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Barriers to and enablers of physical education engagement among school students aged 6–16 years: a scoping review

Chiara Cimenti [a,b], Cecilie Thøgersen-Ntoumani [a,b,c,d], Kristina Pfeffer [a,b], Peter Krustrup [a,b,c], Paulina M. Schenk [e] and Nikos Ntoumanis [a,b,c,d]

aDepartment of Sports Science and Clinical Biomechanics, University of Southern Denmark, Odense, Denmark; bDanish Centre for Motivation and Behaviour Science (DRIVEN), University of Southern Denmark, Odense, Denmark; cDanish Institute for Advanced Study (DIAS), University of Southern Denmark, Odense, Denmark; dSchool of Sport, Exercise, and Rehabilitation Sciences, University of Birmingham, Birmingham, UK; eCentre for Behaviour Change, University College London, London, UK

ABSTRACT

Physical education (PE) offers a valuable opportunity to reduce physical inactivity and promote lifelong healthy habits among children and adolescents. The benefits of interventions in PE largely depend on students' engagement with lessons. However, the mechanisms driving engagement and the behaviour change techniques (BCTs) involved remain underexplored. This scoping review, conducted in accordance with Joanna Briggs Institute methodological guidelines, aimed to map the mechanisms underlying engagement in mainstream PE among 6- to 16-year-olds in high- and upper-middle-income countries. A systematic search in CINAHL, MEDLINE, PsycINFO, PubMed, Scopus, SPORTDiscus, and Web of Science was completed, up to March 2025. Across 98 eligible studies, key barriers (e.g., negative peer interactions, limited teacher training, traditional curricula) and enablers (e.g., need-supportive teaching, positive peer relationships, access to resources) were coded using the 26 mechanisms of action from the Theory and Techniques Tool. Second, this tool guided the identification of potentially relevant BCTs associated with the most important mechanisms, e.g. social support, social comparison, instruction on how to perform behaviour, behavioural practice/rehearsal, graded tasks, information about others' approval. These findings lay the groundwork for future interventions designed to enhance student engagement in PE by identifying promising behavioural strategies and key mechanisms.

Introduction

According to the World Health Organisation's (WHO, 2022) latest report on physical activity (PA), 81% of 11-to-17-year-olds fail to meet the recommended PA levels. Between 2010 and 2016, improvements in PA levels were minimal to modest (WHO, 2022). Additionally, the lack of progress in reducing physical inactivity is projected to

contribute to 500 million new cases of preventable chronic diseases between 2020 and 2030 (WHO, 2022). These findings underscore the urgent need for stronger efforts to promote PA.

Given the critical role of early-life PA, it is prudent to identify effective PA interventions targeted at youth (WHO, 2024). Schools have been recognised as an ideal setting for PA promotion because they reach a large, broad population of children, regardless of their demographics, ethnicity, and socio-economic background (Errisuriz et al., 2018; Lonsdale et al., 2013). Within schools, physical education (PE) has the potential to promote active living, both in the short- and long-term (Dudley et al., 2022; Muntaner-Mas, 2024; UNESCO & Loughborough University, 2024). When effectively implemented, PE can help children and adolescents improve their motor skills, acquire fitness and health knowledge, meet the recommended PA levels, and potentially, establish a lifelong interest for movement (Dudley et al., 2022; Lonsdale et al., 2019; McLennan, 2021). However, students must actively engage in PE lessons for these benefits to be realised, as the compulsory nature of PE in most schools is not a sufficient condition in itself (Muntaner-Mas, 2024). In educational research, student engagement has been positively linked to desirable academic, social, and emotional learning outcomes (Muntaner-Mas, 2024). Engaged students go beyond mere attendance; they demonstrate effort, persistence, self-regulation, and a willingness to challenge themselves while enjoying the learning process (Wong & Liem, 2022). In contrast, student disengagement is associated with low academic achievement and absenteeism (Christenson et al., 2012; Muntaner-Mas, 2024).

To encourage greater student engagement in PE, it is essential to gain insights into the mechanisms by which interventions enhance engagement in PE (Yardley et al., 2020). Unfortunately, this aspect is often overlooked, as many randomised trials primarily focus on intervention outcomes without sufficiently exploring the underlying drivers of effectiveness (Palsola et al., 2020). A systematic review by Sierra-Díaz et al. (2019) examined the psychosocial factors influencing the engagement of 6-to-16-year-olds in PE, using Self-Determination Theory (SDT) as a guiding framework (Ryan & Deci, 2017). SDT, a widely recognised macro-theory of motivation, has been extensively applied in educational research to understand students' motivation for engaging in activities (Christenson et al., 2012; Sierra-Díaz et al., 2019). However, beyond motivation-related factors, no comprehensive evidence synthesis has investigated other relevant mechanisms contributing to student engagement in PE. As a result, this study seeks to address the existing research gap by systematically examining the mechanisms of action driving student engagement, with the purpose of guiding future interventions in PE.

Conceptualising student engagement in physical education

The present review follows Reeve and Tseng's (2011) conceptualisation of student engagement as a multidimensional construct encompassing behavioural, cognitive, emotional, and agentic dimensions. In the context of PE, the behavioural dimension refers to students actively participating in activities, demonstrating effort in exercises, persevering through challenges, and adhering to rules and instructions (Reeve & Tseng, 2011). This behavioural dimension also includes staying focused during lessons and minimising disruptive behaviours (Reeve & Tseng, 2011). The cognitive dimension in PE

involves students employing strategies to improve their physical skills, understanding game tactics, and reflecting on their performance (Reeve & Tseng, 2011). It also includes self-regulating their actions, such as pacing themselves during endurance tasks or adjusting techniques based on feedback, to optimise learning and development (Reeve & Tseng, 2011). The emotional dimension in PE is evident when students show enthusiasm and excitement for activities, express interest in learning new skills, and maintain a positive attitude (Reeve & Tseng, 2011). Finally, ´agentic engagement´ is observed in PE when students take initiative during lessons and actively contribute to the class by suggesting variations to activities, encouraging peers, or asking for clarification (Reeve & Tseng, 2011).

This review considers student engagement both as an influence of behaviour change and as a desirable outcome of interventions in educational settings. As an influence of behaviour change, student engagement, primarily behavioural engagement, links PE instruction to students´ PA intensity levels and minutes spent physically active during PE. By influencing effort, persistence, and participation levels, student behavioural engagement serves as a causally active process in the relationship between an intervention and its behavioural outcome. Additionally, student engagement is modifiable through instructional strategies, making it a viable target for interventions aiming to enhance physically active participation in PE settings. Importantly, such strategies are enacted through the role of the teacher, whose instructional choices, feedback, and interpersonal style serve as central drivers of engagement in PE (Reeve & Tseng, 2011). This view also resonates with broader pedagogical traditions in PE, such as models-based practice and Meaningful PE (Beni et al., 2021; Lynch, 2024). While relevant, these approaches are not the primary focus of this review, since they have been addressed in other reviews (e.g. Nesbitt et al., 2021).

As an educational outcome, engagement fosters long-term benefits, including increased enjoyment of movement and sustained PA participation outside school hours and throughout life. Given its importance as a favourable educational outcome, this review assumes that multiple mechanisms, both distal and proximal, operate sequentially or in combination to influence student engagement. One of its key mechanisms is motivation (Christenson et al., 2012; Sierra-Díaz et al., 2019). Although student engagement is often used interchangeably with motivation in PE research (Hastie et al., 2022), it is better understood as the outward expression of motivation, typically a follow-on of motivational processes (Christenson et al., 2012; Skinner et al., 2009). Besides motivation, it is important to consider other mechanisms. As an example, student engagement operates within a dynamic feedback loop, whereby engaged students are more likely to receive teacher feedback and support, further reinforcing their engagement (Christenson et al., 2012). This reciprocal process is socially embedded, shaped by teacher-student interactions, where instructional support and interpersonal relationships influence student engagement, which in turn affects teachers' pedagogical approaches (Reeve & Tseng, 2011).

