Physical literacy development through interdisciplinary approaches in educational contexts: A critical review of theory, research, and practice

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Abstract

This article examines the multidimensional construct of physical literacy through an interdisciplinary lens, synthesizing research across educational, psychological, sociological, and physiological domains. The review critically analyzes how physical literacy frameworks have evolved from siloed disciplinary approaches toward more integrated educational models that recognize movement competence as fundamental to holistic human development. Drawing on empirical evidence from longitudinal studies, intervention research, and theoretical scholarship, this article illuminates the pedagogical implications of adopting comprehensive physical literacy approaches within educational settings. The analysis reveals how physically literate individuals develop not only movement competence but also cognitive capabilities, psychological resilience, and social competencies that extend beyond traditional physical education paradigms. The findings emphasize the need for educational policies and practices that position physical literacy as central to educational missions rather than peripheral to academic priorities. This interdisciplinary perspective offers valuable insights for researchers, practitioners, and policymakers seeking to reconceptualize physical education within contemporary educational contexts.

Questo articolo esamina il costrutto multidimensionale della *physical literacy* attraverso una lente interdisciplinare. La revisione analizza criticamente l'evoluzione dei quadri teorici della *physical literacy*, che hanno superato approcci disciplinari isolati per convergere verso modelli educativi più integrati, in cui la competenza motoria è riconosciuta come elemento fondamentale per lo sviluppo umano. L'analisi di evidenze empiriche e contributi teorici mette in luce le implicazioni pedagogiche dell'adozione di un approccio olistico alla *physical literacy* nei contesti educativi. L'analisi rivela come gli individui fisicamente alfabetizzati sviluppino competenze motorie e capacità cognitive, resilienza psicologica e competenze sociali che trascendono i paradigmi tradizionali dell'educazione fisica. I risultati sottolineano la necessità di politiche e pratiche educative che collochino la *physical literacy* al centro delle missioni educative, anziché relegarla a un ruolo marginale rispetto alle priorità accademiche. Questa prospettiva interdisciplinare fornisce spunti di riflessione a chi è impegnato nella riconcettualizzazione dell'educazione fisica nei contesti educativi contemporanei.

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Keywords: physical literacy; interdisciplinary pedagogy; embodied cognition; educational theory; movement competence

Parole chiave: *physical literacy*; pedagogia interdisciplinare; *embodied cognition*; teoria dell'educazione; competenza motoria

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1. Introduction

Contemporary educational discourse increasingly acknowledges the fundamental role of physical activity in human development, yet physical education continues to occupy a precarious position within educational systems worldwide (Kirk, 2020; Lynch & Soukup, 2016). This paradoxical situation—where physical education's importance is rhetorically affirmed while simultaneously marginalized in practice—reveals deeper epistemological tensions regarding how educational institutions conceptualize knowledge, learning, and development (Ennis, 2015; Quennerstedt, 2019). The concept of physical literacy has emerged as a potentially transformative framework that challenges traditional educational hierarchies by positioning embodied knowledge and movement competence as essential components of human learning (Whitehead, 2010, 2019). The rapid proliferation of research on this topic, as evidenced by recent bibliometric analyses charting its exponential growth in scholarly output, underscores its increasing importance while also highlighting the persistent challenges related to conceptual consensus and practical application (Qian et al., 2025).

Physical literacy, understood as "the motivation, confidence, physical competence, knowledge, and understanding to value and take responsibility for engagement in physical activities for life" (Whitehead, 2019, p. 8), represents a significant paradigmatic shift in how educational institutions might approach physical education. Rather than viewing physical education narrowly as skill acquisition or fitness development, physical literacy positions embodied experience as fundamental to cognitive, social, emotional, and physical development (Dudley et al., 2017; Robinson et al., 2015). This conceptual framework necessitates interdisciplinary approaches that transcend traditional disciplinary boundaries between educational psychology, motor development, sociology, and pedagogical theory.

This article examines how contemporary research across multiple disciplines has contributed to evolving understandings of physical literacy as an educational construct. It critically analyzes the theoretical foundations, empirical evidence, and pedagogical implications of adopting interdisciplinary approaches to physical literacy development in educational contexts. By synthesizing diverse research traditions, this review aims to illuminate how physically literate individuals develop not merely movement competence but holistic capabilities that support lifelong learning and wellbeing (Cairney et al., 2019; Dudley, 2015).

