological resilience, emotional well-being, psychological well-being, and social problem-solving ability. For example, the reviewed studies conducted in various regions such as Canada (Doré et al., 2018), the United States, (Joseph et al., 2014), Spain (Rodriguez et al., 2022), China (Ge et al., 2019; Wang & Fu, 2023), the Philippines (Niu, 2024) and Mexico (Brito-Suárez et al., 2023) consistently documented that physical activity and exercise play a vital role in promoting positive mental health experiences. In line with these findings, both cross-sectional and longitudinal evidence supported the positive impact of physical exercise on subjective well-being, positive affective experiences, and social adaptability in Chinese college students (Cao & Luo, 2024; Ji & Zheng, 2021; Liao et al., 2023).

Another positive mental health outcome examined within the context of physical activity and exercise was life satisfaction. Several studies have indicated that physical activity enhances the feeling of satisfaction among college students. For instance, leisure-time vigorous-intensity physical activity and a domain-specific activity appeared to have a positive impact on the life satisfaction of university students (Pedisic et al., 2015). Similarly, university students who engage in regular physical exercise are more likely to be satisfied with their lives (Zhou et al., 2023). Additionally, a study from Ireland reported that physically active college students enjoy better overall and mental health and experience a greater feeling of happiness than their inactive peers (Murphy et al., 2018). Other studies conducted among university students also informed that the practice and intensity of physical activity and exercise were positively associated with physical, emotional, and psychological well-being (Skead & Rogers, 2016; Ugwueze et al., 2021). Moreover, the findings of the review revealed that physical activity and exercise are positively associated with various essential components of psychological well-being and cognitive functioning of college students, such as self-esteem, psychological capital (Tian & Yang, 2024; Wei et al., 2024), social support, personal relationships (Kim et al., 2021; Zhao et al., 2024), coping, psychological resilience (Cao et al., 2024; Liu et al., 2024), self-efficacy (Qin et al., 2024; Wang et al., 2020), emotional intelligence (Dev Omer & Abdul Rahman, 2016; Wang et al., 2020), and social problem-solving ability (Sone et al., 2017).

These studies highlight that physical activity and exercise not only promote affective experiences in college students but also play a critical role in fostering personal growth and socioemotional competencies.

The Role of Physical Activity in Mitigating Negative Mental Health Experiences

The second key finding of this review concerns the relationship between physical activity and negative mental health outcomes. Numerous studies highlight that physical activity serves as an essential protective factor and coping mechanism against stress, depression, anxiety, psychological burden, negative affect, distress, and other psychological symptoms. Among these, depression is the most commonly studied mental health outcome in relation to physical activity and exercise. A range of the included studies examined depression and reported that increased physical activity is linked to fewer depressive symptoms. For instance, survey studies conducted in Norway (Grasdalsmoen et al., 2020) and Canada (Doré et al., 2018) found a negative relationship between physical activity and depression, indicating that university students with higher levels of physical activity experienced lower levels of depression. Likewise, a study conducted in Ukraine suggested that students with lower levels of physical activity during the COVID-19 pandemic reported increased depressive symptoms (Rogowska et al., 2020). Similarly, studies from various countries, including Brazil (Barbosa et al., 2024), China (Li et al., 2021; Liu et al., 2024; Wei et al., 2024; Zhang et al., 2022), India (Ghrouz et al., 2019), and South Korea (Kim et al., 2021), report comparable findings. While most studies reported a statistically significant negative relationship between physical activity and depression, some found no such association. For instance, studies conducted in Thailand (Chootong et al., 2022) and China (Wu et al., 2015) found that moderate to high levels of physical activity were not significantly related to depressive symptoms.

Anxiety is the second most widely studied mental health outcome in the reviewed research. Six studies have explored the relationship between physical activity and anxiety. However, unlike the consistent association between physical activity and depression, findings on its role in anxiety are mixed and inconsistent. Several studies have reported a significant negative association between physical activity and anxiety (Barbosa et al., 2024; García-García et al., 2023; Ghrouz et al., 2019; Li et al., 2021; Liu et al., 2024; Rogowska et al., 2020) while others have found no significant relationship between the two variables (Chootong et al., 2022; Doré et al., 2018; Wu et al., 2015). Moreover, the review findings consistently showed that physically active college students tend to experience lower levels of stress and psychological distress, as reported in several cross-sectional studies (Dev Omer & Abdul Rahman, 2016; Grasdalsmoen et al., 2020; Liu et al., 2024; Skead & Rogers, 2016). Likewise, a longitudinal study in Germany suggested that