A theoretical framework for behaviour change interventions

Understanding the most relevant mechanisms of action is essential for developing effective behaviour change interventions, as they guide the selection of behavioural

strategies most likely to influence behaviour change (Carey et al., 2019). In this review, we focus on behaviour change interventions implemented in school PE lessons, delivered either by teachers or researchers, hereafter referred to as interventions in PE. To support the design of such interventions, we employ the Theory and Techniques (TaT) Tool, which maps the potential links between 26 mechanisms of action (MoAs) and 74 Behaviour Change Techniques (BCTs) from the Behaviour Change Technique Taxonomy (BCTTv1) (Johnston et al., 2021; Michie et al., 2013). This tool provides a systematic approach to identifying promising BCTs to target key MoAs, thereby supporting the design of evidence-based behaviour change interventions (Carey et al., 2019; Schenk et al., 2023). While the BCT-MoA links in the TaT Tool were developed to explain influences on behaviour, the current review proposes that in PE settings, MoAs often impact behavioural outcomes through student engagement.

The 26 MoAs from the TaT Tool expand upon the 14 domains of the Theoretical Domains Framework (TDF), a widely used model that distinguishes potential mediators of behaviour change across 33 theories (Atkins et al., 2017). Twelve additional MoAs were added to the original 14 domains based on a systematic review of 83 behaviour change theories (Carey et al., 2019; Davis et al., 2015). These additions offer a more comprehensive theoretical understanding of the diverse pathways through which behaviour change can occur, compared to the TDF. In this review, a MoA is conceptualised as a process through which interventions change behaviour. Thus, we aim to review hypothesised and ´likely´ MoAs of interventions.

Finally, when describing the content of behaviour change interventions, BCTs are also important, as they represent the smallest, observable, and replicable components of interventions that can influence behaviour (Michie et al., 2013). Identifying which BCTs effectively enhance engagement in PE is crucial to ensuring that interventions not only promote immediate PA participation but also support sustained engagement over time.

The present review

As noted earlier, there is a clear need to synthesise the literature on factors influencing student engagement in PE. The use of the 26 MoAs from the TaT Tool enables a comprehensive and novel examination of a broad range of mechanisms underlying student engagement in PE. Given the exploratory nature and wide scope of our work, a scoping review represents the most appropriate methodological approach for mapping this diverse body of evidence. The planned review builds on and extends prior syntheses about student engagement in PE (Sierra-Díaz et al., 2019) in three substantive ways. First, the present study presents a comprehensive, multidimensional framework to understand student engagement in PE by summarising key theoretical aspects of student engagement and linking this concept to its potential predisposing factors and outcomes. Additionally, the review identifies the perceived barriers to, and enablers of engagement experienced by both teachers *and* students in PE. Finally, the review provides a list of promising BCTs and operationalised examples that can guide the development of future interventions in PE.

These contributions are reflected in the review's two objectives. The primary objective of this scoping review is to examine the mechanisms of action (enablers and barriers) that facilitate or hinder engagement in PE among students aged 6–16, including both students' and teachers' perspectives. The secondary objective is to identify the most promising BCTs, that are associated with the most important MoAs and that can potentially enhance student engagement in interventions taking place in PE.

Methods

The scoping review followed the Joanna Briggs Institute (JBI) methodology and adhered to the Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for scoping review (PRISMA-ScR) (Peters et al., 2020, 2022; Tricco et al., 2018). The JBI approach was selected due to its rigour and well-defined methodology (Pollock et al., 2021). The protocol was pre-registered and is accessible at: https://osf.io/6t5rn.

Eligibility criteria

Eligibility criteria were based on the Population, Concept, and Context framework for scoping reviews (Pollock et al., 2023). The population included students aged 6–16 years, representing all genders, ethnicities, and ability levels, from high- and upper-middle-income countries (gross national income of $$4,466 or more) (Hamadeh et al., 2023). Low- and lower-middle-income countries were excluded because issues such as poverty, corruption, and socio-cultural norms (e.g., religious beliefs affecting girls´ participation in PE) can significantly impact the implementation and quality of PE as well as students´ engagement (Martins et al., 2020; UNESCO, 2012, 2014; UNESCO & Loughborough University, 2024). While such issues may also be present in some high- and upper-middle-income countries, they tend to be less dominant and were beyond the scope of this review. The context was PE lessons conducted during school hours in public and private schools as part of the curriculum. PA programmes outside of normal school hours (e.g., after-school activities) were excluded, as well as studies focusing exclusively on schools for special needs students or on interventions delivered outside PE classes. Of note, this implies that studies conducted in mainstream schools accessible to children of all needs and abilities, including those with disabilities, were regarded eligible. The key concept explored was student engagement, as described in the introduction. Studies were included if they addressed one or more dimensions of engagement or examined factors related to engagement, using either qualitative or quantitative methods.

A comprehensive overview of the eligibility criteria is provided in the table below Table 1.

Search strategy

An initial search strategy for MEDLINE and PsycINFO was developed by the first author, reviewed by a librarian, and subsequently refined to create the full search strategy

Table 1. Eligibility criteria

Category	Included	Excluded
Population	The general population of students aged 6–16 years old, including all genders, ethnicities, and ability levels. Studies with broader age range are eligible if the average age falls within this range or if most participants are within the target age group.	Students under 6 or over 16 years of age; pre-school, college or university students.
Concept	Student engagement, explicitly mentioned or broadly described through behavioural (e.g., effort, persistence, attentiveness), emotional (e.g., enthusiasm, interest), cognitive (e.g. deep learning strategies and self-regulation), and agentic (e.g., expressing preferences, initiating learning) dimensions.	Studies that do not broadly encompass the concept of student engagement.
Context (or setting)	Mainstream PE lessons delivered in schools located in high- or upper-middle-income countries.	PA activities outside of PE lessons during school hours; PE lessons delivered in low- or lower-middle-income countries or schools for special needs students.
Publication type (or source type)	Preprints and peer-reviewed articles	Dissertations
Language	English	Any other than English
Methodology	Any	None
Outcomes (if applicable)	Outcomes related to physical activity within PE (e.g., MVPA, physically active minutes), engagement across one or more dimensions (e.g., effort, emotions), motivation to participate in PE, aptitude to participate in PE.	PA-related outcomes measured outside the PE context.
Intervention (if applicable)	Any interventions implemented within PE lessons.	School-based interventions without a PE focus.

(see Supplementary Material 1). The search included preprints and peer-reviewed studies in English, with no time restrictions, across the databases of Scopus, Web of Science, ERIC, SPORTDiscus, and CINAHL, between January and February 2024. When possible, Thesaurus terms related to student engagement were used to guide the search process. An example is ´learner engagement´, a controlled vocabulary term in ERIC´s thesaurus described as ´meaningful involvement by learners in their own education or training. Indicators may include active participation in instruction and other school activities, desire to succeed, willingness to expend effort to achieve, and persistence in the face of obstacles´.

