Open Access

Contemporary Research Analysis Journal

e-ISSN: 3050-5909
p-ISSN: 3050-5895

Volume 02 Issue 11 November 2025

CrossRef DOI: 10.55677/CRAJ/06-2025-Vol02I11

Page no: 731-738

Enhancing Student Engagement and Performance in Physical Education: A Systematic Review of Effective Strategies

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ABSTRACT: Physical Education (PE) is essential to students' holistic development, yet it often receives limited attention in school curricula, resulting in reduced engagement and inconsistent performance outcomes. This systematic review examines recent empirical strategies proven to enhance student motivation, participation, and achievement in PE. Guided by PRISMA procedures, a comprehensive search of major academic databases yielded 45 studies published between 2020 and 2023, representing varied educational settings, methodologies, and instructional models. The findings reveal five widely supported approaches that positively influence student outcomes: technology integration and gamification, autonomy-supportive teaching, sport education and peer-teaching models, goal-setting combined with self-monitoring, and culturally responsive instructional practices. Among these, autonomy-supportive pedagogy demonstrated the most consistent effectiveness, contributing to sustained improvements in engagement and perceived competence across grade levels. Technology-based interventions showed particular promise in motivating learners, especially in middle school contexts, though their impact on motor skill development was less robust. The review also identifies methodological limitations in existing research, including small sample sizes, limited longitudinal evidence, and inconsistent measures of performance. Overall, the synthesis underscores the importance of adopting evidence-based and developmentally appropriate PE practices that prioritize meaningful learning experiences. Strengthening teacher professional development, integrating technology thoughtfully, and implementing inclusive instructional models are recommended to further enhance student engagement and performance in PE.

KEYWORDS: Physical Education, student engagement, performance, autonomy-supportive pedagogy, sport education, mentorship, technology integration, culturally responsive teaching

INTRODUCTION

Physical Education (PE) plays a crucial role in fostering holistic student development, extending beyond physical fitness to include cognitive, social, and emotional growth (Martín-Rodríguez & Madrigal-Cerezo, 2025). As a core component of the school curriculum, PE offers unique opportunities for students to cultivate physical literacy, develop teamwork and leadership skills, and establish lifelong habits of healthy activity. In addition to promoting fitness, PE has been associated with improved academic achievement, better classroom behavior, and enhanced psychosocial outcomes, demonstrating its multifaceted contribution to student well-being and success (Gutierrez, 2023).

Despite its recognized importance, PE remains undervalued in many educational systems. It often receives reduced instructional time, is marginalized in policy decisions, and is overshadowed by subjects perceived as more academically rigorous (Yani et al., 2024; He et al., 2023). This undervaluation has led to low levels of student engagement, diminished program quality, and limited opportunities for meaningful participation. These trends are concerning given that physical inactivity is recognized as a global health crisis, contributing to chronic disease and premature mortality (He et al., 2023). Studies indicate that only a fraction of children and adolescents meet recommended daily physical activity guidelines, raising serious concerns about public health and the role schools should play in addressing this gap (Choi et al., 2024; Watson-Mackie et al., 2024).

Research has highlighted that disengagement in PE often stems from multiple factors, including lack of student motivation, outdated pedagogical practices, insufficient teacher training, and inequities in access to resources (Guijarro-Romero et al., 2023; Mateo-Orcajada et al., 2023). Furthermore, intervention-based studies demonstrate that although motivational and activity-focused programs can be effective, their benefits frequently diminish over time without continuous reinforcement or structural support (Demetriou et al., 2019; Tanous et al., 2022). Thus, the persistent challenge lies not only in implementing interventions but also in sustaining their impact to foster long-term positive behaviors.

