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RECEIVED 23 February 2026
REVISED 14 August 2026
ACCEPTED 18 August 2026
PUBLISHED 21 September 2026

CITATION

Temirbay N, Kaldybaeva A, Baikulova A,
Beknazarov Z, Pushkulov Z,
Bekbergenova Z, Ashimkhanov A-K,
Aganiyazov N, Yeshenali S, Kuderiyev Z
and Seitkasym A (2026) Physical
education and student mental well-
being in higher education: a socio-
cultural review.
Front. Educ. 11:1815626.
doi: 10.3389/feduc.2026.1815626

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Physical education and student mental well-being in higher education: a socio-cultural review

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This review examines the role of physical education as a pedagogically grounded means of supporting student mental well-being in higher education. In the context of increasing academic pressure, sedentary lifestyles, and the growing prevalence of mental health challenges among university students, physical education is reconsidered not merely as a fitness-oriented subject but as an integrative educational practice. The study synthesizes international research on pedagogical conditions, instructional approaches, and institutional strategies that connect physical activity with psychological resilience, motivation, emotional regulation, and social engagement. Particular attention is given to student-centered and inclusive models, the integration of digital technologies, interdisciplinary courses linking physical education with health and neuroscience, and mindfulness-based and stress-reduction practices. A comparative analysis of international best practices demonstrates that positive mental well-being outcomes are most evident when physical education is embedded within supportive university policies and holistic learning environments. The findings indicate that pedagogically informed physical education enhances not only students' physical health but also their academic functioning, sense of belonging, and long-term engagement in healthy lifestyles. The review highlights the need for integrated higher education policies that position physical education as a strategic component of student mental well-being and sustainable university development.

KEYWORDS

health promotion, higher education, instructional methods, pedagogical approaches, physical education, student mental well-being

1 Introduction

Modern society places increasingly high demands on the physical and psycho-emotional well-being of young people. Intensified academic workloads, the widespread adoption of sedentary lifestyles, and declining levels of physical activity have become critical challenges in higher education, affecting not only students' physical health but also their emotional stability, stress resilience, and overall mental well-being. Within this context, physical education is increasingly recognized as an essential component of the educational process, contributing to the holistic development of students and supporting their ability to cope with academic and social pressures.

Physical education plays a significant role in shaping students' personal and psychosocial development. Regular participation in physical education classes contributes to the improvement of physical fitness, including strength, endurance, and coordination, while simultaneously fostering personal qualities such as discipline, perseverance, and stress resistance. Importantly, physical activity has been shown to exert a positive influence on students' emotional state, facilitating stress regulation, enhancing mood, and supporting sustained academic performance. Thus, physical education extends beyond physical conditioning and serves as a meaningful pedagogical resource for students' intellectual, emotional, and moral development (Zheng et al., 2024).

Universities occupy a central position in the formation of students' health-related values and behavioral patterns. The period of higher education represents a critical stage in the establishment of long-term lifestyle habits, including attitudes toward physical activity and self-care. Higher education institutions provide unique opportunities for promoting physical education through structured curricula, extracurricular sports sections, competitions, and mass events. These activities not only support physical development but also foster social interaction, teamwork, and a sense of belonging, all of which are closely linked to students' mental well-being and academic engagement (Cruz, 2022; Ntoumanis and Standage, 2009).

Despite the acknowledged importance of physical education, many universities continue to face persistent challenges in its effective implementation. Low student motivation, insufficient material and technical resources, and the predominance of traditional instructional approaches often limit the potential of physical education to support students' mental well-being. Moreover, physical education is frequently perceived as a formal or peripheral discipline, rather than as an integrated pedagogical tool capable of addressing contemporary challenges related to student stress, emotional exhaustion, and declining engagement. These limitations highlight the need to reconsider pedagogical conditions, update instructional methods, and incorporate innovative and inclusive approaches that enhance both participation and psychological outcomes.

Against this background, there remains a need for a comprehensive pedagogical analysis of how physical education can be effectively leveraged to promote student mental well-being within higher education settings. While existing studies emphasize the physical and organizational aspects of physical education, fewer reviews systematically examine the pedagogical mechanisms, socio-cultural contexts, and innovative practices through which physical education contributes to students'

psycho-emotional health. In this review, "physical education" is understood primarily as a curricular pedagogical discipline implemented within higher education institutions through structured educational programs, instructional strategies, and teacher-guided activities. At the same time, the review also considers broader forms of organized physical activity within the university environment, including extracurricular sports programs, digital activity initiatives, and mind-body practices, when these function as extensions of institutional physical education and student well-being support systems. To avoid conceptual ambiguity, the manuscript distinguishes between physical education as an educational and pedagogical process and physical activity as a broader category of movement, exercise, and health-related behavior.

This review aims to address this gap by critically analyzing pedagogical conditions, instructional methods, and innovative approaches to physical education in universities, with a particular focus on their role in enhancing student mental well-being. By synthesizing international research and best practices, the study seeks to identify key mechanisms through which physical education supports stress regulation, motivation, social connectedness, and overall well-being, and to formulate practical recommendations for improving physical education in higher education institutions.