Study selection

Citations were collated in Covidence, where duplicates were removed. Titles and abstracts were then screened using ASReview, an open-source, machine learning-based software designed to support efficient and transparent screening in systematic and scoping reviews (ASReview, 2022). ASReview uses an active learning algorithm to rank records by predicted relevance based on initial human input. This tool was selected for its demonstrated accuracy in prior validation studies. For example, Chan et al. (2024) and Campos et al. (2024) reported recall rates of 95–100% and workload reductions up to 60%, depending on review scope and stopping rules. In our review, the first author trained the model using a set of known relevant articles, and screening proceeded based on ASReview's prioritisation. Full details on the ASReview procedures are outlined

in the study protocol. Following the initial screening, the full text of selected citations was assessed in detail against the inclusion criteria by two independent reviewers in Covidence. The main reviewer reviewed 100% of the papers, whereas a second reviewer reviewed a random selection of 50% of the records. Disagreements were resolved through discussion, and inter-rater reliability showed moderate agreement (Cohen's Kappa = 0.58) (Figure 1).
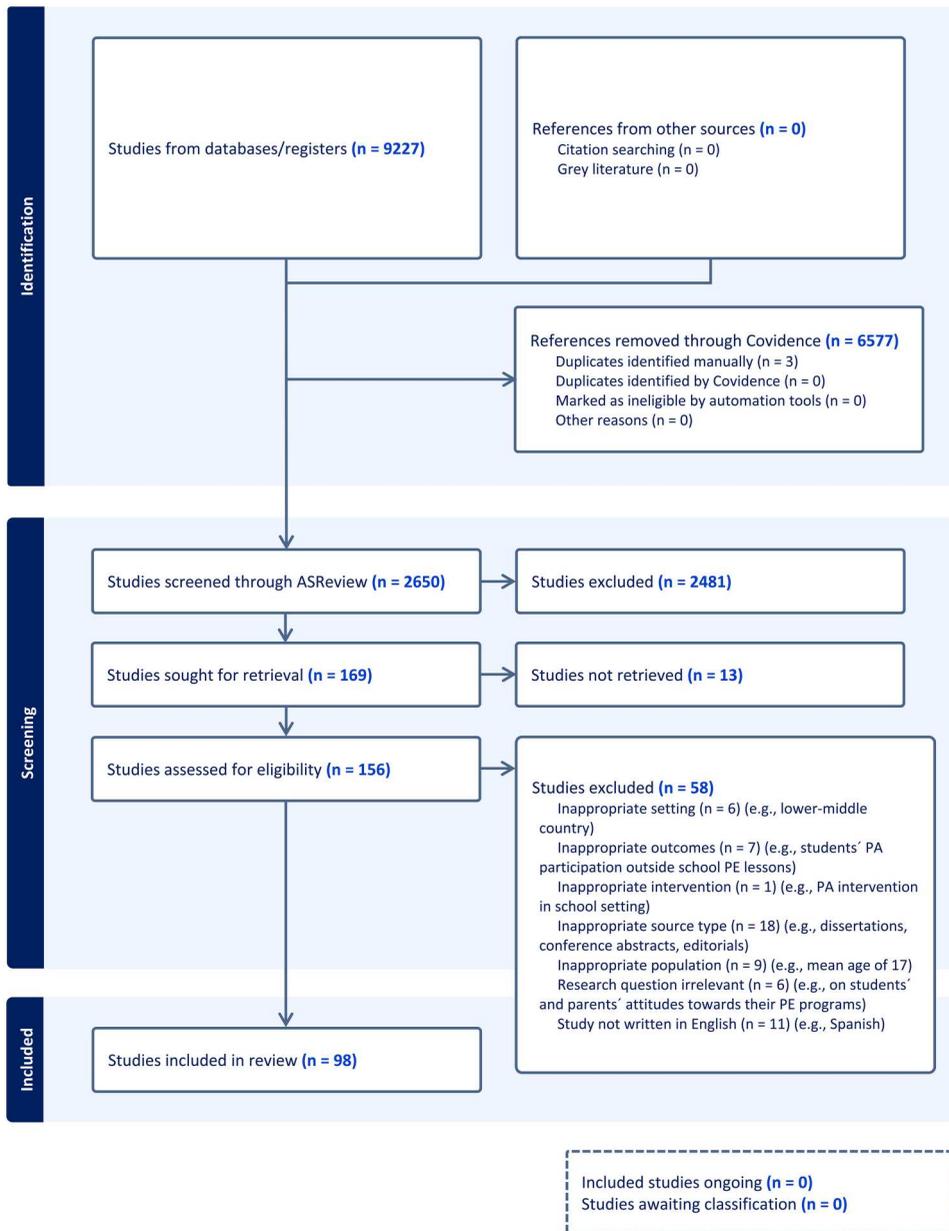

Figure 1. Flow diagram of literature search results.

Data charting

An initial data extraction manual was drafted based on JBI guidance (JBI, 2022), pilot-tested on five papers and amended by the two reviewers. The final manual included author(s), year of publication, country of origin, characteristics of student participants, sample size, study design, measures, type of intervention, theoretical frameworks or models, and key findings relevant to the research questions, including barriers to, and enablers of, student engagement in PE. The reference management software Zotero (v. 6.0.36) was utilised to access the studies and to manage references. The primary author extracted all data, and a co-author reviewed the data added by the primary one under the headings ´Barriers to student engagement in PE´ and ´Enablers of student engagement in PE´.

Data analysis and presentation

In line with JBI scoping review guidance, a qualitative content analysis was employed to descriptively analyse data and code study characteristics into overall categories (Pollock et al., 2023). The selected studies were deductively coded in NVivo (v. 14) using the 26 MoAs from the TaT Tool as codebook (Johnston et al., 2021). In these papers, MoAs were coded broadly following the *Mechanism of action annotation manual* developed for the MoA Ontology, which provides explicit guidance on coding potential MoAs in intervention reports (Moore et al., 2024a; Schenk et al., 2023). However, instead of MoAs for behaviours, the current review coded MoAs for student engagement. The coding process focused on identifying sequential MoAs, both proximal and distal, that were theoretically assumed or inferred by the primary studies' authors or by us to contribute to student engagement. Therefore, potential MoAs were inferred based on theoretical assumptions, qualitative observations, or indirect evidence. Empirically tested MoAs were not identified, as included studies did not explicitly test causal relations between MoAs and student engagement.

The results were described in a narrative summary and accompanied by two tables. Table 2 illustrates the 26 MoAs ranked by importance. Our ranking followed the methodology outlined by authors of similar evidence syntheses (Borek et al., 2020; Brown et al., 2024). Each MoA's importance was evaluated based on how many studies in which the MoA appeared (frequency), how many codes were linked to it (elaboration), and whether the codes described it as a barrier, enabler, or a mix of both. The final ranking was determined first by frequency, followed by elaboration, and then by mixed beliefs. After the MoAs were ranked, the TaT Tool helped identify the most promising BCTs for each important MoA (Johnston et al., 2021).

Table 3 presents the key MoAs identified in this review, along with relevant BCTs detected using the TaT Tool. The BCTs were further illustrated with examples developed by the primary author. Their definitions are available online: https://digitalwellbeing. org/wp-content/uploads/2016/11/BCTTv1_PDF_version.pdf. The TaT Tool includes 'likely' evidence-based links between 74 BCTs from the BCTTv1 and the 26 MoAs included in this study (Johnston et al., 2021). These links have been previously identified through (1) a literature review of hypothesised and tested links (Carey et al., 2019), (2) an expert consensus study about agreed links (Connell et al., 2019) and (3) a triangulation of these studies (Johnston et al., 2021).

Table 2. Ranking of MoA importance based on frequency of studies, the elaboration of codes, and conflicting evidence.