physical activity and exercise may help buffer the negative impact of academic stressors on health-related outcomes during examination periods (Wunsch et al., 2017). Furthermore, an international study conducted in Russia, Italy, Germany, and Spain during the COVID-19 pandemic found that higher frequencies of physical activities, such as jogging and cycling, were linked to lower psychological burden (Brailovskaia et al., 2021). This suggests that students who engaged in physical activity more often experienced reduced psychological distress. Additionally, some of the reviewed studies reported that physical activity and exercise are negatively associated with academic burnout (Tian & Yang, 2024), loneliness (Zhao et al., 2024), suicidal thoughts (Grasdalsmoen et al., 2020), poor mental health (Cao et al., 2024), and negative affect (Joseph et al., 2014). Taken together, these findings suggest that physical activity and exercise may help reduce negative mental health outcomes.

The Potential Mediators Between Physical Activity and Mental Health

The relationship between physical activity and exercise is not direct or simple. Numerous studies included in this review have examined the mediating effects of various psychological and social factors that influence how physical activity impacts mental health. For example, several studies consistently report coping styles and psychological resilience as significant mediators in the relationship between physical activity and negative mental health outcomes (Cao et al., 2024), depression, and anxiety (Liu et al., 2024). Similarly, psychological resilience significantly mediated the association between physical exercise, life satisfaction (Zhou et al., 2023), and negative emotions (Li et al., 2021). These studies point out that physical activity and exercise enhance college students' psychological resilience and coping skills, which in turn improve life satisfaction and reduce negative mental health experiences. Further, self-esteem acted as a significant mediator through which physical activity affects both positive mental health outcomes, such as subjective well-being (Liao et al., 2023), and negative outcomes, such as depression (Wei et al., 2024) and academic burnout (Tian & Yang, 2024). The results highlight that physically active college students have high self-esteem and subsequently experience greater subjective well-being and fewer symptoms of depression and burnout.

The review also found that social support mediated the relationship between physical activity and both positive and negative mental health outcomes, such as subjective well-being (Liao et al., 2023), depression (Zhang et al., 2022), and loneliness (Zhao et al., 2024). Furthermore, emotional intelligence played a significant role in mediating the relationship between physical activity and psychological distress (Dev Omer & Abdul Rahman, 2016), suggesting that physically active students tended to have higher emotional intelligence and thereby experienced less distress. In addition to these mediators, the role of physical

activity and exercise in emotional intelligence (Wang et al., 2020) and negative emotions such as depression, anxiety, and stress (Qin et al., 2024) was mediated by self-efficacy. Other potential variables identified in the review that mediated the relationship between physical exercise and mental health outcomes include psychological capital (Wei et al., 2024), physical health (Wang & Fu, 2023) sense of coherence (Cao & Luo, 2024), mindfulness (Tian & Yang, 2024), interpersonal relationships (Zhao et al., 2024), self-concept (Zhang et al., 2022), perceived health (Liao et al., 2023) and self-control (Zhou et al., 2023). Although most of the reviewed studies included mediating variables, one study reported that gender significantly moderated the effect of physical activity on positive mental health, with a stronger effect observed in male students compared to their female counterparts (Niu, 2024). The review also found that two of the reviewed studies suggested that physical activity could function as both a mediator and a moderator. For example, physical activity was found to buffer the negative effects of early adversity on mental health (Wang & Fu, 2023). Similarly, the study of Brailovskaia et al. (2021) revealed that physical activity mediated the negative relationship between depression and psychological burden.

Table 3
Summary of the Included Study

Author	Country	Main topic	Design	Key results	Quality
Barbosa et al. (2024)	Brazil	Association between sedentary behavior, physical activity, and mental health.	Cross-sectional	Sedentary behavior was related to increased mental health problems, such as anxiety.	10 High
Brailovskaia et al. (2021)	Russia Germany Spain Italy	The association between depression symptoms, psychological burden and physical activity	Cross-sectional	Physical activity was negatively associated with psychological burden and depressive symptoms.	13 High
Brito-Suárez et al. (2023)	Mexico	Association between physical activity and affect.	Cross-sectional	Physical activity was positively related to	9 Moderate