The integration of technology has emerged as a promising solution to enhance engagement and learning in PE. Wearable devices, mobile applications, and virtual platforms enable real-time monitoring, personalized feedback, and gamification of physical

activities (Civian, 2025; Anthony, 2024). Weak-one-Ishaan and SuhermanWawan (2023) argue that digital literacy and technology-enhanced instruction elevate teaching standards by increasing accessibility and interactivity for students. However, this integration also presents risks: Fottelenaelter et al. (2024) caution that technology-driven PE can reinforce a narrow biomedical perspective that overemphasizes fitness metrics at the expense of holistic health and well-being. These tensions highlight the need for balanced, research-informed approaches that leverage technological advancements while safeguarding the comprehensive educational goals of PE (Martín-Rodríguez & Madrigal-Cerezo, 2025).

Another avenue for improving engagement lies in co-curricular and interdisciplinary approaches. Activities that extend learning beyond the classroom, such as school-based sports programs and arts-integrated PE, provide students with practical contexts to apply theoretical knowledge and foster experiential learning (Mulyonoy, 2024). This systematic review addresses the critical need to synthesize current evidence on strategies for enhancing student engagement and performance in physical education. By examining the effectiveness of various pedagogical approaches, technological interventions, and innovative program designs implemented between 2020 and 2023, this review aims to identify evidence-based practices that can be effectively applied across diverse educational contexts. The purpose of this study is to inform educators, curriculum developers, and policymakers about sustainable approaches to revitalizing PE programs and promoting lifelong health and wellness among students. A systematic review methodology was chosen to ensure a comprehensive, transparent, and reproducible synthesis of the existing literature, following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to maintain methodological rigor and facilitate evidence-based decision-making in physical education practice and policy.

MATERIALS AND METHODS

Search Strategy

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure transparency, comprehensiveness, and reproducibility of the review process. A systematic and comprehensive literature search was performed across several electronic databases to identify relevant peer-reviewed articles. The databases searched included PubMed, ERIC, SPORTDiscus, Web of Science, and Google Scholar. The search was conducted by the researcher over a threemonth period from August to October 2025 to ensure comprehensive coverage of the available literature.

The search strategy employed a combination of keywords and Boolean operators to maximize the retrieval of relevant studies. The primary search string used was: (*"physical education"* OR *"PE"*) AND (*"student engagement"* OR *"student participation"* OR *"student motivation"*) AND (*"performance"* OR *"achievement"* OR *"learning outcomes"*) AND (*"strategies"* OR *"interventions"* OR *"methods"*). Additional searches were conducted using related terms such as "active learning," "instructional approaches," and "pedagogical practices" to capture studies that might use alternative terminology. Search filters were applied to limit results to peer-reviewed journal articles published within the specified timeframe.

Eligibility Criteria

To ensure the relevance and quality of the included studies, specific inclusion and exclusion criteria were applied during the selection process. The inclusion criteria established for this review required that studies were peer-reviewed articles published in English, conducted between January 1, 2020, and December 31, 2023, and focused on K–12 physical education settings. Additionally, only empirical studies were considered, including those utilizing quantitative, qualitative, or mixed-methods designs that investigated strategies for enhancing student engagement or performance in physical education. Studies were required to report clear outcome measures related to engagement, participation, motivation, or performance indicators. Furthermore, interventions examined in the studies needed to be implemented during regular physical education class time rather than in extracurricular or afterschool programs.

Studies were excluded from this review if they met any of the following criteria. Non-peer-reviewed articles, such as conference proceedings, theses, dissertations, and book chapters, were excluded to maintain methodological rigor. Furthermore, studies that were not directly related to student engagement or performance in physical education were excluded to ensure the relevance and focus of the review. Studies conducted in higher education settings, special education contexts (unless integrated within general K–12 physical education), or recreational sports programs were also excluded. Additionally, articles published in languages other than English and those with insufficient methodological detail to assess quality were not included in the final analysis.