MoAs	Frequency, no. of studies (%)	Elaboration, no. of codes (%)	Codes (barriers (B), facilitators (F) or mixed (M)	Quotes (citation)
Social influences	74 (75%)	213 (47.6%)	Need-supportive teaching (F)	'Students in the autonomy supportive structure group showed the highest engagement, as compared to the other two experimental conditions.' (Meng & Keng, 2016)
			Social peer interactions (F)	'Peer-to-peer interactions also influenced PE enjoyment, with one child highlighting how the presence and absence of peer support can affect their feelings and PE motivation.' (Domville et al., 2019)
			Lacking family support (B)	'Students not favorable towards P.E. stated that their parents had no involvement in any type of sports or physical activity.' (Hassandra et al., 2003)
			Group teaching format (M)	'Student engagement was positively affected by whole group formats, negatively by centers formats.' (Bertills et al., 2019)
			Mixed-gender settings (B)	'Many of the teachers were concerned that the social environment of mixed-gender settings was a barrier to girls' PA engagement.' (Kim, 2022)
			Poor collaboration between primary and secondary PE teachers (B)	'PE was viewed as an inconsequential subject area and therefore unimportant during the transition process. Moreover, this simple offering is not enough to guarantee participation and engagement in sustained high quality PE and requires greater recognition within transition.' (Rainer & Cropley, 2015)
			Social media (M)	'The role of media had also been associated with students' views about participation.' (Hassandra et al., 2003)
Motivation	31 (31%)	58 (10.8%)	Positive teachers' perceptions of class engagement (F)	'Teachers' perceptions of class engagement were associated with students' motivation.' (André et al., 2023)
			Autonomous motivation (F)	'(...) This finding is supported by previous research that identifies autonomous forms of motivation as the most important predictors of effort for PE, exercise intentions, and leisure-time physical activity.' (Løvoll et al., 2020)
			Collective autonomous motivation (F)	'Class-level motivational predictors were significantly associated with collective engagement.' (Aelterman et al., 2012)
			Need-supportive teaching (F)	'The positive relationship between perceived autonomy support and behavioral engagement was explained in part by increased autonomous motivation.' (Yoo, 2015)
Environmental context and resources	30 (30%)	64 (11.9%)	Traditional PE-curricula (B)	'Curriculum could be a major barrier but also a primary way to engage girls, so many of them intentionally made changes in an effort to increase female students' PA in PE.' (Kim & Hodge, 2024)
			Inadequate teacher training (B)	'Very limited opportunities to practice and develop the teaching skills were provided to the teachers during their undergraduate studies.' (Derri et al., 2015)

(*Continued*)

Table 2. Continued.

MoAs	Frequency, no. of studies (%)	Elaboration, no. of codes (%)	Codes (barriers (B), facilitators (F) or mixed (M)	Quotes (citation)
			Large class size (B)	'Low student-to-physical educator ratio was also associated with a greater proportion of class time during which children engaged in MVPA and a lesser proportion of class time devoted to management.' (Bevans et al., 2010a)
			Early PE-lesson scheduling with fewer transition activities (F)	'Effort was significantly influenced at a group level, but only as a result of the time of day; students taking part in classes held earlier in the day contributed greater effort.' (Gillison et al., 2013)
Skill	23 (23%)	40 (7.4%)	High teaching skills (F)	'Teachers with high-level (teaching) T-skills were observed to be instructing significantly more frequently, students were more engaged.' (Bertills et al., 2019)
			Low student motoric skills (B)	'Deficiencies in one's ability and low value in the tasks would impede effort and attention during the execution of learning activities.' (Shen, 2010)
			Practicing with peers of a different gender (M) or same skill level (F)	'The teachers reported that the traditional curriculum, especially within mixed-gender settings, impeded girls from engaging in PA because of gender differences in skills, preferences, and knowledge.' (Kim & Hodge, 2024)
			Good student social skills (F)	'Socio-cognitive skills showed moderate to strong correlations with general school self-efficacy, aptitude to participate in PE and PE specific self-efficacy.' (Bertills et al., 2018)
			Effective teacher communication skills (F)	'To be positively perceived by students, teachers should improve their communication and group work skills, create a favourable atmosphere conducive to greater involvement, and conduct attractive classes.' (Zalech, 2021)
Beliefs about capabilities	18 (18%)	36 (6.7%)	Class content (M)	'Those with greater perceived competence were more engaged in PE and their levels of engagement were basically unchanged by class content.' (Bevans et al., 2010a)
			Need-supportive teaching (F)	'Secondary PE students who engage in a highly autonomy-supportive learning context experience significantly greater competence support, self-determined motivation, and enjoyment.' (Perlman, 2015)
			Having disabilities (B)	'Students with disabilities reported (…) less aptitude to participate, and consistent lower perceived physical functional skills.' (Bertills et al., 2021)
			Differences in self-efficacy between genders (M)	'She felt 'frustrated with [her] ability' because the standard in her mixed-gender high school class always seemed too high to her. In a gymnastics lesson, Hyorin kept avoiding practicing the backward roll.' (Kim & Hodge, 2024)
Feedback processes	14 (14%)	17 (3.2%)	Structure (F)	'The structure during the activity support is nurtured, for example, by the use of appropriate feedback related to the task objective with a positive value.' (González-Peño et al., 2021)
			Student-teacher relatedness (F)	'For these lowly motor competent students, the presence of positive feedback appeared a crucial prerequisite for experiencing a trustworthy and warm teacher-student relationship.' (De Meester et al., 2020)
			Comparison to lesson objectives (F)	

Theme		Subtheme		Example quote
General attitudes or beliefs	13 (13%)			'The timely competence-relevant feedback reinforces the meaningfulness of activities by providing a reference for the students with regards to how they are performing in relation to the lesson objectives.' (Meng & Keng, 2016)
		Opportunities for social interaction (F)	25 (4.7%)	'Participants perceived that PE was stressful when there was less focus on fun and social interaction.' (Hemingway et al., 2025)
		Choice (F)		'Participants discussed the importance of choice to improve enjoyment and ultimately engagement levels.' (Tidmarsh et al., 2022)
		Novelty (F)		'Many expressed their boredom (…) They wanted to learn new and novel activities compared with the 'same thing every year'.' (Rikard & Banville, 2006)
		Appropriate physical challenges (F)		'Many expressed their boredom from being under challenged by sport activities that did not contribute to their fitness or interest levels.' (Rikard & Banville, 2006)
		Gameplay (F)		'Participants indicated a much greater preference for game play compared with fitness activities.' (Rikard & Banville, 2006)
		Fun factor (F)		'PE was (perceived as) stressful when there was less focus on fun.' (Hemingway et al., 2025)
		'Gender-appropriate activities' (F)		'Many of the teachers also talked about mixed-gender settings as a barrier girls' PA.' (Kim & Hodge, 2024)
Subjective norms	6 (6%)	Gender norms (B)	8 (1.5%)	'In some classes, such as personal fitness and physical training, boys and girls segregated themselves into what they considered gender-appropriate courses.' (Ennis et al., 1997)
		Teacher biases (B)		'Another significant barrier to female students' PA was related to their teachers' gender biases and assumptions. For example, Haena complained about not being given the choice to play competitive team sports with boys in her high school class' (Kim & Hodge, 2024)
		Negative peer influence (B)		'The students were experienced as group members, and often adopted the same behavior as their friends concerning participation in PE' (Abildsnes et al., 2015)
Emotion	3 (3%)	Autonomous motivation (F)	6 (1.1%)	'Students who feel positive emotions may be more likely to become engaged in PE through increased autonomous motivation.' (Yoo, 2015)
Goals	3 (3%)	Intrinsic goal (F)	5 (0.9%)	'Perceived intrinsic goal focus (i.e. health) was a significant positive predictor of all outcomes (including effort in PE).' (Gillison et al., 2013)
		Manageable, progressive goals (F)		'Several of the teachers also talked about the importance of making manageable goals for girls.' (Kim & Hodge, 2024)
		High task orientation (F)		'Students with high task orientation, irrespective of their ego orientation levels, participated longer compared to those with low task and high ego orientation.' (Duda & Ntoumanis, 2003)
Self-image	2 (2%)	Negative self-image (B)	8 (1.5%)	'statistically significant associations between (…) body image and engagement in PE.' (Bevans et al., 2010a)
Perceived susceptibility or vulnerability	2 (2%)	Aggressive behaviours (B)	4 (0.7%)	'Boys' aggressive play was intimidating to the point that some girls would rather receive a failing grade than have to participate with boys.' (Ennis et al., 1997)

(*Continued*)

Table 2. Continued.