2 Methodology

This study adopts a critical narrative review supported by a structured literature search to examine the role of physical education in promoting student mental well-being in higher education. This methodological framework was selected to allow an in-depth synthesis of interdisciplinary research spanning pedagogy, physical education, psychology, and educational innovation. Unlike strictly systematic reviews, a critical narrative review enables the integration of diverse theoretical perspectives, pedagogical models, and empirical findings relevant to complex educational phenomena such as student mental well-being. A structured literature search and study selection process was employed to enhance the transparency and reproducibility of the review; however, the study was not designed or conducted as a formal systematic review or meta-analysis.

2.1 Data sources and search strategy

The literature search was conducted using major international academic databases, including Scopus, Web of Science, and PubMed, which are widely recognized for their coverage of peer-reviewed research in education, physical education, and related social sciences. Additional relevant sources were identified through reference list screening of key articles. The literature search was conducted between January and March 2025. The search strategy combined keywords related to physical education, higher education, and student mental well-being using Boolean operators.

The search process employed combinations of keywords and Boolean operators, including: physical education, university students, higher education, mental health, mental well-being,

stress, motivation, student engagement, psychological well-being, innovative approaches, and digital technologies. The main search strategy combined the following terms using Boolean operators: (“physical education” OR “physical activity”) and (“higher education” OR university OR “university students”) and (“mental health” OR “mental well-being” OR stress OR motivation OR “psychological well-being”).

Additional searches incorporated terms including student engagement, emotional well-being, inclusive education, stress regulation, and digital technologies to capture interdisciplinary studies relevant to the review objectives. The literature identification and screening process was structured using predefined search and eligibility criteria to ensure transparency and consistency throughout the review.

2.2 Inclusion and exclusion criteria

The review includes peer-reviewed studies that examine physical education and organized physical activity within higher education and address psychological or mental well-being outcomes among university students. Particular attention was paid to research focusing on stress regulation, motivation, emotional well-being, student engagement, and social interaction. Only publications in English-language academic journals were considered. Studies focusing exclusively on primary or secondary education, elite or professional sports without an educational dimension, or clinical mental health interventions unrelated to pedagogical processes were excluded. Publications that did not demonstrate a clear connection between physical education and student well-being were also not included in the analysis.

The primary focus of the review is curricular physical education in higher education. However, studies examining extracurricular and institutionally supported physical activity initiatives were also considered when they contributed to understanding the pedagogical and psychological mechanisms supporting student mental well-being. In addition, selected studies from school-based physical education, teacher education, and broader physical activity research were included when they provided relevant theoretical, pedagogical, or methodological insights applicable to university settings. Nevertheless, priority in the synthesis and discussion was given to studies specifically examining university students and higher education environments.

2.3 Time frame and study selection

The review primarily considered publications from 2010 to 2025, a period reflecting significant transformations in higher education, including the increased emphasis on student mental health, digitalization of learning environments, and innovative pedagogical approaches. The initial database search identified 412 records. After removing duplicate publications, 336 records remained for title and abstract screening. Following the application of the inclusion and exclusion criteria, 128 full-text articles were assessed for eligibility. Ultimately, 67 studies were included in the final narrative synthesis. Foundational studies

published prior to this period were also included when they provided essential theoretical frameworks, particularly in relation to motivation and psychosocial development. The selection process involved an initial screening of titles and abstracts, followed by a full-text review of studies that met the inclusion criteria. Priority was given to research presenting empirical evidence, pedagogical models, or comprehensive reviews relevant to physical education and student mental well-being. The study selection process prioritized peer-reviewed empirical studies, theoretical analyses, and review articles addressing pedagogical or psychological aspects of physical education and student mental well-being in higher education contexts. The study selection process is summarized in [Figure 1](#).