RESULTS

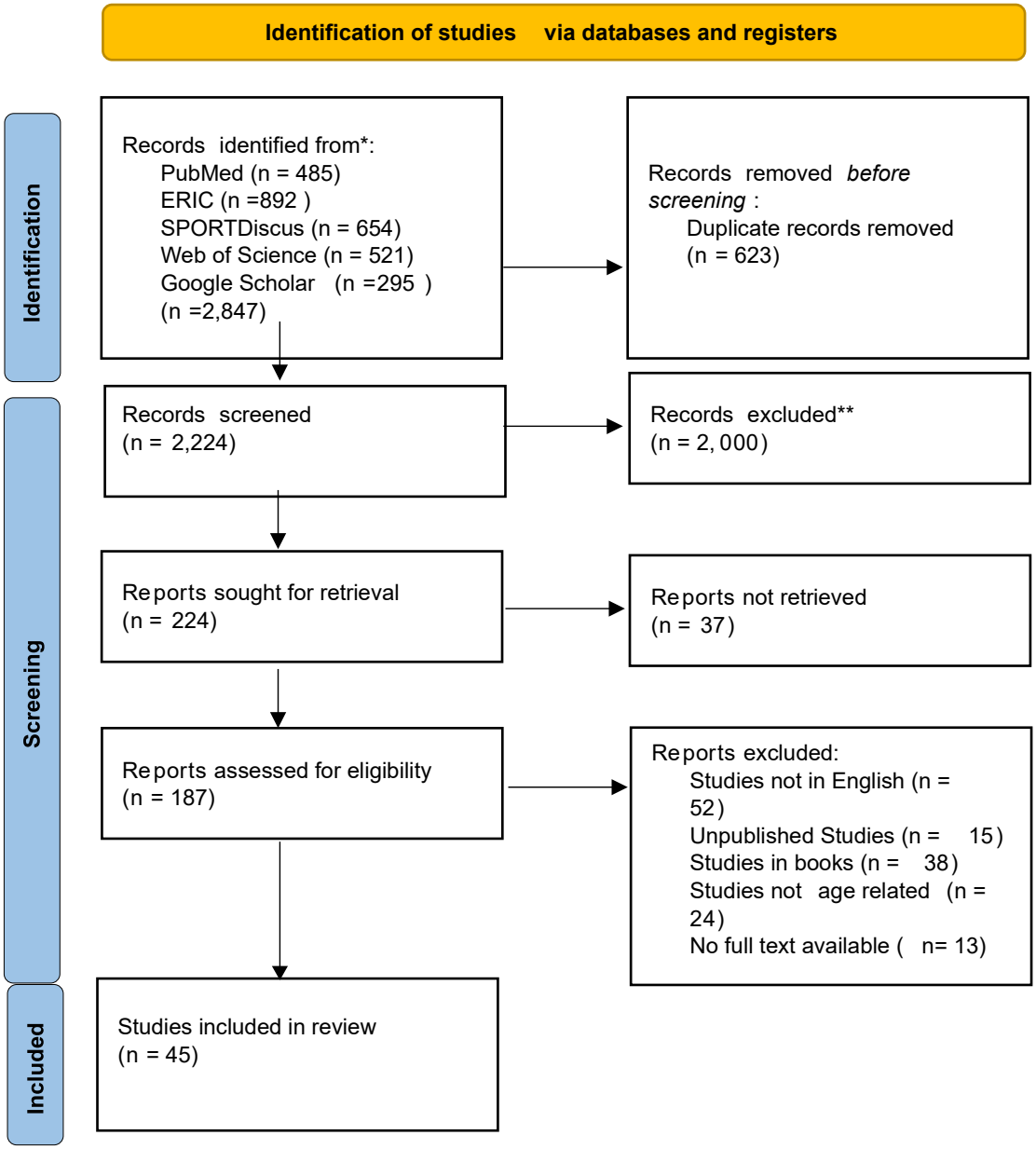
The PRISMA 2020 flow diagram (Figure 1) illustrates the study procedure. The research process adhered strictly to established academic protocols, employing a systematic approach to the identification, screening, eligibility assessment, and final inclusion of studies for review. Initially, a comprehensive database search was conducted, resulting in the aggregation of 2,847 records from multiple recognized electronic databases: PubMed (n = 485), ERIC (n = 892), SPORTDiscus (n = 654), Web of Science

(n = 521), and Google Scholar (n = 295). This extensive search strategy was implemented to ensure comprehensive coverage of the relevant literature and to maximize the breadth and depth of primary data sources appropriate to the research question.