MoAs	Frequency, no. of studies (%)	Elaboration, no. of codes (%)	Codes (barriers (B), facilitators (F) or mixed (M)	Quotes (citation)
Beliefs about consequences	2 (2%)	3 (0.6%)	Low student expectations about PE (B)	'The PE teachers believed this was a result of (…) low expectations concerning attendance, learning outcome and physical skills in junior high school. Some students had not attended to PE for several years with no obvious explanation.' (Abildsnes et al., 2015)
Behavioural regulation	1 (1%)	3 (0.6%)	Self-regulation (F)	'Perceptions of autonomy supportive motivational climate predicted both directly and indirectly, through (…) metacognition (defined as self-regulation), students' cognitive and affective responses during PE lessons.' (Karagiannidis et al., 2015)
Knowledge	1 (1%)	2 (0.4%)	Low student knowledge (B)	'Many students lacked basic knowledge about physical fitness and motoric skills to be able to master daily activities in PE class.' (Abildsnes et al., 2015)
Norms	1 (1%)	2 (0.4%)	Normative student evaluation criteria (B)	'Decreases in task-involving climate (…) as children grow older, PE teachers tend to place more emphasis on normative criteria for success and failure and evaluate children more frequently on that basis.' (Ntoumanis et al., 2009)
Attitude towards the behaviour	0 (0.0%)	0 (0.0%)	N/A	N/A
Reinforcement	0 (0.0%)	0 (0.0%)	N/A	N/A
Social or professional role & identity	0 (0.0%)	0 (0.0%)	N/A	N/A
Behavioural cueing	0 (0.0%)	0 (0.0%)	N/A	N/A
Memory, attention, decision processes	0 (0.0%)	0 (0.0%)	N/A	N/A
Intention	0 (0.0%)	0 (0.0%)	N/A	N/A
Values	0 (0.0%)	0 (0.0%)	N/A	N/A
Social learning or imitation	0 (0.0%)	0 (0.0%)	N/A	N/A
Optimism	0 (0.0%)	0 (0.0%)	N/A	N/A

Table 3. Overview of the five most important MoAs, their linked BCTs via the TaT tool, and examples of operationalized BCTs.

26 MoAs (MoA Ontology entities (identifier))[a]	BCTs	Operationalised BCT Examples
Social influences (interpersonal behaviour (BCIO:03 6025))	(1) Social support (unspecified), (2) social support (practical), (3) social comparison, (4) information about others' approval, (5) social reward	(1) A PE teacher encourages students to cheer for each other during team activities, fostering a supportive atmosphere. (2) A teacher pairs students with different skill levels and instructs higher-skilled students to guide their peers through drills, ensuring everyone gets help. (3) A PE teacher shares success stories of students who improved their skills through consistent effort, encouraging others to strive for progress. (4) The teacher highlights that most students enjoy and value participating in PE. (5) Students who demonstrate teamwork and effort receive public recognition.
Motivation (behavioural motivation (BCIO:00 6133))	(1) Goal setting (outcome), (2) feedback on behaviour, (3) pros and cons, (4) incentive (outcome), (5) reward (outcome), (6) self-talk	(1) Each student sets a personal fitness goal (e.g. improving their sprint time). (2) The teacher provides immediate feedback on students' technique in running drills. (3) Before introducing a new sport, students discuss the benefits of participation and the challenges they might face. (4) Students who complete a PE challenge (e.g. achieving a personal best in an endurance test) earn a privilege, such as choosing the next activity. (5) Students who consistently engage in activities receive certificates or praise in front of the class to reinforce their participation. (6) The teacher instructs students to use positive self-talk during difficult tasks (e.g. 'I can do this' before attempting a challenging skill).
Environmental context and resources (environmental system (ENVO:01 000254) and behavioural opportunity (BCIO:00 6086))	(1) Social support (practical), (2) prompts/cues, (3) remove aversive stimulus, (4) restructuring the physical environment, (5) restructuring the social environment, (6) avoidance/reducing exposure to cues for the behaviour, (7) adding objects to the environment	(1) A teacher organizes a buddy system where students help each other set up and complete exercises. (2) Visual reminders are placed in the gym to reinforce proper technique. (3) Students who feel self-conscious about performing in front of others are given the option to practice in small groups first. (4) The teacher modifies the playing field size in a game to make it more inclusive and engaging for all students. (5) Instead of always grouping students by ability, the teacher rotates teams to encourage diverse social interactions and avoid peer pressure. (6) For students who feel anxious about competitive elements, the teacher introduces non-competitive warm-ups to gradually build confidence. (7) The teacher introduces equipment like cones, hurdles, or music to make exercises more engaging and dynamic.

(Continued)

Table 3. Continued.

26 MoAs (MoA Ontology entities (identifier))[a]	BCTs	Operationalised BCT Examples
Skills (physical skills (BCIO:0060 10), social skill (BCIO:0060 12), and mental skills (BCIO:00 6004))	(1) Instruction on how to perform behaviour, (2) behavioural practice/rehearsal, (3) graded tasks	(1) The teacher gives a step-by-step explanation of how to properly execute a basketball layup before practice. (2) Students practice a new skill repeatedly in controlled drills before applying it in a game. (3) The teacher starts students with simplified versions of an exercise and gradually increases difficulty.
Beliefs about capabilities (self-efficacy belief for a behaviour and its associated outcomes (BCIO:006043), and self-efficacy belief for a behaviour (BCIO:00 6154))	(1) Problem solving, (2) instruction on how to perform behaviour, (3) demonstration of the behaviour, (4) behavioural practice/rehearsal, (5) graded tasks	(1) A teacher asks students to identify challenges they face in PE and brainstorm solutions together (e.g. modifying activities for different skill levels). (2) The teacher breaks down the mechanics of a movement (e.g. proper push-up form) and explains its benefits. (3) The teacher or a skilled student demonstrates the correct technique for a movement before students attempt it. (4) Students repeatedly practice volleyball serves with feedback before playing a full game. (5) The teacher introduces easier versions of an exercise before increasing intensity (e.g. balancing on one foot before attempting a dynamic balance drill).

[a]The MoA Ontology entities and their identifiers are provided in parentheses to support future work on student engagement in PE and its related MoAs. These details were derived from Schenk et al. (2023) and Moore et al. (2024b).

Results

Study characteristics

After removing duplicates, 2,651 articles were screened by title and abstract using ASReview. Thirteen records could not be retrieved due to lack of access via our institutional databases. Following initial screening and retrieval, 156 articles were selected for full-text screening. Of these, 98 articles met the inclusion criteria.

Studies were primarily conducted in the USA (n = 20), Spain (n = 14), the UK (n = 12), Greece (n = 8), South Korea (n = 8), Norway (n = 6), Belgium (n = 4), Australia (n = 4), France (n = 3), Sweden (n = 3), Finland (n = 2), the Netherlands (n = 2), Estonia, Poland, Hong Kong, Singapore, Germany, Italy, Serbia, Argentina, and Canada (n = 1 each). A total of 1,366 teachers and 65,145 students were included. Most studies (93) were conducted with the general student populations, with more than half (55 studies) involving students within the 11-14-year age range. This category includes studies that reported either single ages (e.g. 12 years), age ranges, or mean ages that fell within this bracket (the complete age information, as reported in the original studies, can be found in Supplementary Material 3, alongside each study´s characteristics). Most studies did not specify the socioeconomic status and ethnicity of the students or characteristics of the school area (e.g. geographical location). Studies predominantly used a cross-sectional design (n = 41), including quantitative methods (n = 22), qualitative methods (n = 15), and mixed methods (n = 4). This was followed by randomised controlled trials (n = 20), quasi-experimental studies (n = 11), correlational studies (n = 9), longitudinal studies (n = 12), evidence syntheses (n = 5), and prospective studies (n = 1). Across the 99 studies, 90% reported using a theoretical framework or model. Self-Determination Theory was the most highly cited theory (90% of all studies which mentioned a theory). Other theories and models included Achievement Goal Theory, Theory of Planned Behaviour, Social Cognitive Theory, Constructivist and Social Learning Theories, Participation-Related Constructs Model, Motor Learning Theory, Transcontextual Model of Motivation, Control-Value Theory of Achievement Emotions, Theory of Reasoned Action, Social Constructivism Theory, Goal Perspectives Theory, Hierarchy of Motivation Models, Dual Process Model, Social Cognitive Theory of Emotion, and the TARGET Framework.