				positive affect.	
Cao et al. (2024)	China	The impact of physical activity on mental health	Cross-sectional	Physical activity positively predicted coping styles and psychological resilience, while negatively predicting mental health.	11 High
Cao and Luo (2024)	China	The effect of physical exercise on the emotional states through coherence	Longitudinal	Physical exercise predicted positive affect through the mediating effect of a sense of coherence.	10 High
Chootong et al. (2022)	Thailand	The association between physical activity and mental health.	Cross-sectional	There was no statistically significant association between physical activity and mental health status.	8 Moderate
Dev Omer and Abdul Rahman (2016)	Malaysia	The mediating effect of emotional intelligence on physical activity and mental health	Cross-sectional	Emotional intelligence mediated the relationship between physical activity and mental health.	10 High
Doré et al. (2018)	Canada	The association between physical activity and mental health	Longitudinal	Informal group physical activity and team sports were	11 High

				positively associated with positive mental health and negatively related to depression.	
García-García et al. (2023)		Physical activity, sleep, and mental health during the COVID-19 pandemic	Longitudinal	Increased physical activity and decreased sedentary time were related to decreased anxiety, better sleep, mood, and perceived health.	9 Moderate
Ge et al. (2019)	China	Association of physical activity, sedentary time, and sleep duration on the health-related quality of life	Cross-sectional	High physical activity and adequate quality of sleep are associated with health-related quality of life. However, sedentary time was not related to health-related quality of life.	8 Moderate
Ghrouz et al. (2019)	India	Physical activity and sleep quality in relation to mental health	Cross-sectional	Physical activity was negatively related to anxiety and depression. Poor sleep quality was also associated with increased	8 Moderate

				depression and anxiety.	
Grasdalsmoe et al. (2020)	Norway	Physical exercise, mental health problems, and suicide attempts	Cross-sectional	Physical exercise was negatively related to mental health problems and suicidality in a dose-response manner.	8 Moderate
Ji and Zheng (2021)	China	The influence of physical exercise on mental health and social adaptability	Cross-sectional	Physical exercise showed a positive effect on mental health and social adaptation ability.	11 High
Joseph et al. (2014)	USA	The role of physical activity on quality of life through self-efficacy, self-esteem	Cross-sectional	Physical activity was positively related to quality of life, exercise self-efficacy, physical self-esteem, positive affect, and negative affect.	9 Moderate
Kim et al. (2021)	South Korea	The effect of physical activity level on depression and personal relationships	Cross-sectional	A higher level of physical activity was correlated with decreased depression and better personal relationships.	10 High
B. Li et al. (2024)	China	Associations of physical	Cross-sectional	Moderate to high levels of	12 High

		activity and sleep with mental health		physical activity in college students were associated with a reduction in depressive symptoms.	
J. Li et al. (2024)	China	Exercise motivation, physical exercise, and mental health	Cross-sectional	Various categories of exercise motivations were positively associated with mental health.	13 High
Li et al. (2021)	China	The mediating role of resilience in the effects of physical exercise on negative emotions	Cross-sectional	Resilience partially mediated the effect of physical exercise on negative emotions.	12 High
Liao et al. (2023)	China	The relationship between physical activity and subjective well-being	Cross-sectional	Physical activity was positively related to subjective well-being, and the relationship was mediated by perceived health, social support, and self-esteem.	10 High
Liu et al. (2024)	China	Effects of physical activity on depression, anxiety, and stress of via	Cross-sectional	Physical activity was positively associated with psychological	13 High

		the mediating role of psychological resilience and coping styles		resilience and coping and negatively related to negative emotions. Further, psychological resilience and coping mediated the relationship.	
Murphy et al. (2018)	Ireland	Active students are healthier and happier than their inactive peers	Cross-sectional	Physically active students appeared to have better overall and mental health and a greater feeling of happiness than their inactive peers.	9 Moderate
Niu (2024)	Philippines	Physical exercise on the physical and mental health of obese university students	Cross-sectional	Physical exercise predicted physical and mental health. Physical health mediated the relationship between physical exercise and mental health.	10 High
Pedusic et al. (2015)	Croatia	Associations between total, intensity and domain-specific physical activity	Cross-sectional	The result revealed that leisure-time vigorous intensity was the only physical activity variable that	10 High