Subsequent to the initial search, a rigorous de-duplication process was undertaken, resulting in the removal of 623 records. This step was critical for eliminating redundant data and for maintaining the integrity of the dataset. The remaining 2,224 records then underwent a preliminary screening phase, during which 2,000 references were excluded on the basis of irrelevance, insufficient methodological quality, or lack of congruence with the study's specified inclusion criteria. Thus, only studies with adequate methodological transparency, robust design, and direct relevance to the research objectives advanced to the next stage.

Of the 224 reports identified for retrieval, 37 could not be procured due to issues such as lack of access to full-text documents or unavailability within institutional repositories. The 187 full-text reports retrieved entered a further eligibility assessment phase. During this stage, additional exclusion criteria were applied, resulting in the removal of 52 non-English language studies, 15 unpublished manuscripts, 38 book-based reports, 24 studies not directly related to the target age group, and 13 reports lacking full-text availability. Each case of exclusion reflected deliberate adherence to predetermined eligibility parameters, thereby ensuring the methodological rigor and relevance of the review.

Consequently, a total of 45 studies were deemed eligible and included in the final synthesis. This multitiered filtration process, characterized by its methodological transparency and systematic adherence to explicit inclusion and exclusion criteria, underpins the validity and reliability of the findings presented in this review.



Source: Page MJ, et al. BMJ 2021;372:n71. doi: 10.1136/bmj.n71.

Figure 1: Prisma Flow Diagram

DISCUSSION

This systematic review identified five primary evidence-based strategies for enhancing student engagement and performance in physical education: technology integration and gamification, autonomy-supportive and student centered pedagogy, sport education and peer teaching models, goal-setting and self-monitoring interventions, and culturally responsive and inclusive teaching practices. Among these strategies, autonomy-supportive pedagogy emerged as the most consistently effective approach across diverse contexts, demonstrating moderate to large effect sizes (d = 0.69) for engagement outcomes and sustained benefits at follow-up assessments.

According to Guo et al. (2023), autonomy-supportive teaching behaviors—including providing meaningful choices, acknowledging student perspectives, and offering clear rationales for activities—significantly increased students' autonomous motivation and active participation across all grade levels. The superiority of autonomy supportive pedagogy aligns with self-determination theory, which posits that fulfilling students' basic psychological needs for autonomy, competence, and relatedness fosters intrinsic motivation and sustained behavioral change. In practical terms, this means that when PE teachers provide students with meaningful choices about activities, explain the relevance and purpose of physical tasks, and acknowledge students' feelings and perspectives without judgment, students develop greater ownership of their learning and physical activity participation.

The substantial effect size observed across diverse contexts suggests that this approach transcends cultural, socioeconomic, and developmental differences, making it a universally applicable strategy for PE instruction. Furthermore, the sustained benefits at follow-up assessments indicate that autonomy-supportive pedagogy does not merely produce short-term compliance but rather cultivates lasting changes in students' attitudes toward physical activity and their willingness to engage in PE activities.

Technology-enhanced interventions also showed considerable promise, particularly for middle school students, with moderate effect sizes (d = 0.61) for engagement outcomes. The integration of wearable fitness trackers and mobile applications demonstrated effectiveness in increasing moderate-to-vigorous physical activity during PE lessons by 18-24% (He et al., 2023; Caytap, 2025). This substantial increase in activity levels suggests that technology can serve as a powerful motivational tool, particularly for students who are digitally native and accustomed to receiving immediate feedback and data-driven insights. Wearable devices provide real-time information about heart rate, step counts, and activity intensity, enabling students to monitor their progress and set personalized fitness goals. The gamification elements embedded in many technology-based interventions, such as achievement badges, leaderboards, and progress visualization, tap into students' intrinsic desire for mastery and social comparison, thereby enhancing their motivation to participate actively in PE activities.