The review addresses three primary questions: (1) How have theoretical conceptualizations of physical literacy evolved across disciplines? (2) What empirical evidence supports the relationship between physical literacy development and broader educational outcomes? (3) What pedagogical approaches effectively foster physical literacy development within educational contexts? Through this analysis, the article contributes to ongoing scholarly conversations about reconfiguring educational priorities to recognize embodied knowledge as central rather than peripheral to human development and learning.

2. Methods and design

This critical review adopts a narrative synthesis approach, a methodology designed to systematically integrate and interpret findings from multiple and often heterogeneous sources when statistical meta-analysis is not feasible or appropriate (Lisy & Porritt, 2016; Popay et al., 2006). This approach is particularly suited to exploring complex, multidimensional constructs like physical literacy, as it enables the integration of theoretical scholarship, empirical research, and pedagogical practices across educational, psychological, sociological, and physiological domains. The design therefore employs a systematic yet interpretive methodology, aligning with established guidance on conducting narrative syntheses to produce a coherent and trustworthy analysis (Popay et al., 2006). Relevant literature was identified using keywords such as 'physical literacy,' 'interdisciplinary pedagogy,'

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'embodied cognition,' 'educational theory,' and 'movement competence,' searched across databases including PubMed, ERIC, PsycINFO, and Scopus. Sources were selected for their contributions to understanding physical literacy's evolution, its impact on educational outcomes, and its practical applications, emphasizing an interdisciplinary perspective to inform educational policy and practice. The entire review process, from literature search to synthesis, was conducted by the author to ensure conceptual coherence and consistency. The selection followed a multi-stage process. The initial search across the specified databases yielded over 1,500 potentially relevant records. Titles and abstracts were then screened for relevance, which resulted in a selection of approximately 350 articles for full-text review. The final corpus of sources cited in this manuscript was selected based on a full-text analysis, with inclusion criteria prioritising seminal theoretical papers, systematic reviews, meta-analyses, and high-impact empirical studies that directly addressed the review's research questions. While foundational texts were included regardless of their publication date, the review placed a strong emphasis on literature published in the last 15 years to ensure the synthesis reflects the contemporary state of the field.

3. Theoretical foundations: The evolution of physical literacy conceptualizations

3.1 Philosophical underpinnings and conceptual development

The concept of physical literacy has deep philosophical roots in phenomenology, existentialism, and monist perspectives that reject Cartesian dualism and recognize the embodied nature of human existence (Whitehead, 2010). Margaret Whitehead's seminal work established physical literacy as a multidimensional construct grounded in phenomenological understanding of embodiment, drawing particularly on Merleau-Ponty's (2011) notion that perception and knowledge are fundamentally grounded in bodily experience. While this foundation remains crucial, the concept's growing popularity has led to its evolution and, at times, dilution. An evolutionary concept analysis by Young, O'Connor, and Alfrey (2020) demonstrates how physical literacy has splintered into various interpretations, often moving up a "ladder of abstraction" away from its rich philosophical roots. Furthermore, a scoping review by Martins et al. (2021) highlights significant international divergences in definitions across different cultural and linguistic contexts. In response to this fragmentation, recent international efforts are now aimed at building a shared global agenda, exemplified by the initiative to develop a Global Physical Literacy (GloPL) Action Framework (Carl et al., 2024). Alongside this macro-level evolution, the conceptual foundation has been enriched by recent studies integrating psychological dimensions, such as resilience (Zhu et al., 2025) and motivation (Choi et al., 2024). Recent theoretical work has also further expanded physical literacy conceptualizations through integration with embodied cognition perspectives. Embodied cognition theory posits that cognitive processes are deeply rooted in the body's interactions with the world (Clark, 2008; Shapiro, 2019), a view supported by Jiang et al. (2024), who link physical literacy to cardiorespiratory fitness, suggesting physiological underpinnings to cognitive development.

As Latino and Tafuri (2024) argue, this theoretical perspective provides critical insight into how movement experiences contribute to cognitive development, suggesting that physical literacy may enhance learning across domains through embodied cognitive mechanisms. This integration of embodied cognition with physical literacy frameworks represents a significant theoretical advancement that positions movement as fundamental to, rather than separate from, cognitive development (Light & Kentel, 2013). Furthermore, to genuinely operationalise this monist perspective within educational settings, it is imperative to transcend the traditional "observer-centric stance" that historically dominates empirical motor learning. As elucidated by Cereda (2024, pp. 126-127), abandoning mind-body dualism necessitates prioritising the learner's subjective, lived experience of movement. This phenomenological shift allows physical activity to be apprehended not merely as a functional output

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or a health-driven imperative, but as a profound process of intrinsic meaning-making and embodied self-awareness.