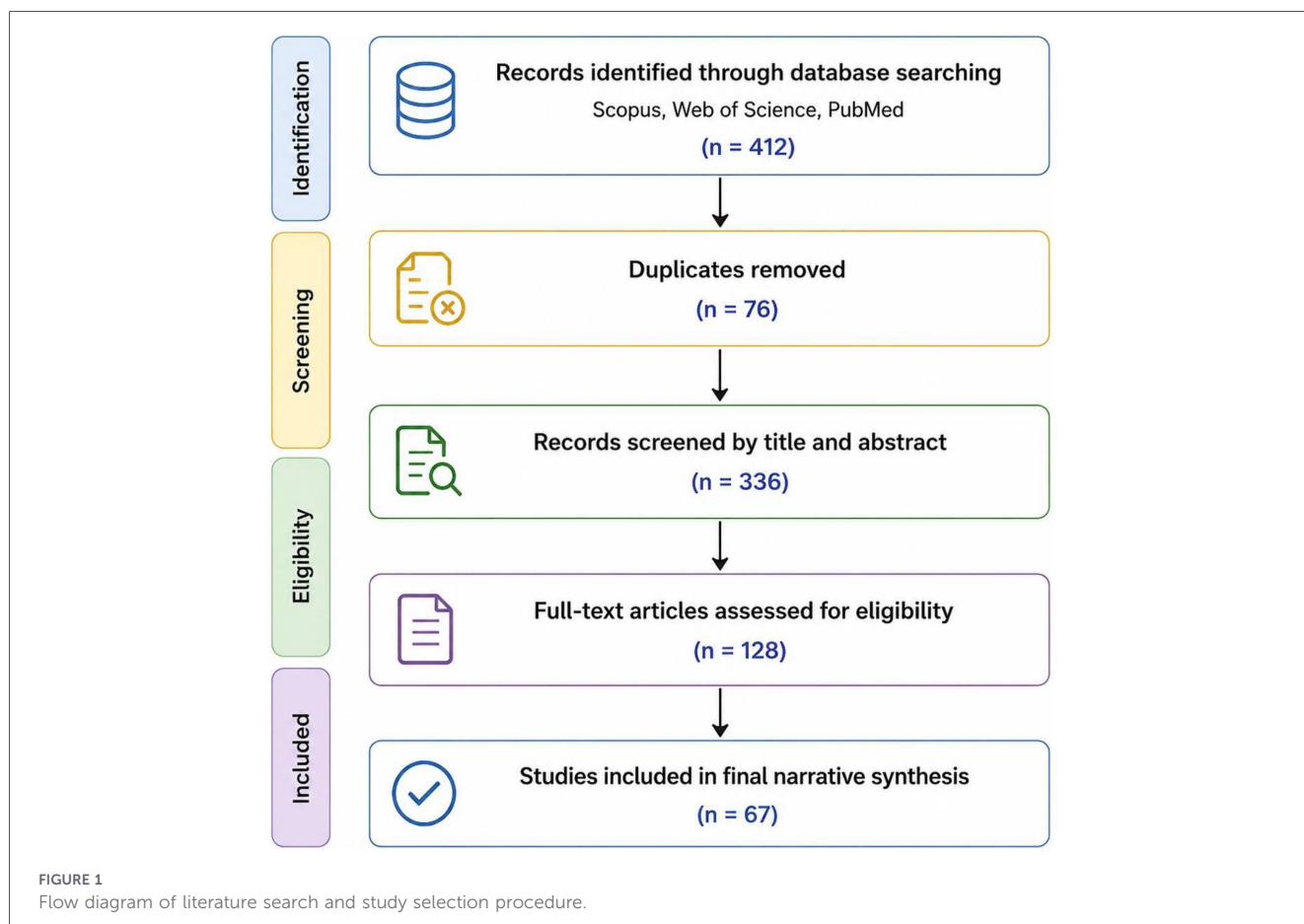
2.4 Data analysis and synthesis

The selected studies were analyzed using a thematic approach aimed at identifying pedagogical and psychological mechanisms through which physical education influences student mental well-being in higher education. The analysis focused on recurring themes related to pedagogical conditions, instructional strategies, motivation, stress regulation, and social connectedness. Consistent with a critical narrative review approach, rather than aggregating quantitative outcomes, the review synthesizes conceptual and empirical findings to highlight how traditional and innovative physical education practices contribute to students’ psycho-emotional well-being and academic engagement across different university contexts.

3 Physical education in higher education: context and challenges for student mental well-being

Physical education in higher education institutions remains an important component of the educational process, traditionally aimed at promoting physical health, developing motor skills, and fostering healthy lifestyle habits among students. However, contemporary socio-economic changes, increasing academic and professional demands, and shifts in students’ attitudes toward physical activity have significantly altered the context in which physical education is implemented. These transformations have direct implications not only for students’ physical condition but also for their mental well-being, including stress levels, motivation, and emotional stability.

In many universities, physical education continues to be organized according to traditional curricular models, with a primary focus on meeting formal requirements defined by regulatory frameworks and state standards. Such programs typically emphasize general physical training, the development of basic physical qualities, and theoretical knowledge related to physical culture. Despite the presence of these formal structures, student engagement in physical education remains limited in many higher education institutions. This low level of involvement reduces the potential of physical education to serve as a meaningful pedagogical resource for supporting students’ psycho-emotional well-being.



Recent research highlights a broader institutional trend toward the reduction or elimination of compulsory physical education requirements in higher education. For example, evidence from the United States indicates that a majority of tertiary institutions no longer mandate physical education coursework for graduation, raising concerns about the long-term consequences for both physical and mental health among students (Szarabajko and Cardinal, 2023). The decline in institutional commitment to physical education underscores the need to reconsider its role within universities, particularly in light of growing concerns related to student stress, emotional exhaustion, and declining motivation.

At the same time, higher education institutions are experiencing notable shifts in the content and delivery of physical education. One prominent trend is the integration of digital technologies and online platforms, which allow students to monitor physical activity, receive individualized feedback, and participate in flexible learning formats. The increased use of digital tools has been particularly evident during periods of crisis, such as the COVID-19 pandemic, when remote and hybrid models of physical education became necessary (Bucharest University of Economic Studies and Jinga, 2024; Latyshev et al., 2024). While these innovations have expanded access and personalization, their effectiveness in supporting students' mental well-being depends on pedagogical design and meaningful engagement rather than technological adoption alone.

However, the effectiveness of technology-based physical education remains uneven across institutional contexts. Several studies note that digital and remote formats may reduce direct social interaction, teacher supervision, and students' emotional engagement, which are important components of mental well-being support. In addition, unequal access to digital resources and varying levels of students' self-regulation may limit the effectiveness of technology-enhanced physical education, particularly among students experiencing psychological distress or low motivation.

Another important development is the growing emphasis on integrating physical and psycho-emotional dimensions within physical education curricula. Practices such as yoga, breathing exercises, and relaxation techniques are increasingly incorporated to address stress reduction, emotional regulation, and concentration. Empirical evidence suggests that regular participation in physical education can positively influence students' mood, reduce anxiety, and enhance cognitive functioning, thereby contributing to improved academic performance and psychological resilience (Soga et al., 2022).