Mechanisms of Actions

The five most important MoAs linked to student engagement in PE are presented in Table 2 in order of importance, along with the percentage of studies that identified each MoA. A complete overview of the coded MoAs is provided in Table 1, where MoAs are listed in order of frequency (from the highest to the lowest).

1. MoA: social influences (n = 75% studies)

A central MoA in this review is social influences, defined as ´interpersonal processes that can cause oneself to change one's thoughts, feelings, or behaviours´ (Moore et al., 2024b). Key social influences are peer and teacher-student relationships, both of which significantly shape students' motivation, engagement, and participation in PE (Abildsnes et al., 2015; André et al., 2023; Cheon & Reeve, 2013, 2015; De Meester et al., 2020; Domville et al., 2019; Gairns et al., 2015; Gillison et al., 2013; Girard et al., 2023; González-Cutre et al.,

2014; Guo et al., 2023; Jang et al., 2024; Leisterer & Paschold, 2022; Leo et al., 2023; Leo et al., 2022a, 2022b; Perlman & Goc Karp, 2010; Sanchez-Oliva et al., 2020; Sparks et al., 2015, 2016; Tendinha et al., 2021; White et al., 2021).

Peer relationships can influence student engagement both positively and negatively. Positive peer interactions, which can enhance student engagement, include encouragement and feedback, while negative dynamics, which may reduce it, involve judgments and perceived unfairness (Domville et al., 2019; Gray et al., 2018). Beyond individual social factors, the format of PE activities also affects students´ interactions and, as a result, student engagement, though findings remain inconsistent (Bennie et al., 2017; Harvey et al., 2016; Ilić et al., 2010; Kim & Hodge, 2024; Mitchell et al., 2015; Tidmarsh et al., 2022). Some evidence suggests whole classroom formats improve engagement in PE more than small group- or individual-based activities, while other studies provide evidence in support of small-group formats (Bennie et al., 2017; Harvey et al., 2016).

Teacher-student interactions shape student engagement in complex but important ways. In line with SDT, a need-supportive teaching style fosters student engagement by satisfying their psychological needs for autonomy, competence, and relatedness and promoting autonomous motivation (Cheon & Reeve, 2013; Fitton Davies et al., 2023; González-Peño et al., 2021; Leptokaridou et al., 2016; Mavropoulou et al., 2019; Moreno-Murcia & Sánchez-Latorre, 2016; Mouratidis et al., 2008; Ntoumanis, 2005; Sotos-Martínez et al., 2023; Zhang et al., 2020). Conversely, controlling or chaotic styles, characterised by e.g. negative conditional regard and controlling use of rewards, frustrate these psychological needs, resulting in lower motivational quality and engagement (Cheon & Reeve, 2013; Fitton Davies et al., 2023; González-Peño et al., 2021; Invernizzi et al., 2019; Murfay et al., 2022; Zhang et al., 2020). However, teacher knowledge about need-supportive behaviours may not be sufficient. Teachers recognise the effectiveness of strategies like explaining task relevance to enhance student engagement but often find it difficult to implement them due to classroom management challenges or time constraints (Bennie et al., 2017). Furthermore, when teachers perceive students as engaged, they are more likely to adopt an effective communication style and demonstrate a greater capacity to foster student engagement (Abildsnes et al., 2015; André et al., 2023; Van den Berghe et al., 2016). This reciprocal dynamic suggests that teachers tend to reinforce engagement in students they already perceive as engaged, potentially overlooking those who are less visibly involved. Conversely, when teachers perceive students as disengaged, they are more likely to employ need-thwarting (controlling) teaching behaviours (André et al., 2023; Ntoumanis et al., in press). Complementing this, qualitative evidence indicates that teacher disengagement, implicitly characterised by not actively participating in PE and tolerating student non-attendance, may undermine students' PE-specific academic outcomes (Abildsnes et al., 2015).

Other factors associated with lower student engagement include limited involvement of parents in leisure-time physical activities and poor collaboration between primary and secondary PE teachers (Abildsnes et al., 2015; Hassandra et al., 2003 Rainer & Cropley, 2015). Media can act as both a barrier and an enabler by exposing students to athlete role models as well as violent sporting events (Hassandra et al., 2003). Nonetheless, their role should be further explored (Hassandra et al., 2003). In summary, key social influences are peer and teacher-student relationships, followed by family support and inter-teacher collaboration.

In relation to students' needs, the reviewed studies primarily focused on psychological needs, a core concept of SDT. Within this theoretical framework, a psychological need is defined as ´a psychological nutrient that is essential for well-being´ (Vansteenkiste et al., 2020). Three basic psychological needs are proposed within the SDT framework. These are the needs for autonomy (the experience of volition), competence (the experience of mastery), and relatedness (the experience of bonding, care, and warmth) (Vansteenkiste et al., 2020). Research indicates that satisfying students´ psychological needs is closely linked to various positive outcomes, such as classroom engagement, motivation quality, skill development, anticipated course achievement, PA participation, moderate-to-vigorous PA (MVPA), intentions to exercise, and time spent doing out-of-school sports (Almolda-Tomas et al., 2014; Cheon et al., 2012, 2016, 2020; Huéscar et al., 2020; Meng & Keng, 2016; Zhang et al., 2011).

The strategies that have been studied in the extant literature to support students' needs in PE involve fostering a teacher mastery climate and implementing need-supportive teaching behaviours (Cechini et al., 2021). Teacher motivational climates, as conceptualised within Achievement Goal Theory, can be mastery-oriented (focusing on student self-improvement and learning) or performance-oriented (emphasising student competition and comparison) (Cechini et al., 2021). Need-supportive teaching practices, studied from a SDT perspective, focus on teacher strategies that are supporting of autonomy, competence and relatedness (Escriva-Boulley et al., 2018). Examples include taking an interest in students' lives (relatedness support), introducing novel activities (autonomy support), providing meaningful choices that support skill acquisition, creating structure, and offering suitably challenging activities (competence support) (Cechini et al., 2021; Domville et al., 2019; Ennis et al., 1997; Fitton Davies et al., 2023; Gray et al., 2018).

2. MoA: students´ and teachers´ motivation (n = 12% studies)

Engagement in PE is strongly influenced by motivational quality, which reflects the degree of self-determination underlying student motivation (Aelterman et al., 2012; Barkoukis et al., 2014; Cechini et al., 2021; de Bruijn et al., 2023; Duda & Ntoumanis, 2003; Gairns et al., 2015; Haug et al., 2023; Karagiannidis et al., 2015; Ryan & Deci, 2017; Sun & Chen, 2010; Tendinha et al., 2021; Tessier et al., 2010; Ulstad et al., 2018; Yli-Piipari et al., 2009; Yoo, 2015; Zhang et al., 2011). According to SDT, autonomous motivation represents high-quality motivation, based on enjoyment or the perceived value of the task (Ryan & Deci, 2017). In contrast, controlled motivation reflects low-quality motivation, driven by external or internal pressures, such as rewards, punishments, or social approval (Ryan & Deci, 2017). Amotivation, the lack of intrinsic or extrinsic motivation, reflects no quality of motivation (Ryan & Deci, 2017).