3.2 Interdisciplinary convergence in physical literacy theory

The theoretical evolution of physical literacy has been characterized by increasing interdisciplinary convergence, drawing together previously disparate research traditions. Neuroscientific research on brain development and motor learning has contributed substantial evidence regarding the neurophysiological mechanisms underlying movement competence and its relationship to cognitive function (Diamond & Ling, 2019; Tomporowski et al., 2015). Simultaneously, sociological perspectives have illuminated how sociocultural contexts shape physical activity engagement and movement competence development across diverse populations (Azzarito, 2016; Light & Georgakis, 2023).

This interdisciplinary convergence has produced more nuanced theoretical frameworks that recognize physical literacy development as occurring within complex ecological systems. Ecological dynamics theory, for instance, conceptualizes physical literacy as emerging through dynamic interactions between individuals and their environmental contexts (Button et al., 2020; Rudd et al., 2020). This perspective has been powerfully articulated by O'Sullivan et al. (2020), who argue that an ecological dynamics framework offers a persuasive theoretical grounding for physical literacy, reframing it away from a collection of acquired attributes and toward a focus on the functional, adaptive relationship between an individual and their environment. Similarly, Cairney et al. (2019) proposed an ecological model of physical literacy that explicitly recognizes how individual, social, institutional, and policy factors interact to shape physical literacy development across the lifespan.

The theoretical landscape has further evolved through integration with broader educational theories. Quennerstedt (2019) has drawn connections between physical literacy and John Dewey's pragmatist educational philosophy, highlighting how both frameworks emphasize learning through embodied experience and meaningful engagement with the environment. Similarly, Standal (2015) has connected physical literacy with critical pedagogy traditions, arguing that physical literacy development must attend to issues of social justice, inclusion, and democratic participation.

This theoretical convergence across disciplines reflects growing recognition that physical literacy represents not merely a physical education concept but a fundamental aspect of human development with implications across educational domains. As Dudley (2015) argues, physical literacy provides a conceptual bridge between traditionally siloed disciplines, offering a framework for understanding how embodied experience contributes to cognitive, social, emotional, and physical development in integrated ways.

4. Empirical evidence: Physical literacy and educational outcomes

4.1 Cognitive domains and academic achievement

A growing body of empirical research demonstrates significant relationships between physical literacy development and cognitive function, a link now robustly confirmed by a systematic review and meta-analysis showing that physical literacy interventions yield significant positive effects across physical, affective, and cognitive domains (Carl et al., 2022). Longitudinal studies have found positive associations between fundamental movement skill proficiency—a key component of physical literacy—and cognitive outcomes including executive function, working memory, and attention (Davis et al., 2011; Hillman et al., 2014). Recent intervention studies bolster these findings, with Urbano-Mairena et al. (2025) reporting that a 7-week active breaks program enhanced physical literacy and cognitive performance in schoolchildren aged 8-12, while Jerebine et al. (2024)

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found strong evidence of physical domain improvements in holistic school-based interventions, suggesting broader cognitive benefits. These findings align with meta-analytic evidence indicating that physical activity interventions produce small to moderate positive effects on cognitive function and academic achievement (Álvarez-Bueno et al., 2017; Singh et al., 2019), and are further supported by Jiang et al. (2024), who identify a significant correlation (COR = 0.64) between physical literacy and cardiorespiratory fitness, a known enhancer of cognitive capacity.

The relationship between physical literacy and academic achievement appears to be mediated through multiple pathways. Neurophysiological research suggests that physical activity promotes structural and functional changes in brain regions associated with learning and memory (Chaddock-Heyman et al., 2014; Donnelly et al., 2016). Concurrently, psychological research indicates that physical competence contributes to self-efficacy, motivation, and engagement, which subsequently support academic performance (Bailey, 2017; Meyer & Turner, 2006). These complementary mechanisms suggest that physical literacy development may enhance learning across academic domains through both direct neurophysiological pathways and indirect psychosocial mechanisms.