		levels and life satisfaction		was significantly associated with life satisfaction.	
Qin et al. (2024)	China	Effect of physical exercise on negative emotions through the mediating effect of self-efficacy	Cross-sectional	Physical exercise negatively predicted negative emotions and positively predicted self-efficacy.	12 High
Rodriguez et al. (2022)	Spain	Physical activity and mental health in undergraduate students	Cross-sectional	The results generally indicate that a higher level of physical activity was associated with better mental health status.	10 High
Rogowska et al. (2020)	Ukraine	Physical activity and mental health during the COVID-19 Pandemic	Cross-sectional	Decreased physical activity was associated with increased depression and anxiety.	10 High
Skead and Rogers (2016)	Australia	A comparative study on the impact of exercise on the physical and mental health of law and psychology students	Cross-sectional	The frequency of physical exercise enhances physical and emotional well-being. Physical exercise was negatively associated with distress.	8 Moderate
Sone et al. (2017)	Japan	Attitude and practice of physical	Cross-sectional	Physical activity was positively	8 Moderate

		activity and social problem-solving ability		related to improved social problem-solving ability.	
Tian and Yang (2024)	China	The mediating effect of mindfulness and self-esteem in the relationship between leisure-time physical activity and academic burnout	Cross-sectional	Leisure-time physical activity was correlated with self-esteem and academic burnout. Self-esteem and mindfulness mediated the relationship between physical activity and burnout.	11 High
Ugwueze et al. (2021)		Relationship between physical activity levels and psychological well-being	Cross-sectional	Physical activity was positively and significantly associated with psychological well-being of male university students.	10 High
Wang et al. (2020)	China	The relationship between physical activity and emotional intelligence via the mediating role of self-efficacy	Cross-sectional	Physical activity was positively associated with emotional intelligence and self-efficacy. Self-efficacy further partially mediated the	12 High

				connection between physical activity and emotional intelligence.	
Wang and Fu (2023)	China	Long-term effects of early adversity on the mental health: The mitigating effect of physical exercise	Cross-sectional	Physical exercise positively predicted mental health. High levels of physical exercise also mitigated the negative effects of early adversity on mental health.	9 Moderate
Wei et al. (2024)	China	The effect of physical activity on depression through the mediating effects of self-esteem and psychological capital	Cross-sectional	Physical activity appeared to have negative effects on depression and positive effects on self-esteem and psychological capital. Self-esteem and psychological capital mediated the relationship.	10 High
Wu et al. (2015)	China	Association between physical activity and high screen time and mental health problems,	Cross-sectional	Low physical activity and high screen time were independently and interactively associated with increased	11 High

		and poor sleep quality		risks of mental health problems and poor sleep quality.	
Wunsch et al. (2017)	Germany	The effect of physical activity on sleep quality, well-being, and affect in academic stress periods	Longitudinal	Physical activity and exercise during the academic examination period buffered the adverse effects of stress on health-related outcomes.	8 Moderate
Zhang et al. (2022)	China	The effect of physical exercise on depression through serial mediating effects of self-concept and social support	Cross-sectional	Physical exercise negatively predicted depression. Self-concept and social support serially mediated the relationship.	11 High
Zhao et al. (2024)	China	A chain-mediated model of the effect of physical exercise on loneliness	Cross-sectional	Physical activity was negatively related to loneliness and positively associated with interpersonal relationships and social support.	11 High
Zhou et al. (2023)	China	The influence of physical exercise on life	Cross-sectional	Physical exercise was associated with life satisfaction,	12 High

satisfaction through the mediation of self-control and psychological distress	and the association was mediated by self- control and psychological resilience.
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DISCUSSION

The principal aim of the current review was to synthesize evidence on the dynamics of the relationship between physical activity and mental health outcomes among college students through a comprehensive and systematic content analysis of relevant studies. To this end, a total of 38 studies conducted across 21 countries on six continents were selected using the PRISMA guidelines and thoroughly reviewed. The review process was guided by specific research questions. Based on these questions, the discussion section addresses four key issues: 1) trends in publications on the reviewed studies, 2) the role of physical activity in mental health, 3) potential mediators between physical activity and mental health, and 4) the strengths and limitations of the included studies, along with the research gaps and future research directions. The first issue relates to trends in publications of included studies. The findings of the review highlight a surge in research output between 2020 and 2024, with the topic receiving increasing attention in the Asian region, specifically in China. A potential reason for this trend could be the impact of the COVID-19 pandemic on students' mental health. This increase in mental health issues might have prompted more research on physical activity and exercise as potential interventions and coping mechanisms to address these problems during and post-pandemic periods.