In PE, autonomous motivation is associated with greater engagement, more frequent participation, higher MVPA levels, and higher PE grades (Aelterman et al., 2012; Barkoukis et al., 2014; Cechini et al., 2021; de Bruijn et al., 2023; Duda & Ntoumanis, 2003; Haug et al., 2023; Karagiannidis et al., 2015; Ntoumanis et al., 2009; Sun & Chen, 2010; Tendinha et al., 2021; Tessier et al., 2010; Ulstad et al., 2018; Yli-Piipari et al., 2009; Yoo, 2015; Zhang et al., 2011). Conversely, controlled motivation and amotivation contribute to lower student engagement, MVPA, and PE grades (Aelterman et

al., 2012; Barkoukis et al., 2014). It should be noted, however, that PE is not consistently graded across different school systems, and where it is, criteria are often inconsistent, limiting the validity of PE grades as indicators of motivation and engagement (López-Pastor et al., 2013). Across classrooms, nearly one-third of the variation in collective (i.e. classroom-based) engagement can be attributed to class motivation, with higher average autonomous motivation correlating with greater overall engagement (Aelterman et al., 2012). Beyond motivation, positive emotions predict students' behavioural engagement and, when paired with autonomous motivation, also shape students' future intentions to participate in PE (Løvoll et al., 2020; Simonton & Shiver, 2021). A key factor closely linked to student motivation is teachers' communication style. Teachers tend to adopt a more need-supportive approach when they perceive students as autonomously motivated (André et al., 2023; Hassandra et al., 2003; Taylor & Ntoumanis, 2007). In contrast, they are more likely to exhibit need-thwarting behaviours when students appear to be driven by controlled motivation (André et al., 2023; Hassandra et al., 2003; Taylor & Ntoumanis, 2007). Additionally, teachers' perceptions of students´ motivation may affect their own motivational quality, suggesting a bidirectional relationship in which teachers who feel more effective in motivating students may also experience greater autonomous motivation for teaching (Taylor & Ntoumanis, 2007).

In summary, autonomous motivation can enhance students' engagement in PE, with positive effects on their PA intensity and time spent being physically active. Moreover, teacher perceptions of student motivation predict their instructional styles, which in turn influence student motivation, ultimately shaping both teacher motivation and their instructional approaches toward students.

3. MoA: environmental context and resources (n = 12% studies)

Teachers and students encounter several contextual challenges that reduce student engagement, active minutes, and MVPA levels in PE lessons (Bertills et al., 2019; Bevans et al., 2010a, 2010b; Fitton Davies et al., 2023; Gillison et al., 2013; Hassandra et al., 2003; Hortigüela Alcala & Hernando Garijo, 2017; Kim & Hodge, 2024).

During their undergraduate studies, PE teachers report insufficient opportunities to develop and practice effective instructional strategies, particularly for supporting students with disabilities (Derri et al., 2015; Qi et al., 2017). Additionally, student engagement is hindered by inadequate equipment and facilities, large class sizes, late-day PE scheduling, extended transition time (e.g., changing clothes), and limited time and space to practice skills (Bertills et al., 2019, 2021; Bevans et al., 2010a, 2010b; Fitton Davies et al., 2023; Gillison et al., 2013; Hassandra et al., 2003; Hortigüela Alcala & Hernando Garijo, 2017; Kim & Hodge, 2024; McKenzie et al., 2000). Traditional curricula often lack diversity, fail to be inclusive, and focus on competitive activities and team sports (Bessa et al., 2020; Kim & Hodge, 2024). The perceived poor curricular progression from primary to secondary school further exacerbates disengagement (Rainer & Cropley, 2015). These structural and instructional barriers collectively limit student engagement in PE, highlighting the need for more inclusive curricula, training opportunities, better resource allocation, and improved planning of PE lessons to foster equitable participation.

4. MoA: teachers´ and students' skills (n = 9% studies)

4.1. Teachers´ mental skills. High-quality teaching skills are associated with increased student engagement in PE (Bertills et al., 2019; Derri et al., 2015). These skills include explaining syllabus content, providing feedback, actively engaging with students, starting and completing the lesson in a consistent manner, using instructional prompts, and designing appropriately challenging activities (Bertills et al., 2019; Derri et al., 2015; Domville et al., 2019; Mitchell et al., 2015; Weeldenburg et al., 2021). When teachers demonstrate these competencies, students, including those with disabilities, are more likely to participate in whole-group activities and remain physically active throughout the lesson (Bertills et al., 2019).

Despite this, students report a general lack of teacher skills, particularly among generalist teachers in primary school and early secondary education (Domville et al., 2019; Mitchell et al., 2015), and teachers acknowledge challenges in supporting students with disabilities (Qi et al., 2017). Encouragingly, intervention studies show that professional development programs can sustainably enhance teaching skills (Cheon & Reeve, 2013; Derri et al., 2015; Tilga et al., 2021).

4.2. Students´ physical skills. Motor skills are linked to cognitive and behavioural engagement, as well as students' willingness to participate plus their actual participation in PE (Abildsnes et al., 2015; Bertills et al., 2018; Shen, 2010). However, disparities in physical skills are common within PE classes and may arise from a range of factors. For instance, students with obesity and girls with lower motor skills report reduced enjoyment and participation in PE (Abildsnes et al., 2015; Kim & Hodge, 2024). While these examples highlight how disparities can manifest, skill differences are shaped by multiple interacting factors, making them a complex challenge for teachers. This complexity is particularly evident when trying to ensure that all students experience an appropriate level of difficulty in mixed-ability groups, especially in team games (Rikard & Banville, 2006; Qi et al., 2017). These challenges also intersect with teachers' choices to group students by ability and gender, alongside students' preferences for grouping approaches, a research area that remains contested and characterised by nuanced findings (Wilkinson et al., 2025; Wilkinson & Penney, 2022). The impact of grouping students by ability and/or gender remains a contested topic. Some studies portray girls as less engaged and competent and boys as more active and skilled (Aelterman et al., 2012; McKenzie et al., 2000). Teachers often adopt gender-based assumptions about students' abilities, which can influence instructional practices and students' experiences in PE (Kim & Hodge, 2024; Lewis, 2014). Researchers present mixed findings on students´ preferences. One study finds that students have different feelings about being grouped by ability and feel more stressed when PE focuses on skill acquisition (Hemingway et al., 2025). In contrast, another study indicates that students prefer practising with peers of similar abilities, as they believe it enhances their learning (Gray et al., 2018). Additionally, while many girls tend to exhibit lower physical skills, engage less in PE, and prefer single-gender activities, some highly active girls enjoy mixed-gender settings (Kim, 2022; Kim & Hodge, 2024).

4.3. Students´ and teachers´ social skills. Social skills are defined as ´social capabilities acquirable through training or practice´ and essential for effective interpersonal

interactions and relationships (Moore et al., 2024b). They are distinct from social influences, which refer to interpersonal processes affecting one's thoughts, feelings, or behaviours, and from mental skills, which concern cognitive processes (Moore et al., 2024b). Research suggests that effective teacher communication and interpersonal skills are critical in shaping students' perceptions of and participation in PE (Zalech, 2021). Teachers who communicate clearly and effectively facilitate group work are more likely to enhance student motivation and involvement in PE by fostering a positive educational environment (Zalech, 2021).

Moreover, students' social skills (i.e., a 'child's ability to relate to others in a meaningful manner') (Simeonsson & Bailey, 1991), alongside their cognitive abilities, show moderate to strong positive correlations with their aptitude to participate in PE and their PE-specific self-efficacy (Bertills et al., 2018). These findings underscore the importance of interventions that support the development of social skills of both teachers and students.

5. MoA: students´ beliefs about capabilities (n = 7% studies)

PE-specific self-efficacy is positively associated with behavioural and emotional engagement, whereas low self-efficacy is linked to controlled motivation, amotivation, and reduced aptitude to participate and actual participation in PE (Abildsnes et al., 2015; Bertills et al., 2018, 2019, 2021; Bevans et al., 2010a; Kim & Hodge, 2024; Lewis, 2014; Ntoumanis, 2001a; Rutten et al., 2012; Ulstad et al., 2018, 2019; Zhang et al., 2011). Certain student groups, i.e., overweight, female, older (within the 10–13 age range), and those with a special health care need, are particularly susceptible to low PE self-efficacy (Bevans et al., 2010a).