Intervention studies implementing comprehensive physical literacy approaches within educational settings have demonstrated promising effects on both movement competence and academic outcomes. For example, Telford et al. (2012) found that a two-year specialist-led physical education program significantly improved both arithmetic and numeracy scores compared to control conditions. Similarly, Mullender-Wijnsma et al. (2016) demonstrated that physically active academic lessons improved mathematics and reading performance over a two-year period. These intervention studies suggest that integrating physical literacy development with academic content may enhance learning across domains.

4.2 Psychosocial development and wellbeing

Physical literacy development appears particularly consequential for psychosocial outcomes and wellbeing. Systematic reviews have consistently found positive associations between physical activity participation and psychological wellbeing, including reduced symptoms of anxiety and depression and enhanced positive affect (Lubans et al., 2016; Rodriguez-Ayllon et al., 2019). Recent cross-sectional studies reinforce this, with Pastor-Cisneros et al. (2025) reporting an inverse relationship between perceived physical literacy and symptoms of depression, anxiety, and stress in Spanish adolescents, and Leung et al. (2025) identifying positive correlations with resilience and life satisfaction among tertiary students. These benefits appear particularly pronounced when physical activity occurs in supportive social environments that foster autonomy, competence, and relatedness—key psychological needs identified in self-determination theory (Deci & Ryan, 2000; Ntoumanis et al., 2020), a dynamic further evidenced by Choi et al. (2024), who highlight motivation as a mediator in physical activity gains from sport education models.

The relationship between physical literacy and psychosocial development extends beyond general wellbeing to include specific social and emotional competencies. Longitudinal research by Barnett et al. (2015) found that childhood motor competence predicted adolescent self-perception and social engagement, suggesting that early physical literacy development may establish trajectories for positive psychosocial development. Similarly, Harter's (2012) extensive research on self-concept development indicates that physical competence represents a critical domain of self-evaluation that influences global self-worth throughout development.

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Intervention research provides further evidence regarding physical literacy's contribution to psychosocial development. Programs emphasizing mastery-oriented learning environments and fundamental movement skill development have demonstrated positive effects on perceived competence, autonomous motivation, and physical activity enjoyment (Cairney et al., 2018; Morgan et al., 2013). These findings align with theoretical frameworks suggesting that physical literacy development creates a positive spiral of engagement wherein competence begets confidence, leading to increased motivation and continued participation (Stodden et al., 2008; Whitehead, 2010).

4.3 Health trajectories and lifelong physical activity

Perhaps the most extensively documented relationships exist between physical literacy components and long-term health outcomes. Longitudinal research consistently demonstrates that childhood movement competence predicts adolescent and adult physical activity participation (Barnett et al., 2008; Lima et al., 2017). These findings are particularly significant given substantial evidence linking physical activity with reduced risk for numerous chronic diseases, including cardiovascular disease, type 2 diabetes, and certain cancers (Lee et al., 2012; Warburton & Bredin, 2017).

The mechanisms linking early physical literacy development to lifelong health trajectories appear multifaceted. From a skill development perspective, early movement competence provides the fundamental movement patterns necessary for participation in diverse physical activities across the lifespan (Gallahue et al., 2012; Stodden et al., 2008). Concurrently, early positive experiences with physical activity contribute to intrinsic motivation and physical activity identity formation, which support sustained engagement (Green, 2014; Harter, 2012). These complementary mechanisms suggest that comprehensive physical literacy development in childhood establishes both the physical capabilities and psychological dispositions necessary for lifelong physical activity.

Intervention research further supports these relationships, demonstrating that programs targeting fundamental movement skills, physical activity motivation, and physical activity knowledge can produce meaningful changes in physical activity behavior (Cohen et al., 2015; Morgan et al., 2013). Perhaps most promising are interventions adopting comprehensive physical literacy approaches that address movement competence, confidence, motivation, and knowledge simultaneously (Cairney et al., 2018; Dudley et al., 2017). These multidimensional interventions appear more effective than narrower approaches focusing exclusively on fitness or sports skills.

5. Pedagogical approaches: Fostering physical literacy in educational contexts

5.1 Curriculum design and implementation

The empirical evidence regarding physical literacy development has significant implications for curriculum design and implementation. Traditional physical education curricula have often emphasized either fitness development through exercise or sport skill development through multi-activity models (Kirk, 2013). However, contemporary physical literacy frameworks suggest the need for more comprehensive curricular approaches that develop not merely physical skills but the motivation, confidence, and knowledge necessary for lifelong physical activity (Dudley et al., 2017; Whitehead, 2019).