Second, the review suggests that physical activity is a significant personal resource for fostering a wide range of positive mental health outcomes. The review further notes that students' regular and frequent engagement in physical activity and exercise significantly enhances their cognitive and socioemotional abilities. The findings of the current review are consistent with prior similar reviews that have reported the positive role of physical activity in mental health (e.g., Brown et al., 2024; Donnelly et al., 2024; Malagodi et al., 2024). Several theories also support the positive relationship between physical activity and mental health. For instance, self-determination theory suggests that engaging in physical activity can motivate individuals to satisfy key psychological needs such as autonomy, competence, and relatedness (Rhodes et al., 2019). These needs are crucial for positive psychological functioning (Rebar et al., 2021). In the context of college students, physical activity provides opportunities to fulfill these needs, which in turn supports mental well-being. Additionally, Social cognitive theory emphasizes that behavior is influenced by goals, intentions, and expectations (Rebar et al.,

2021; Rhodes et al., 2019). Physically active college students often expect to experience better mental health outcomes, such as improved mood, happiness, and cognitive functioning. These expectations guide their engagement in physical activity, leading to better emotional experiences and reinforcing the cycle of positive mental health. In addition to its vital role in promoting positive mental health outcomes, there is consistent evidence that physical activity and exercise serve as protective factors against negative mental health experiences of college students. Generally, the findings of our review align with prior related reviews which have synthesized research evidence for the significant role of physical activity in reducing negative mental health experiences such as depression, anxiety, and stress (e.g., Huang et al., 2024; Huang et al., 2023; J. Li et al., 2024; Li et al., 2022). However, it is equally important to point out that the relationship between physical activity and anxiety is not as stable as other negative outcomes such as depression and stress. Previous reviews also observed that the relationship between physical activity and anxiety is mixed and not well-established (Rehman et al., 2024). Such inconsistent results might be associated with methodological variation and limitations of these studies, such as variations in scales and sample size.

In its third research question, our review aimed to explore the mechanism by which physical activity and exercise impact mental health outcomes. The findings of the review highlight that various psychosocial factors serve as potential mediators in the relationship between physical activity and mental health. These results of the review are in accord with prior reviews that have reported similar findings (e.g., Lubans et al., 2016; White et al., 2024). It is evident from the review that the role of physical activity is complex and not straightforward. Physical activity fosters positive mental health outcomes and alleviates negative ones by increasing their psychological and social resources. For example, college students' involvement in physical activity and exercise helps them gain better psychological resources, which in turn leads to improved positive mental health and decreased negative emotional experiences. Likewise, engaging in regular physical and sports activities may assist students in building interpersonal relationships, gaining social support, and ultimately fostering better mental health. Therefore, these mediational effects suggest that physical activity and exercise enhance students' mental health by strengthening their psychosocial resources, such as emotional intelligence, positive self-image, and psychological capital. College students who engage in regular physical activity are more likely to possess the psychological resources needed to cope with negative mental health challenges while simultaneously fostering positive mental experiences.

The final research question of the review addresses the strengths and limitations of the reviewed studies, analysis of research gaps, and suggestions for future research directions. The included studies have several strengths, primarily related to their methodological qualities. The quality assessment of study methods indicates that most achieve high scores, placing them in the higher methodological

category. Some specific methodological strengths include the use of valid and reliable measurements, advanced statistical analytical techniques, large sample sizes, exploration of relationships between independent and outcome variables, and protection of anonymity. Another strength is that several studies incorporate single and multiple mediating variables, offering additional insights into the mechanisms through which physical activity influences student mental health. Despite these strengths, the included studies also exhibit certain methodological limitations. First, most are cross-sectional, meaning the relationship between physical activity and mental health outcomes is correlational, preventing causal inferences. Hence, more longitudinal and experimental research is needed. Second, although probabilistic sampling enhances representativeness, non-probabilistic techniques were predominantly used in most of the reviewed studies. Future studies should consider probabilistic sampling strategies such as random, stratified, cluster, and systematic sampling. Third, most studies were not guided by clearly articulated theoretical frameworks, a critical limitation that future research should address. Fourth, the review observes that the existing literature on this topic is heavily concentrated in the Chinese context, indicating an uneven geographical distribution of studies. This highlights the need for future research to be conducted in regions outside China to improve representation and generalizability. Fifth, since most of the reviewed studies were conducted in China (see Figure 2), future research should include multi-country comparative studies. Using longitudinal and experimental designs would offer deeper insights into potential cross-national differences in how physical activity influences mental health outcomes. Finally, the majority of the studies did not explicitly describe their theoretical frameworks. The current review recommends that future research employ well-established theoretical frameworks, as these provide a clear conceptual and methodological foundation for hypothesis development and testing.