Despite these positive trends, physical education in universities continues to face persistent challenges. One major issue is declining student interest in physical activity, particularly in the context of digitalized lifestyles that prioritize sedentary and virtual forms of engagement. This often results in irregular attendance, low motivation, and a formal attitude toward physical education courses. Studies evaluating student

satisfaction and learning outcomes indicate that outdated teaching methods and limited innovation undermine the educational and psychological value of physical education, highlighting the need for continuous pedagogical renewal (Dau and Ninh, 2024).

Material and technical constraints further limit the effectiveness of physical education in higher education. In many institutions, outdated facilities, insufficient equipment, and limited access to inclusive infrastructure reduce the safety, attractiveness, and accessibility of physical education programs. These limitations disproportionately affect students with disabilities and restrict opportunities for inclusive participation, thereby negatively influencing students' sense of belonging and well-being (Schwarz, 2016).

Teacher qualifications represent an additional challenge. Not all physical education instructors possess the competencies required to implement student-centered, digitally supported, or inclusive teaching approaches. Insufficient training in modern pedagogical methods, educational technologies, and psychological principles may lead to monotonous instruction that fails to address students' individual needs and psycho-emotional characteristics (Morgan and Hansen, 2008; Napper-Owen et al., 2008). As a result, the potential of physical education to support mental well-being is often underutilized.

Overall, the current state of physical education in higher education reflects a complex interplay of institutional, pedagogical, and socio-cultural factors. Addressing these challenges requires a comprehensive rethinking of physical education as not merely a formal curricular requirement but as a strategic pedagogical tool for promoting student mental well-being, engagement, and sustainable personal development.

4 Pedagogical and psychological mechanisms linking physical education and student mental well-being

Physical education in higher education exerts its influence on student mental well-being not merely through physical activity itself, but through a complex interaction of pedagogical and psychological mechanisms embedded within the educational process. The effectiveness of physical education as a resource for supporting students' mental well-being depends on how instructional strategies, learning environments, and interpersonal interactions are designed and implemented.

One of the central mechanisms linking physical education to mental well-being is individualization of the educational process. When physical education programs take into account students' physical fitness levels, personal interests, and psycho-emotional characteristics, students are more likely to experience a sense of competence and personal relevance. Such individualized approaches reduce performance anxiety, increase self-confidence, and promote positive emotional experiences during physical activity (Edwards et al., 2004). Although this evidence was derived from broader sport and exercise populations, the identified psychological mechanisms are applicable to university physical education. In this context, physical education becomes not a source of stress or comparison, but a supportive environment that fosters psychological comfort and engagement.

Motivation represents another key psychological mechanism mediating the relationship between physical education and mental well-being. Research consistently shows that students' sustained participation in physical education is closely associated with the development of intrinsic motivation rather than external control. Pedagogical practices that emphasize autonomy, meaningful choice, cooperation, and personal goal setting contribute to higher levels of enjoyment, emotional satisfaction, and commitment to physical activity (Kuznyetsova, 2017). When students perceive physical education as an integral and meaningful component of their lifestyle, rather than as a compulsory academic requirement, it supports stress resilience and emotional balance.

At the same time, the relationship between physical education and mental well-being is not always consistent across studies. Some research indicates that compulsory or performance-oriented physical education environments may increase anxiety, social comparison, and disengagement among students, particularly when instructional approaches do not consider individual psychological needs. These findings suggest that the positive impact of physical education depends substantially on pedagogical design and the emotional climate created within the learning environment.

The integration of innovative and interactive teaching methods further strengthens the mental health benefits of physical education. Approaches such as functional training, team-based activities, outdoor exercises, and blended learning formats introduce variability and novelty into the learning process, which can enhance students' interest and emotional engagement. Importantly, innovative methods that combine physical activity with elements of cooperation and play create opportunities for positive social interaction and collective achievement, which are closely linked to psychological well-being. Although Invernizzi et al. (2019) focused on primary school children, the pedagogical principles of active learning and reflective practice remain relevant for higher education. At the same time, these approaches can serve as effective tools for emotional regulation, helping students cope with academic stress and mental fatigue.

Psychological and pedagogical support provided by instructors constitutes a crucial mechanism in shaping students' mental well-being within physical education contexts. Teachers who possess competencies in psychological support and motivational communication are better equipped to identify students' internal barriers, reduce anxiety related to physical performance, and strengthen self-esteem. Supportive feedback, encouragement, and recognition of individual progress contribute to the development of self-efficacy and a sense of psychological safety, which are essential for sustained engagement in physical activity (Curran and Standage, 2017).

The effectiveness of physical education in promoting mental well-being is also enhanced through interdisciplinary collaboration and institutional support. Integrating physical education with health education, nutrition, and preventive medicine allows students to develop a holistic understanding of well-being that encompasses both physical and mental dimensions. Collaboration with external sports organizations and community resources expands opportunities for participation and reinforces the social significance of physical

activity. These studies discuss broader educational collaboration rather than university student populations specifically, but they provide useful conceptual guidance for institutional practice (Rees et al., 1991; You and Craig, 2015). These connections strengthen students' social networks and sense of belonging, which play a protective role against stress and emotional exhaustion.

An additional mechanism influencing mental well-being is the use of assessment and feedback systems that prioritize personal progress over normative comparison. Continuous, supportive feedback helps students recognize their achievements, set realistic goals, and maintain motivation without experiencing excessive pressure or fear of failure. Such assessment practices contribute to a positive emotional climate in physical education and reinforce students' trust in the learning process (Chng and Lund, 2018; Hsia et al., 2024).