Several curricular models show particular promise for physical literacy development. Teaching Games for Understanding (TGfU) emphasizes tactical understanding and decision-making within modified game contexts, developing not merely technical skills but strategic thinking and game comprehension (Harvey & Jarrett, 2013; Mitchell et al., 2020). Similarly, Sport Education models create authentic sport experiences that develop not

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only movement competence but also social responsibility, leadership, and appreciation for sport cultures (Hastie et al., 2011; Siedentop et al., 2011), a model recently validated by Choi et al. (2024), who found it increased daily physical activity through heightened situational motivation among university students. Additionally, Urbano-Mairena et al. (2025) demonstrate that active breaks in school settings significantly boost physical literacy domains, offering a practical complement to structured curricula, while Raiola (2025) advocates daily movement routines in preschool to reduce sedentary time, aligning with ecological dynamics approaches. These models align with physical literacy goals by developing multidimensional competencies through authentic, engaging learning experiences.

Movement-based approaches that emphasize fundamental movement skill development within diverse environmental contexts also show significant promise. The constraints-led approach, grounded in ecological dynamics theory, emphasizes how movement emerges through interaction between individual, task, and environmental constraints (Chow et al., 2016; Rudd et al., 2020). This approach focuses not on rigid technique acquisition but on developing adaptable movement capabilities that transfer across contexts—a key aspect of physical literacy (Button et al., 2020; Whitehead, 2019).

Effective curriculum implementation requires sufficient time allocation, appropriate sequencing, and clear learning progressions. Research suggests that developing physical literacy requires substantial practice time distributed across multiple years (Logan et al., 2012; Morgan et al., 2013). This time requirement presents significant challenges within contemporary educational contexts where academic pressures often result in reduced physical education allocation (Ennis, 2015; Lynch & Soukup, 2016). Addressing this challenge requires reconceptualizing physical literacy development not as competing with academic priorities but as complementary to broader educational goals (Dudley, 2015; Whitehead, 2019).

5.2 Pedagogical strategies and instructional approaches

The pedagogical strategies employed within physical education contexts significantly influence physical literacy development. Research suggests that mastery-oriented learning environments emphasizing personal improvement rather than normative comparison promote more positive motivational patterns and greater learning gains (Morgan et al., 2005; Ntoumanis et al., 2020). These environments create psychological safety for skill development and risk-taking—essential components of movement learning (Standal, 2015). Such environments stand in stark contrast to prevailing linear paradigms of motor programming and information processing. These traditional models tend to inadvertently reduce the human body to a computational entity—assimilating cognitive instructions for mere execution—while relegating the educator to the role of a technician tasked with rectifying mechanical errors (Cereda, 2024, p. 158). By explicitly rejecting this mechanistic deconstruction of activities into discrete components, holistic pedagogical strategies facilitate a more authentic acquisition of movement capabilities.

Differentiated instruction and appropriate challenge appear particularly consequential for physical literacy development. Providing options that accommodate diverse skill levels ensures that all students experience appropriate challenge and success opportunities (Dudley, 2015; Morrison et al., 2012). This differentiation is especially important given the wide variability in movement competence typically observed within educational settings (Barnett et al., 2015; Gallahue et al., 2012).

Instructional approaches that emphasize guided discovery and problem-solving appear particularly effective for developing the adaptable movement capabilities central to physical literacy. These approaches involve presenting movement challenges and guiding students to discover effective solutions rather than prescribing rigid movement patterns (Chow et al., 2016; Mosston & Ashworth, 2008). This guided discovery approach develops

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not merely movement techniques but movement understanding—a key aspect of physical literacy that supports transfer across contexts (Whitehead, 2019).

Effective instruction also requires appropriate feedback that develops students' self-assessment capabilities. Research suggests that feedback focusing on process rather than outcomes, delivered with autonomy support, enhances intrinsic motivation and skill development (Aelterman et al., 2019; Cheon et al., 2012). This approach develops not merely movement competence but the self-regulation capabilities necessary for independent learning—a key aspect of physical literacy that supports lifelong engagement (Whitehead, 2010, 2019).