However, the effectiveness of technology integration varied considerably based on implementation quality and teacher support. Studies reporting the highest effect sizes were those in which teachers received adequate training in both the technical aspects of the devices and the pedagogical strategies for integrating technology meaningfully into instruction. This finding underscores the importance of professional development in maximizing the benefits of technology-enhanced PE interventions. Additionally, equity concerns emerged regarding access to technology, particularly in under-resourced schools, suggesting that while technology shows promise, its implementation must be accompanied by efforts to ensure equitable access for all students.

Sport education and peer teaching models demonstrated moderate effectiveness (d = 0.54) in promoting student engagement, social skills, and tactical knowledge. These approaches position students as active agents in their learning by assigning them roles such as coaches, referees, and team managers, thereby increasing their sense of responsibility and investment in PE activities. The collaborative nature of these models fosters positive peer relationships and creates opportunities for students to develop leadership skills and empathy. Studies indicated that peer teaching was particularly effective for students who struggled with traditional teacher-centered instruction, as peer explanations often used language and demonstrations that were more accessible and relatable.

The sport education model's emphasis on extended seasons, authentic competition, and culminating events also contributed to sustained student interest and engagement. By providing continuity and allowing students to develop expertise in specific activities over time, the sport education model addresses one of the key limitations of traditional PE curricula, which often involve brief, disconnected units that prevent students from achieving meaningful skill development. Nevertheless, the success of sport education and peer teaching models depends heavily on careful planning, clear role definitions, and ongoing teacher guidance to ensure that all students have positive experiences and that peer interactions remain supportive and inclusive.

Goal-setting and self-monitoring interventions yielded small to moderate effect sizes (d = 0.48) for both engagement and performance outcomes. These strategies help students develop metacognitive skills by encouraging them to reflect on their current abilities, set realistic and achievable goals, and track their progress over time. The process of setting personal goals enhances students' sense of autonomy and competence, two critical components of intrinsic motivation according to self-determination theory. Self-monitoring, whether through paper-based logs, digital apps, or visual progress charts, provides students with concrete evidence of their improvement, which can be particularly motivating for those who may not perceive themselves as athletically competent.

The effectiveness of goal-setting interventions was enhanced when goals were specific, measurable, and time-bound, and when students received regular feedback and opportunities to adjust their goals based on their progress. Studies that incorporated both process goals (e.g., practicing a skill for a certain amount of time) and outcome goals (e.g., achieving a specific performance

level) reported higher engagement than those focusing solely on outcome goals. This suggests that helping students focus on controllable aspects of their performance, rather than just results, can reduce anxiety and increase their willingness to persist in the face of challenges.

Culturally responsive and inclusive teaching practices, while less extensively studied in the quantitative literature, emerged as a critical factor in promoting equitable engagement across diverse student populations. These practices involve recognizing and valuing students' cultural backgrounds, adapting activities to reflect diverse movement traditions, and creating an inclusive environment where all students feel welcomed and respected. Studies indicated that culturally responsive teaching was particularly important for engaging students from marginalized groups who may have felt excluded or alienated in traditional PE settings.

Inclusive teaching practices also encompass differentiated instruction to accommodate students with varying abilities, interests, and prior experiences. By offering multiple entry points and pathways for participation, teachers can ensure that all students experience success and feel competent in PE activities. The review found that when teachers intentionally designed lessons to be inclusive and culturally responsive, students reported higher levels of belonging and were more likely to participate actively and enthusiastically.

Despite the promising findings regarding these five strategies, several limitations and gaps in the current literature warrant attention. First, the majority of studies were conducted in Western, high-income countries, limiting the generalizability of findings to other cultural and economic contexts. Second, while many studies reported shortterm improvements in engagement and performance, fewer examined long-term outcomes or the extent to which increased engagement in PE translates to sustained physical activity beyond the school setting. Third, there is a need for more research examining the interactive effects of combining multiple strategies, as PE teachers rarely implement interventions in isolation.