In addition to the methodological limitations of the included studies, several research gaps should be addressed in future investigations. While numerous studies suggest that engagement in physical activity can reduce negative affective experiences such as anxiety, depression, and psychological distress (e.g., Brailovskaia et al., 2021; Ghrouz et al., 2019; Grasdalsmoen et al., 2020; Kim et al., 2021; Liu et al., 2024), some report non-significant relationships between these variables (Brito-Suárez et al., 2023; Chootong et al., 2022; Doré et al., 2018; Wu et al., 2015). This inconsistency indicates that the link between physical activity and negative mental health outcomes is not yet well-established and requires further exploration. Moreover, this review finds that most of the included studies primarily focused on how physical activity mitigates negative mental health experiences, highlighting the need for more research on its potential to enhance positive mental health outcomes. The reviewed literature also predominantly adopts a hedonic perspective on mental well-being, defining it in terms of positive emotions (e.g., happiness, satisfaction, and pleasure) and the absence of negative

states. However, the eudaimonic perspective, which emphasizes deeper dimensions of mental well-being such as meaning, purpose in life, positive relationships, autonomy, environmental mastery, self-acceptance, personal growth, and self-actualization (Ryan & Deci, 2001; Ryff & Keyes, 1995), remains largely underexplored. Future research should examine the role of physical activity and exercise in fostering positive psychological functioning and well-being.

Limitations and Implications of the Systematic Review

Like all systematic reviews, the current review is not flawless and has several limitations that need to be acknowledged for future consideration. Even though there is a wide range of documents, such as qualitative studies, books, book chapters, conference proceedings, and theses, that might provide valuable information on the topic, the content analysis of the current review was limited to quantitative and peer-reviewed empirical articles. Furthermore, due to the lack of sufficient longitudinal and experimental studies, most of the included studies in the review were cross-sectional. It is also possible that the initial search for information might not have retrieved all relevant records. Another limitation of the review is associated with the publication timeframe of the reviewed studies, as the review selected publications published between 2014 and 2024. Hence, future systematic reviews might extend the current review and consolidate its findings by considering these limitations. Despite these limitations, this review has several contributions. Given the paucity of comprehensive content analysis on the topic, the findings of the current review could enhance our understanding of the role of physical activity and exercise in the mental health of college students. Additionally, the review's synthesis of evidence regarding potential mediating variables contributes to our understanding of the complexity of the topic. Practically, the review's results could guide college communities in integrating physical activities into their curricula to promote students' mental health. For example, colleges could introduce physical education as a mandatory practical course for all students. Moreover, colleges and mental health professionals should raise awareness among students about the positive role of physical activity in mental health. Furthermore, building a variety of sports teams and organizing events may benefit many students while also increasing their interest in physical activity and exercise. Colleges are also encouraged to provide student fitness centers at no or affordable cost to encourage regular student engagement in physical activities and exercise. Beyond university-level initiatives, higher education policymakers and curriculum developers should integrate physical education into curricula to support student mental health. Community-based fitness centers and programs should be made accessible to students and the wider population, fostering regular exercise habits and persistence, which are essential for mental well-being. These local initiatives can be embedded within broader public health strategies, supported by national

policies and cross-sector collaboration between the Ministries of Health and Education. Such coordinated efforts can raise awareness, encourage consistent physical activity, and strengthen policies aimed at promoting mental health.

CONCLUSION

Even though there is a growing body of literature on the positive role of physical activity in the mental health of college students, qualitative content analysis of these studies remains significantly limited. In light of this gap, we conducted a comprehensive content analysis and synthesis of studies from various countries, published between 2014 and 2024. Our review observes a surge in research output between 2020 and 2024. In addition, the research output on the topic was unevenly distributed, with a significant number of studies conducted in China. The main findings highlight that physical activity and exercise play a critical role in fostering positive mental health outcomes and reducing negative experiences. Furthermore, a range of psychological and social factors emerged as significant mediators in the relationship between physical activity and mental health outcomes. Therefore, this review underscores the importance of physical activity as an essential aspect of college students' mental health. College communities and other stakeholders who work closely with college students should consider incorporating physical activity and exercise when addressing student mental health issues.

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