5.3 Assessment and evaluation practices

Assessment practices significantly influence physical literacy development through their impact on student motivation, learning focus, and instructional decisions. Traditional assessment approaches in physical education have often emphasized fitness testing or isolated skill performance, which may undermine intrinsic motivation and provide limited information about multidimensional physical literacy development (Domangue & Solmon, 2010; López-Pastor et al., 2012). Contemporary physical literacy frameworks suggest the need for more comprehensive assessment approaches that address not merely movement competence but confidence, motivation, and knowledge (Edwards et al., 2018; Whitehead, 2019). Indeed, critical analyses of existing assessment instruments suggest that many adopt a "strong classification and framing"—in Bernstein's terms—by promoting the measurement of isolated, decontextualized skills over holistic, integrated understanding, thereby narrowing pedagogical possibilities (Young et al., 2021).

Several promising assessment approaches have emerged from physical literacy research. Authentic assessment involving real-world movement challenges provides information about how students apply movement competence in meaningful contexts (Hay & Penney, 2013; López-Pastor et al., 2012). Formative assessment integrated throughout learning experiences provides ongoing feedback that guides both teaching decisions and student learning (Leirhaug & MacPhail, 2015). Self-assessment approaches develop metacognitive capabilities that support continued learning beyond formal educational contexts (Ní Chróinín & Cosgrave, 2012).

Comprehensive physical literacy assessment frameworks have been developed that address multiple dimensions across cognitive, physical, affective, and social domains (Dudley, 2015; Edwards et al., 2018). These frameworks recognize that physical literacy development involves not merely movement skills but knowledge, attitudes, and behaviors that support lifelong physical activity. However, implementing such comprehensive assessment approaches presents significant challenges within educational systems that prioritize standardized assessment and quantifiable outcomes (Ennis, 2015; Lynch & Soukup, 2016).

Digital technologies offer promising opportunities for comprehensive physical literacy assessment, allowing for the capture of multidimensional data on movement and participation (Casey et al., 2017; Koekoek & van Hilvoorde, 2018). However, recent critical scholarship cautions against the uncritical 'datafication' of the student body. As Cereda (2025b) argues, wearable technologies can inadvertently function as surveillance mechanisms that prioritize external metrics over students' internal, embodied sensations. By creating a "hidden curriculum" of monitoring, these tools risk teaching students to trust objective data more than their own interoceptive awareness—a core component of physical literacy—potentially undermining the development of intrinsic motivation and confidence (Cereda, 2025b). Therefore, effective implementation requires not only attention to pedagogical principles and privacy but also a critical approach that ensures technology supports, rather than overrides, the subjective experience of movement.

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6. Systemic considerations: Positioning physical literacy in educational contexts

6.1 Teacher education and professional development

The development of physically literate students requires teachers equipped with both content knowledge and pedagogical capabilities. Research suggests that teacher knowledge, beliefs, and self-efficacy significantly influence instructional quality and student outcomes in physical education (Morgan & Bourke, 2008; Tsangaridou, 2016). Effective professional development appears crucial for enhancing teacher capacity for physical literacy development, a need underscored by Curovic and Grecic (2025), who identify gaps in Serbian personal trainers' education, particularly in behavior change and inquiry-based skills, suggesting broader implications for teacher training. Jerebine et al. (2024) further emphasize the importance of holistic training approaches in schools, advocating for professional development that targets all physical literacy domains to maximize student outcomes. Furthermore, developing such holistic capability involves more than skill acquisition; it requires a maturation of professional identity. Cereda (2025a) argues that navigating the interdisciplinary nature of movement sciences—a prerequisite for teaching physical literacy—depends on the development of sophisticated epistemological beliefs. Teachers must learn to integrate diverse knowledge forms, moving from dualistic views toward a reconciled understanding of biomedical and pedagogical perspectives to effectively manage the complexity of the field (Cereda, 2025a).