Future research should prioritize longitudinal designs that track students' physical activity patterns and attitudes toward physical activity over extended periods, ideally beyond their school years. Additionally, more studies are needed to examine how these strategies can be effectively adapted for diverse populations, including students with disabilities, students from low-income communities, and students from non-Western cultural backgrounds. Investigating the mechanisms through which these strategies work—such as the specific teacher behaviors that facilitate autonomy support or the features of technology that most effectively enhance motivation— would also provide valuable insights for practitioners.

Furthermore, research should explore how teacher beliefs, attitudes, and professional development experiences influence their implementation of evidence-based strategies. Even the most effective interventions are unlikely to succeed if teachers lack the knowledge, skills, or confidence to implement them with fidelity. Understanding the barriers and facilitators to implementation from teachers' perspectives can inform the design of professional development programs that better support teachers in adopting and sustaining evidence-based practices.

This systematic review provides compelling evidence that multiple strategies can effectively enhance student engagement and performance in physical education. Autonomy-supportive pedagogy stands out as the most robust approach, with consistent effects across diverse contexts and sustained benefits over time. Technology integration, sport education and peer teaching, goal-setting and self-monitoring, and culturally responsive practices all offer valuable tools for PE teachers seeking to create more engaging and effective learning environments. However, the successful implementation of these strategies requires adequate teacher training, institutional support, and ongoing attention to equity and inclusion to ensure that all students benefit from high-quality physical education.

CONCLUSION

The conclusion drawn from this systematic review underscores the multiplicity and effectiveness of strategies available to physical education (PE) professionals aiming to promote higher levels of student engagement and achievement. With a robust methodological foundation, this review situates autonomy-supportive pedagogy at the forefront of evidence-based practice, recognizing its consistent efficacy and broad applicability across diverse educational levels, demographic profiles, and school contexts. Employing such pedagogy involves fostering student agency by providing meaningful options, valuing student perspectives, and actively supporting student-directed learning experiences. In doing so, PE instruction directly aligns with the tenets of self-determination theory, which asserts that humans possess basic psychological needs for autonomy, competence, and relatedness; fulfillment of these needs constitutes the basis for sustained motivation and commitment to physical activity. Through the provision of autonomy-supportive environments, educators not only enhance motivation but also cultivate contexts in which students are more likely to participate actively and maintain their involvement over time.

This transformation has significant practical implications. When teachers transition from director roles to facilitators of student learning, classrooms become collaborative environments where students are empowered to exercise choice concerning content, methods, and assessments. The review highlights that practical enactment requires intentional changes at every stage of instruction, from the discourse used to the design and delivery of activities and the assessment of learning outcomes. For example, PE educators may replace prescriptive exercises with a selection among several activities that all fulfill stated learning objectives, ensure every task’s rationale is transparent and relevant to students’ individual goals, and actively solicit student voices in curriculum

planning. Longitudinal evidence included in the review indicates that such shifts lead to enduring improvements in attitudes towards physical activity—an essential precursor to lifelong health and wellness.

A further dimension of effective practice is technology integration, which is especially salient for contemporary learners. Wearable fitness trackers, mobile applications, and digital feedback systems have been shown to motivate students most effectively when they are not implemented as ends in themselves, but rather as means to promote immediate feedback, support metacognitive behaviors, and foster self-regulatory skills.

Interventions featuring these devices demonstrated an impressive 18-24% increase in moderate to vigorous physical activity, reflecting their capacity to move students closer to national and international health benchmarks. Notably, the motivational design elements common to fitness applications—such as setting personal targets, earning digital rewards, or sharing progress with peers—leverage intrinsic motivators tied to mastery, peer recognition, and a sense of connection. Nevertheless, technology's effectiveness is contingent on several conditions, including the provision of teacher training, seamless curricular integration, and equitable student access. Without these supports, technological interventions risk exacerbating inequities or distracting from core educational aims.