Finally, the development of a university culture that values physical activity and well-being amplifies the psychological impact of physical education. Institutional support for sports traditions, student clubs, and inclusive participation fosters a sense of community and shared identity. Participation in collective sports events and extracurricular activities strengthens social bonds and promotes emotional well-being, reinforcing the role of physical education as a space for both personal growth and social integration (Wegner et al., 2020).

The pedagogical conditions presented in Table 1 were derived through thematic analysis of the reviewed literature. The categories reflect recurring pedagogical and psychological mechanisms most frequently associated with student mental well-being outcomes in higher education physical education contexts.

Thus, these pedagogical and psychological mechanisms demonstrate that physical education contributes to student mental well-being not through isolated activities, but through a coherent educational ecosystem. By aligning instructional strategies, motivational practices, and institutional support with students' psycho-emotional needs, physical education can function as an effective pedagogical resource for enhancing mental well-being in higher education.

5 International best practices in physical education for promoting student mental well-being

International literature and institutional models suggest that physical education can contribute to student mental well-being most effectively when it is designed not only as a set of physical exercises but as a broader institutional system supporting motivation, social connectedness, emotional regulation, and inclusive participation. Many universities strengthen student participation through infrastructure development, the expansion of sports clubs, and the organization of competitions and campus events, which collectively create a motivational environment and help build stable habits of physical activity. Although some supporting evidence originates from school-based and adolescent populations (Hale et al., 2021; Institute of Medicine et al., 2013), these findings provide useful pedagogical principles that are conceptually applicable to higher education.

TABLE 1 Pedagogical and psychological mechanisms supporting student mental well-being through physical education.

Pedagogical conditions	Description	Sources
Individual approach	Taking into account the physical, psycho-emotional and motivational characteristics of each student to improve the effectiveness of classes.	(Edwards et al. 2004)
Formation of motivation for physical education	Development of internal and external motivation through practical examples, creation of a positive atmosphere, encouragement of student achievements.	(Kuznyetsova 2017)
Use of modern technologies	Implementation of digital platforms, interactive applications, gaming methods and virtual reality technologies in the learning process.	(Invernizzi et al. 2019)
Psychological and pedagogical support	Providing moral and psychological support to students, reducing anxiety and increasing self-confidence.	(Curran and Standage 2017)
Cooperation with external sports organizations	Organization of joint events with fitness clubs, sports sections and institutions, which expands students' opportunities.	(Rees et al. 1991; You and Craig 2015)
Development of inclusive education	Adaptation of physical education classes for students with disabilities, creation of accessible infrastructure.	(Demchenko et al. 2021)
Comprehensive approach to the development of physical and psycho-emotional qualities	Combining physical education with teaching the basics of a healthy lifestyle and disease prevention.	(Leshchii 2020)
Assessment and feedback	Regular provision of students with constructive feedback on the results of classes to increase their interest.	(Chng and Lund 2018; Hsia et al. 2024)
Development of sports traditions in the university	Organization of sports events, support for student sports clubs and sections to form sustainable habits for sports.	(Wegner et al. 2020)
Updating training programs	Constant review and updating of physical education curricula in accordance with modern standards and requirements.	(Prystynskyi et al. 2020; Siedentop and Van der Mars 2023)

Importantly, such practices are not merely “extra activities”: when they are coordinated by university sports clubs, student organizations, and physical education departments, they function as a pedagogical process that shapes students’ engagement, discipline, and self-management skills (Han et al., 2025; Kahn et al., 2002; Zhamardiy et al., 2020).

It is important to note that the institutional examples discussed in this section should be interpreted primarily as illustrative models derived from the reviewed literature rather than as uniformly evaluated empirical case studies. In several instances, the cited sources provide conceptual, pedagogical, or technology-oriented discussions associated with particular university contexts rather than direct longitudinal evaluations of institutional programs. Consequently, these examples are used to demonstrate potential directions and implementation approaches within higher education rather than definitive evidence of effectiveness.

A first major cluster of best practices concerns technology-supported physical education, where digital tools are used to increase engagement and promote self-regulation. Illustrative examples discussed in the literature include technology-supported initiatives associated with universities such as the University of Sydney and Harvard, where digital tools and flexible participation formats have been explored as potential mechanisms for increasing student engagement and supporting self-regulation (Buchheit and Laursen, 2013; Collins and Halverson, 2018; Skarzhinskaya and Sarafanova, 2019). Although these studies are not limited to university students, they provide relevant conceptual foundations for technology-enhanced learning in higher education. From a mental well-being perspective, the key value of these practices lies not in the technology itself but in its pedagogical function: digital tools can help students set goals, monitor progress, and maintain routines associated with stress management and perceived control over daily life. At the same time, these approaches carry a clear risk: if digitalization reduces social interaction or teacher feedback, the mental well-being effect may weaken, particularly for students who need encouragement and belonging. Therefore, the most transferable element of such practices is not the platform, but the integration of technology with pedagogical support and opportunities for social participation.

A second cluster includes immersive and innovative formats, with illustrative institutional examples discussed in relation to institutions such as ETH Zurich. These approaches can increase motivation by offering novelty, gamification, and engaging learning environments, which may be particularly beneficial for students who avoid traditional physical education settings (Ghaoui, 2003). Although not specific to higher education physical education, this work provides conceptual insight into technology-enhanced learning environments. However, the mental well-being value of immersive technologies depends on whether they promote sustainable participation and real-world activity rather than short-term excitement. In addition, high cost and limited scalability can restrict the potential for broad adoption, suggesting that VR-based solutions may be most realistic as pilot initiatives or targeted interventions rather than as universal models.