However, teacher preparation programs vary considerably in their approach to physical education, with many providing limited preparation for comprehensive physical literacy development (Fletcher & Mandigo, 2012; Webster et al., 2015). This inconsistency is fundamentally rooted in a structural imbalance within higher education curricula, where a prevailing overemphasis on reductionist biomedical sciences often marginalises the pedagogical and motor behaviour disciplines that are essential for holistic movement education (Cereda, 2025d, p. 49). Such excessive academic specialisation effectively constrains the capacity of emerging professionals to cultivate the broad, interdisciplinary toolkit required to foster physical literacy in diverse educational settings (Cereda, 2025d, p. 153). Consequently, research suggests that sustained, collaborative professional learning communities produce more significant instructional changes than isolated workshops (Armour & Yelling, 2007; Parker et al., 2012). These communities provide opportunities for teachers to develop content knowledge, experiment with pedagogical innovations, and critically reflect on practice—essential components of teacher development (O'Sullivan & Deglau, 2006). Extending this collaborative model to pre-service training, Cereda (2025c) provides empirical evidence that the effectiveness of such development relies heavily on the quality of mentorship and a functional tripartite relationship between the student, university, and industry partners. This analysis of internship experiences highlights that structured reflective practice is the primary mechanism through which emerging professionals bridge the gap between academic theory and the practical application of physical literacy (Cereda, 2025c).

Professional development focused specifically on physical literacy shows particular promise. For example, Durden-Myers et al. (2018) found that professional development explicitly addressing physical literacy concepts enhanced teacher understanding and instructional approaches. Similarly, Edwards et al. (2019) demonstrated that collaborative learning communities focused on physical literacy assessment improved teacher assessment practices and student learning outcomes. These findings suggest that targeted professional development can enhance teacher capacity for implementing comprehensive physical literacy approaches.

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6.2 Educational policy and institutional structures

Educational policies and institutional structures significantly influence physical literacy development through their impact on time allocation, resource distribution, and programmatic priorities. Contemporary educational policies often emphasize standardized academic outcomes, creating institutional pressures that marginalize physical education within school schedules and budgets (Ennis, 2015; Lynch & Soukup, 2016), a challenge compounded by the lack of standardized qualifications, as noted by Curovic and Grecic (2025) in their study of Serbian personal trainers, which calls for national accreditation to legitimize exercise professionals. This marginalization contradicts research evidence regarding the importance of physical literacy for holistic development and lifelong wellbeing (Dudley, 2015; Whitehead, 2019). Naylor et al. (2025) further underscore the policy gap, showing physical literacy's association with adult physical activity, suggesting that early institutional investment could yield long-term public health benefits, yet such prioritization remains underexplored in current frameworks.

Several policy approaches show promise for elevating physical literacy development within educational institutions. Whole-school approaches that integrate physical activity throughout the school day—including active classrooms, recess enhancement, and after-school programs—provide expanded opportunities for physical literacy development beyond dedicated physical education time (Castelli et al., 2014; Webster et al., 2015). These approaches recognize that physical literacy development requires substantial practice time that may exceed available physical education allocation.

Cross-curricular integration represents another promising approach, positioning physical literacy development as complementary to rather than competing with academic priorities. For example, physically active learning approaches incorporate movement into academic instruction, potentially enhancing both physical literacy and academic learning simultaneously (Grieco et al., 2016; Mullender-Wijnsma et al., 2016). Similarly, outdoor education and environmental education provide opportunities for integrated learning experiences that develop physical literacy alongside scientific understanding and environmental stewardship (Dyment & Potter, 2014; Scrutton, 2014).

Effective policy implementation requires clear articulation of physical literacy within educational frameworks. Several jurisdictions have incorporated physical literacy into educational standards and curricular expectations, elevating its status within accountability systems (Mandigo et al., 2009; McLennan & Thompson, 2015). This policy recognition represents an important step toward legitimizing physical literacy as an educational priority comparable to traditional academic domains.

6.3 Community partnerships and societal context

Physical literacy development extends beyond formal educational boundaries, requiring coordination between educational institutions and broader community contexts. Research suggests that community-based physical activity opportunities significantly influence overall physical activity participation and movement competence development (Castelli et al., 2014; Liukkonen et al., 2014). These community contexts include organized sports, recreation programs, active transportation networks, and public recreation facilities.

Effective community partnerships enhance physical literacy development by expanding opportunities and creating coherent messaging across contexts. School-community partnerships provide complementary learning experiences that develop physical literacy components through diverse activities and settings (Lynch, 2016; Spengler, 2014). These partnerships may be particularly important for students from disadvantaged backgrounds who face greater barriers to physical activity participation outside school contexts (Light & Georgakis, 2023; Humbert et al., 2006).