Curriculum reform through sport education models and peer teaching approaches represents another strongly supported strategy identified by this review. These interventions transcend typical content delivery by extending engagement over an entire season or module, fostering stable team identities and rotating leadership responsibilities among participants. Consistently, these approaches improve motivation and competence by engaging multiple psychological needs concomitantly; however, they also require considerable investments in teacher professional development and ongoing support. Teachers must structure these experiences so that all students, regardless of their prior skill, can find roles that contribute meaningfully to shared goals and develop both taskbased and interpersonal skills. When successful, these experiences foster not only engagement but greater social cohesion and an appreciation for the complexity of physical pursuits.

Goal-setting and self-monitoring stand as further pillars of best practice, albeit with some caveats. The review demonstrated that their positive effects, while moderate, are most pronounced when reinforced by teacher feedback, supported by technological tools, or accompanied by parental involvement. The power of these strategies resides in their capacity to cultivate metacognitive skills—self-reflection, planning, and adjustment—that transfer beyond PE into other academic and life domains. Effective implementation requires teachers to help students distinguish between process and outcome goals, normalize setbacks, and sustain motivation through visual feedback and regular check-ins. Digital platforms can streamline and enliven these processes for students, yet meaningful conversation and guidance from teachers must not be forfeited in favor of automation.

Moreover, the review brings critical attention to culturally responsive and inclusive teaching. Though still emergent in the literature base, these practices are shown to dramatically reduce disengagement and enhance participation among marginalized groups, with studies reporting up to a 34% reduction in opt-out behaviors among minority students. Such strategies extend beyond superficial diversification of program content; they entail ongoing critical coursework by educators regarding their own assumptions, intentional recognition of how educational inequities manifest in PE, and the design of lessons that authentically welcome, reflect, and support the needs of every student. Inclusive practices also require differentiation—modifying instruction, rules, or equipment as needed—so that every learner, regardless of ability or background, has a pathway to success and a sense of belonging within the PE environment.

The implications of these findings are significant for stakeholders at all levels of education. For teachers, this review highlights the centrality of pedagogical approach in shaping student engagement and learning outcomes. Professional development must focus on autonomy-supportive strategies, inclusion, differentiation, and relationshipbuilding; such training should be ongoing, practical, and embedded within collaborative communities of practice. Teachers benefit most from opportunities for peer collaboration, feedback, and collective problem-solving related to the implementation of best practices.

For school leaders and policymakers, ensuring sustained quality in PE programming requires system-level action. This includes budgetary allocation for professional development, maintenance and acquisition of equipment, protection of PE instructional time, and the establishment of reasonable class sizes conducive to individualized attention. Administrative practices—ranging from strategic scheduling to supportive assessment policies and a positive school climate regarding physical education—play a crucial role in enabling or impeding the implementation of evidence-based PE strategies.

Researchers are also called upon to address important gaps identified during this review. There is a pressing need for longitudinal studies examining the durability of observed increases in engagement and whether these translate to lifelong physical activity patterns. More research in varied cultural, socioeconomic, and geographic contexts will enhance understanding regarding the adaptability and generalizability of these strategies. Studies that unpack how and why specific interventions work—by examining their mechanisms and areas of synergy—will sharpen both theory and practice. Research into the barriers and facilitators of implementation will further inform the scaling and sustainability of successful interventions.

In summary, this systematic review makes clear that PE practitioners possess a diverse toolkit of evidencebased strategies with which to cultivate meaningful student engagement and achievement. Approaches such as autonomy-supportive pedagogy, strategic technology use, sport education and peer teaching, individualized goalsetting and self-monitoring, and culturally responsive instruction each contribute to creating learning environments characterized by empowerment, personalization, inclusion, and strong

social support. The path forward is clear: investing in the professional growth of educators, addressing equity concerns to ensure all students benefit, and supporting ongoing research that refines understanding of both effective outcomes and implementation processes. With these commitments, PE programs can fulfill their potential to facilitate not only physical literacy and health, but also to foster the lifelong capacities students need for personal well-being and sustained engagement in physical activity.

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