Nevertheless, the long-term effectiveness of immersive technologies for supporting student mental well-being remains

insufficiently explored. Existing studies often rely on small-scale pilot implementations and short intervention periods, limiting the generalizability of findings across different university environments.

A third cluster is represented by interdisciplinary courses that explicitly connect physical activity with mental well-being and cognitive functioning. Illustrative examples discussed in the literature include interdisciplinary courses linking physical activity, cognitive functioning, and mental well-being, such as initiatives associated with the University of Tokyo and seminar-based formats reported in relation to Cambridge (Bouchard et al., 2012; Hayashi, 2022). Although Bouchard et al. (2012) synthesized evidence from diverse populations rather than university students specifically, the identified physiological and cognitive mechanisms remain relevant for higher education contexts. This type of practice supports mental well-being by strengthening students’ understanding of stress regulation, concentration, and cognitive benefits, thereby increasing intrinsic motivation and reducing the perception of physical education as a formal requirement. Its main limitation is institutional complexity: interdisciplinary initiatives require coordination between faculties and stable curricular integration, which may be challenging in universities with rigid program structures.

Illustrative examples of community-oriented participation models described in the literature include university sports clubs and campus-based wellness initiatives associated with institutions such as Stanford and the University of British Columbia. These models promote mental well-being by strengthening social connectedness, peer support, and a sense of belonging, which serve as protective factors against stress and emotional exhaustion (Boa Sorte Silva et al., 2024; Taylor-Piliae et al., 2010). Although Taylor-Piliae et al. (2010) investigated older adults, the reported psychosocial mechanisms related to physical activity and social connectedness provide transferable theoretical insights for higher education settings. The key mechanism here is inclusion through choice: when students can select activities aligned with their interests and participate in flexible formats, engagement and emotional satisfaction tend to increase. At the same time, universities must address the challenge that event-based approaches may attract already active students more than those experiencing stress, low motivation, or social withdrawal; therefore, supportive outreach and low-threshold entry points are essential for these practices to contribute broadly to mental well-being.

A fifth cluster focuses on inclusive and adaptive physical education, illustrated by adaptive sports initiatives reported in relation to the University of Amsterdam. These practices are particularly important from a mental well-being perspective because they address social integration, reduce isolation, and support self-confidence among students with disabilities (Van Mechelen et al., 2000). Although this longitudinal study involved adolescents rather than university students, it offers valuable evidence regarding the long-term relationship between physical activity and health that informs higher education practice. However, inclusiveness requires trained staff, adapted infrastructure, and careful assessment strategies; without these conditions, inclusive programs may remain symbolic rather than effective. Consequently, the key transferable lesson is that

accessibility must be treated as a pedagogical and institutional commitment rather than an optional addition.

The literature also describes mind–body and stress-reduction initiatives, including yoga- and meditation-based programs associated with universities such as the National University of Singapore. These initiatives directly address psycho-emotional outcomes by providing structured opportunities for emotional regulation and resilience building, including digital resources that enable independent practice (Balasekaran et al., 2021). Similar logic underpins step-based engagement campaigns such as UCLA’s “10,000 Steps Challenge,” where behavioral activation and daily routine formation are supported through motivational structures (Scroggs et al., 2025). Although Singh and McMahan (2006) examined school populations, the findings highlight general behavioral mechanisms that are also relevant for promoting regular physical activity among university students. From an implementation perspective, such initiatives are often scalable and cost-effective, yet their long-term impact depends on integration with broader university support systems rather than isolated campaigns.

Overall, the synthesis of international best practices suggests that physical education contributes to student mental well-being most consistently when universities implement multi-level models combining

- (1) supportive pedagogical design,
- (2) flexible and inclusive participation formats, and

- (3) institutional environments that normalize physical activity as part of student life.

While digitalization, immersive technologies, and interdisciplinary models offer substantial opportunities, their effectiveness depends on resource availability, teacher competencies, and the preservation of social interaction and psychological safety. Therefore, universities seeking to transfer these best practices should focus not only on adopting visible innovations, but on embedding them into coherent pedagogical strategies aligned with student mental well-being outcomes.

Table 2 summarizes major thematic clusters of international approaches identified in the reviewed literature. The presented categories reflect commonly discussed institutional and pedagogical strategies aimed at supporting student mental well-being through physical education in higher education settings. The institutional examples are intended as illustrative cases synthesized from the reviewed literature rather than comprehensive descriptions of officially documented university programs. They demonstrate representative approaches reported across different higher education contexts.

Thus, modern approaches to physical education in universities increasingly emphasize the integration of technology, inclusiveness, and interdisciplinary learning, contributing not only to students’ physical health but also to their psychological well-being and academic success. However, successful implementation requires adequate financial, human, and technical resources.

TABLE 2 Illustrative international approaches to promoting student mental well-being through physical education identified in the literature.