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The broader societal context significantly influences physical literacy development through cultural values, media representations, and economic structures. Contemporary societies often prioritize sedentary activities, present narrow ideals of physical competence, and create substantial barriers to physical activity participation for marginalized populations (Azzarito, 2016; Light & Georgakis, 2023). Addressing these societal factors requires coordinated efforts across educational, community, healthcare, and policy domains to create environments that support universal physical literacy development (Dudley et al., 2017; Whitehead, 2019).

7. Conclusion

This critical review has examined physical literacy through an interdisciplinary lens, synthesizing research across educational, psychological, sociological, and physiological domains. The analysis reveals physical literacy as a multidimensional construct with significant implications for educational theory, research, and practice. The theoretical foundations of physical literacy have evolved from primarily physical education scholarship to incorporate insights from embodied cognition, ecological dynamics, sociocultural theory, and educational philosophy. This theoretical evolution positions physical literacy not merely as a physical education concept but as a fundamental aspect of human development with implications across educational domains.

Empirical evidence demonstrates significant relationships between physical literacy components and broader educational outcomes, including cognitive function, psychosocial development, and health trajectories. These relationships suggest that physical literacy development contributes to educational goals extending far beyond traditional physical education objectives. This evidence challenges traditional educational hierarchies that position cognitive development as primary and physical development as secondary, suggesting instead an integrated approach that recognizes embodied experience as fundamental to human learning. Recent findings further enrich this perspective, such as Leung et al. (2025), who link perceived physical literacy to mental wellbeing in tertiary students, and Naylor et al. (2025), who demonstrate its predictive role in adult physical activity.

Pedagogical approaches that effectively foster physical literacy development emphasize authentic learning experiences, mastery-oriented environments, appropriate challenge, and comprehensive assessment practices. These approaches differ substantially from traditional physical education models focusing narrowly on fitness development or sport skill acquisition. Implementing such approaches requires significant professional development, institutional support, and policy recognition that positions physical literacy as an educational priority rather than a peripheral concern. Curovic and Grecic (2025) further emphasize the need for systemic support, advocating holistic training models to address professional gaps, reinforcing physical literacy's transformative potential across contexts.

Several critical challenges and future directions emerge from this analysis. First, while theoretical conceptualizations of physical literacy have evolved substantially, operational definitions and measurement approaches remain inconsistent across research and practice (Edwards et al., 2017, 2018). Developing more unified conceptual frameworks and validated assessment tools represents an important priority for advancing both research and practice. Second, implementing comprehensive physical literacy approaches within contemporary educational contexts requires addressing significant systemic barriers, including limited time allocation, inadequate teacher preparation, and competing priorities (Ennis, 2015; Lynch & Soukup, 2016). Developing effective implementation strategies within these constraints represents a critical challenge for physical literacy advocates. Future research should continue investigating how physical literacy development contributes to broader educational outcomes, particularly through longitudinal designs that track developmental trajectories across the lifespan, while also addressing implementation challenges in diverse educational systems to fully realize its inter-

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disciplinary promise. Additionally, intervention research examining how different pedagogical approaches influence physical literacy development across diverse populations would provide valuable insights for educational practice. Finally, implementation research examining how physical literacy frameworks can be effectively integrated within existing educational systems would address critical gaps between research and practice.

This review acknowledges certain limitations inherent to its narrative synthesis approach and interdisciplinary scope. The absence of a formal systematic review protocol (e.g., PRISMA) reflects a deliberate choice to prioritize interpretive depth and theoretical integration over rigid methodological standardization, aligning with the aim of fostering interdisciplinary dialogue rather than exhaustive quantification. Similarly, while the empirical synthesis emphasizes positive outcomes to highlight physical literacy's potential, it does not extensively explore null or mixed findings, as the focus remains on established trends relevant to educational practice rather than a comprehensive meta-analysis. Cultural and socioeconomic variability receives limited attention due to the review's primary emphasis on universal theoretical and pedagogical frameworks; however, this constraint opens avenues for future context-specific research. These limitations are outweighed by the review's contribution to reconceptualizing physical education, offering a cohesive interdisciplinary perspective that bridges theory and practice.

In conclusion, physical literacy represents a potentially transformative framework for reconceptualizing physical education within contemporary educational contexts. By positioning embodied experience as fundamental to human development and learning, physical literacy challenges traditional educational hierarchies and offers a more integrated vision of educational priorities. Realizing this transformative potential requires continued interdisciplinary dialogue, empirical investigation, and coordinated efforts across educational, community, and policy domains.

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