Approach	Representative example from the literature	Advantages	Disadvantages
Use of digital technologies	University of Sydney (Australia) — digital activity tracking applications	– Increased accessibility of classes. – Personalized recommendations. – Increased student engagement.	– Requires access to gadgets and the Internet. – Reduced social interaction. – Lack of teacher supervision.
Virtual reality and interactive classes	ETH Zurich (Switzerland) — virtual reality-supported physical education.	– Interesting and innovative format. – Variety of training. – Motivating students with low levels of involvement.	– High cost of equipment. – Limited number of participants. – Less activity in the real world.
Interdisciplinary courses	University of Tokyo (Japan) — interdisciplinary courses linking physical activity and brain health.	– Formation of a holistic understanding of physical and mental health. – Increasing motivation through a scientific approach.	– Complexity of developing curricula. – Need for interfaculty cooperation.
Adaptive sports and support for students with disabilities	University of Amsterdam (Netherlands) — adaptive sports initiatives	– Equal access for all students. – Reduced stress and anxiety. – Increased student well-being.	– Need for qualified teachers. – Additional equipment costs. – Difficulty in assessing effectiveness.
Sports events and clubs	University of British Columbia (Canada) — university sports clubs and recreational programmes	– Strengthening team spirit. – Motivation through choice of sport. – Health culture at the university.	– Not all students participate in the events. – Lack of resources and instructors. – Funds are needed to organize the events.

6 Discussion: implications for higher education policy and practice

The findings of this review highlight that the contribution of physical education to student mental well-being in higher education depends not on isolated instructional techniques or individual initiatives, but on systemic alignment between pedagogical design, institutional policy, and educational practice. While previous sections have demonstrated the mechanisms and international models through which physical education can support mental well-being, this discussion focuses on the broader implications of these findings for higher education systems and decision-making processes.

An additional conceptual issue emerging from the reviewed literature concerns the distinction between physical education as a pedagogically structured curricular discipline and physical activity as a broader behavioral and health-related concept. While many studies examine physical activity in general, the present review focuses primarily on higher education physical education as an institutional and educational process. Nevertheless, extracurricular sports programs, digital activity initiatives, and mind-body practices were included where they operated within broader university well-being and educational frameworks.

The reviewed literature also demonstrates that research specifically focused on higher education physical education remains comparatively limited in some thematic areas. As a result, certain theoretical and pedagogical arguments discussed in this review draw partially on studies from school-based physical education, teacher education, and broader physical activity research. While these studies provide valuable conceptual insights, their direct transferability to university contexts should be interpreted with caution due to differences in institutional structures, student autonomy, and educational objectives.

From a policy perspective, the analysis suggests that physical education should be reconsidered as a strategic component of student well-being frameworks rather than as a peripheral or optional curricular element. In many higher education systems, the gradual reduction or elimination of compulsory physical education reflects a narrow interpretation of academic priorities, where cognitive performance is separated from psycho-emotional health. However, the reviewed evidence indicates that such separation may undermine long-term educational outcomes, as stress regulation, motivation, and emotional resilience are closely linked to academic engagement and persistence. Therefore, higher education policies that marginalize physical education risk weakening institutional capacity to address the growing mental health challenges among students.

At the level of institutional governance, the findings emphasize the importance of integrating physical education into comprehensive student support strategies. Universities that embed physical activity within broader health, well-being, and student success policies demonstrate more coherent approaches to mental health promotion. This integration allows physical education to function not only as a site of physical training, but also as a preventive and supportive environment that complements counseling services, academic advising, and wellness programs. Importantly, such integration requires cross-

sector coordination between academic departments, student services, and administrative units, rather than reliance on isolated sports or recreation offices.

For educational practice, the review underscores that the mental well-being effects of physical education are strongly mediated by pedagogical choices. Approaches that prioritize autonomy, individual progress, and supportive feedback tend to foster psychological safety and sustained engagement, whereas rigid assessment systems and performance-oriented norms may exacerbate anxiety and disengagement. This distinction has important implications for curriculum design: physical education programs that focus exclusively on standardized outcomes may inadvertently reproduce stressors already present in academic environments, while student-centered models can serve as counterbalancing spaces that promote emotional regulation and self-efficacy.

The comparison of international practices also reveals that innovation alone does not guarantee positive mental well-being outcomes. Digital platforms, immersive technologies, and interdisciplinary courses offer substantial potential to enhance flexibility and relevance, but their effectiveness depends on pedagogical integration and accessibility. In institutions where technological solutions are implemented without adequate instructor support or opportunities for social interaction, the mental well-being benefits appear limited or uneven. Conversely, practices that combine technological tools with human-centered pedagogy, such as guided reflection, collaborative activities, and adaptive feedback, are more likely to support diverse student needs. This finding suggests that higher education institutions should evaluate innovations not only in terms of scalability and visibility, but also in relation to their psychological and social impacts.

Equity and inclusion emerge as critical dimensions of policy and practice. Adaptive physical education programs and inclusive participation models demonstrate that access to physical activity can significantly influence students' sense of belonging and self-worth, particularly for those with disabilities or health-related limitations. However, the uneven distribution of resources across institutions raises concerns about the sustainability and transferability of inclusive practices. From a policy standpoint, this highlights the need for targeted funding mechanisms, professional development, and institutional accountability to ensure that mental well-being support through physical education does not remain confined to well-resourced universities.

Finally, the findings point to the central role of instructors as mediators between institutional policy and student experience. Teacher competencies in motivational communication, inclusive pedagogy, and psychological awareness shape how physical education is perceived and experienced by students. Without systematic investment in professional development, even well-designed curricula and policies may fail to achieve their intended mental well-being outcomes. This underscores the importance of recognizing physical education instructors not only as facilitators of physical activity, but as key contributors to the psycho-emotional climate of higher education institutions.

In summary, the implications of this review suggest that promoting student mental well-being through physical education requires a shift from fragmented initiatives toward integrated,

policy-supported educational models. Higher education institutions that align curricular design, pedagogical practice, and institutional governance around student well-being are better positioned to address contemporary mental health challenges. Physical education, when embedded within such coherent frameworks, can function as an effective pedagogical resource that supports both academic success and sustainable personal development.

Despite the growing body of literature linking physical education with student mental well-being, the existing evidence base remains methodologically heterogeneous. Many studies rely on self-reported measures, cross-sectional designs, or institution-specific samples, which limits the ability to establish causal relationships and generalize findings across higher education systems. Furthermore, differences in cultural context, institutional resources, and pedagogical traditions complicate direct comparison between studies and may influence the reported effectiveness of physical education interventions.

7 Conclusions and future directions

This review demonstrates that physical education in higher education should be reconsidered not merely as a component of physical training, but as a pedagogical resource with substantial potential to support student mental well-being. The analysis of theoretical frameworks, pedagogical mechanisms, and international practices indicates that the mental health benefits of physical education emerge primarily when it is embedded within student-centered, psychologically informed, and institutionally supported educational models.

The findings suggest that contemporary challenges in higher education—such as increased academic pressure, sedentary lifestyles, and rising levels of stress and anxiety among students—cannot be effectively addressed through traditional, standardized approaches to physical education. Instead, pedagogical strategies that emphasize individualization, autonomy, supportive feedback, and meaningful engagement are more likely to foster emotional regulation, motivation, and resilience. In this context, physical education functions not only as a means of improving physical fitness, but also as a structured environment for developing coping skills, self-efficacy, and social connectedness.

The review also highlights persistent systemic barriers, including insufficient material resources, uneven institutional commitment, and limited pedagogical preparation of instructors for addressing students' psycho-emotional needs. While international best practices illustrate the potential of digital technologies, adaptive programs, and interdisciplinary integration, their effectiveness depends on coherent implementation and alignment with institutional policies. Innovations introduced without pedagogical grounding or adequate instructor support may yield limited or uneven outcomes, particularly with regard to student mental well-being.

From a practical standpoint, the results underline the importance of positioning physical education within broader university well-being strategies. Institutions that integrate physical activity into comprehensive student support systems—rather than treating it as an isolated curricular requirement—are

better equipped to respond to mental health challenges in a sustainable manner. Such integration requires coordination across academic departments, student services, and administrative structures, as well as continuous professional development for physical education instructors.

7.1 Future directions

Future research should move beyond descriptive analyses of physical education models and focus on empirically examining the causal relationships between pedagogical approaches in physical education and specific indicators of student mental well-being. Longitudinal and mixed-methods studies are particularly needed to assess how sustained participation in different instructional formats influences stress levels, emotional resilience, academic engagement, and overall quality of life among university students.

Further investigation is also required into the contextual factors that shape the effectiveness of physical education initiatives, including institutional culture, resource availability, and socio-cultural differences across higher education systems. Comparative studies across regions and institutional types would contribute to a more nuanced understanding of how best practices can be adapted rather than directly transferred.

Another promising direction involves examining the professional competencies of physical education instructors in relation to mental health promotion. Research focused on pedagogical training, psychological literacy, and reflective teaching practices could inform the development of targeted professional development programs that enhance instructors' capacity to support student well-being.

Finally, future studies should pay greater attention to issues of equity and inclusion, particularly regarding students with disabilities, chronic health conditions, or heightened vulnerability to stress. Understanding how adaptive and inclusive physical education models contribute to mental well-being can support the design of policies that ensure equal access to the benefits of physical activity for all students. Future research should also address the methodological limitations of current studies by incorporating longitudinal designs, multi-institutional samples, and standardized measures of student mental well-being.

In conclusion, advancing the role of physical education in promoting student mental well-being requires a shift from fragmented initiatives toward integrated, evidence-based educational strategies. When supported by coherent institutional policies and pedagogically informed practice, physical education can serve as a vital component of higher education systems aimed at fostering both academic success and sustainable student well-being.

Author contributions

NT: Conceptualization, Formal analysis, Funding acquisition, Methodology, Project administration, Supervision, Writing – original draft. AK: Conceptualization, Formal analysis, Methodology, Visualization, Writing – review & editing. AB:

Conceptualization, Data curation, Formal analysis, Software, Visualization, Writing – original draft. ZhamB: Investigation, Methodology, Resources, Validation, Writing – review & editing. ZP: Conceptualization, Resources, Software, Visualization, Writing – original draft. ZhanB: Data curation, Formal analysis, Resources, Software, Writing – original draft. A-KA: Data curation, Investigation, Methodology, Writing – original draft. NA: Data curation, Investigation, Methodology, Validation, Writing – review & editing. SY: Conceptualization, Data curation, Validation, Visualization, Writing – review & editing. ZK: Investigation, Methodology, Visualization, Writing – original draft. AS: Conceptualization, Data curation, Formal analysis, Writing – original draft.

Funding

The author(s) declared that financial support was not received for this work and/or its publication.

Acknowledgments

The authors express their gratitude to colleagues who provided valuable comments on earlier versions of the manuscript.

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