Specific MoAs (e.g., environmental constraints, specifically curricular offer) may indirectly influence student engagement in PE depending on students´ self-efficacy levels (Bevans et al., 2010a). Bevans et al. (2010a) found that students with high self-efficacy maintain consistent engagement regardless of activity type, whereas those with lower PE self-efficacy respond positively to opportunities for skill practice but disengage during periods of inactive instruction. However, qualitative findings by Lewis (2014) suggest that students who reported self-efficacy between 4 and 10 on a 10-point scale often associate their physical capabilities with the activity type. Moreover, the role of gender differences in perceived competence remains debated (Bevans et al., 2010a; Guan et al., 2023; Kim, 2022; Lewis, 2014; Safvenbom et al., 2015). While boys generally score higher in perceived competence and enjoyment, girls often experience greater pressure and lower confidence,especially in mixed-gender settings, where they may perceive boys as having superior skills (Guan et al., 2023; Kim, 2022). However, some research suggests that barriers to PE participation are not necessarily gender-specific and higher PE self-efficacy might be linked to participation in extracurricular sports (Lewis, 2014; Safvenbom et al., 2015).

6. Other mechanisms of action

Other MoA had weaker importance as they had frequency below 15% and elaboration below 5%.

Behaviour change techniques in PE settings

Table 3 presents the most promising BCTs linked to the five key MoAs, along with their operationalised examples.

Several BCTs enhance student engagement in PE. Social support, social comparison, and rewards foster belonging and encouragement, such as peer cheering and teacher recognition. Goal setting, feedback, and incentives strengthen motivation by promoting autonomy and persistence, while environmental adaptations, like adjusting activities and using visual cues, ensure inclusivity. Structured skill development, through step-by-step instruction and graded tasks, builds competence, and self-efficacy-enhancing strategies, such as peer demonstrations and problem-solving, boost confidence. When applied effectively, these BCTs can support the development of an inclusive, engaging PE environment that may encourage lifelong participation in PA.

Behaviour change interventions often involve BCT clusters rather than individual BCTs (Michie et al., 2018). This likely applies to interventions in PE, which should be multi-component and contextually embedded, integrating contextual BCTs (e.g., restructuring the physical environment), student-focused BCTs (e.g., goal setting), and teacher-focused BCTs (e.g., feedback on behaviour). This review also highlights the potential of need-supportive teaching practices and approaches that promote a mastery-oriented climate in fostering student engagement (Almolda-Tomas et al., 2014; Carriedo et al., 2023; Cheon & Reeve, 2013; Sierra-Díaz et al., 2019). Yet, the TaT Tool did not allow for the identification of BCTs specific to the support of these needs.

Discussion

This scoping review examined the key barriers and enablers influencing engagement of 6-to-16-year-olds in PE, explored from the perspectives of both PE teachers and students. These barriers and enablers were mapped onto 26 MoAs using the TaT Tool. This is the first study to employ this tool to systematically synthesise evidence about MoAs regarding student engagement in PE and to recommend promising BCTs, linked to those MoAs, for inclusion in future interventions. In sum, this study builds on efforts to synthesise knowledge about MoAs and link them to potential BCTs for more evidence-based intervention development.

The following sections discuss the key mechanisms of action identified in this review, integrating the findings with relevant literature to contextualize their role in student engagement in PE.

1. Social influences: teacher-student and peer relationships

The most commonly mentioned factor was teacher-student and peer relationships (social influences MoA). While most studies emphasised the key role of need-supportive teaching in fostering teacher-student relationships, fewer explored the mechanisms benefiting peer-to-peer interactions and, ultimately, student engagement. Nevertheless, in a meta-analysis on SDT's application to PE (Vasconcellos et al., 2020), it was concluded that autonomy and competence are mainly fostered by teachers, whereas relatedness is mostly influenced by peers (Vasconcellos et al., 2020). Similarly, a systematic review of qualitative

studies confirmed that, among students aged 7–19, peer relationships have a stronger impact on perceived relatedness in PE than teacher-student interactions for students (White et al., 2021). Given the central role of peer relationships in student engagement in PE, it is also important to recognise how teachers shape social relationships among students, a factor not directly examined in this review. Previous research has demonstrated that teacher practices can promote prosocial, respectful peer interactions, with implications for student academic performance and motivation (Yee Mikami et al., 2011). For example, praising students publicly can increase peer acceptance (Yee Mikami et al., 2011), though in some contexts it may diminish acceptance depending on peer group norms. Similarly, instructional practices that accommodate diverse abilities can minimise academic hierarchies, fostering a more inclusive PE environment (Yee Mikami et al., 2011). According to the classroom ecology paradigm, teachers and students also influence each other reciprocally (Van den Berghe et al., 2016). While evidence suggests that student disengagement can negatively impact teaching practices (André et al., 2023), relatively little is known about how teacher disengagement affects student engagement. Existing studies largely emphasise the reciprocal influence of students' motivational quality on teachers' motivation and instructional style (Taylor & Ntoumanis, 2007), and also have linked students' behavioural problems to burnout syndrome among PE teachers (Alsalhe et al., 2021). However, future research on student engagement in PE should also take into account factors beyond classroom engagement and motivation that contribute to teacher disengagement, resulting in lower student engagement during PE lessons.

2. Gender, motor skills, and engagement disparities

This review also highlights a notable discrepancy between students' and teachers' perceptions of PE activities in single-gender versus mixed-gender groups. While teachers tend to arrange activities according to gender-specific stereotypes, students' preferences for activity type often differ based on their skill level rather than gender. This implies that teachers' gender-based assumptions and stereotypes may hinder their ability to support their students´ need for autonomy and offer PE activities aligned with students' skills and preferences (Pautu et al., 2025). Gender-based differences in motor skills also warrant consideration in relation to student engagement in PE. A systematic review on motor competence among 3-to-10-year-olds found consistent gender patterns, with boys tending to outperform girls in object-control skills, while girls excelling in locomotor skills (Bolger et al., 2021). These differences are likely shaped by activity preferences (e.g., ball games vs. dance and gymnastics) rather than innate ability (Bolger et al., 2021). However, as children grow older, biological factors such as hormonal changes and body composition shifts may further influence neuromuscular strength and coordination, leading to gender disparities in PE participation (Burton et al., 2023). Despite these physiological factors, social and environmental influences remain critical in shaping engagement, motivation, and perceived competence in PE (Cairney et al., 2012; Peers et al., 2020). For example, Lentillon-Kaestner and Roure (2019) found that when cross-gender interactions occur, girls often feel excluded from ball games or team sports. Similarly, Vargos et al. (2021) reported that female students in co-educational PE had significantly lower heart rates than males, but matched male heart rates in single-sex classes. More

recently, research highlighted the role of family social capital (resources and support provided through family networks) in influencing adolescents' participation in physical activity. Adolescents from families with higher social capital are more likely to engage in extracurricular sports and benefit from better health outcomes, whereas limited social capital can exacerbate inequalities in participation (Sui & Huang, 2025). Nonetheless, teachers' ability to offer diverse, non-gender conforming activities and to respond sensitively to gendered norms (skills often undeveloped in single-sex classes) can improve engagement for both boys and girls in coeducational classrooms (Lentillon-Kaestner & Roure, 2019). Moreover, qualitative studies confirm that teachers' perceptions often align with gender stereotypes, reinforcing traditional gender norms in PE (Aasland et al., 2020; Preece & Bullingham, 2022). PE curricula frequently emphasise masculine traits such as speed, strength, and competitiveness, which may marginalise students who do not conform to these expectations (Aasland et al., 2020; Preece & Bullingham, 2022). Additionally, students themselves may perpetuate gender norms, with boys dominating activities and girls perceiving PE as a threat to feminine ideals (Allender et al., 2006). Addressing these stereotypes requires structural changes in PE curricula, teacher training, and school policies. Frühauf et al. (2022) similarly emphasised the importance of gender-sensitive pedagogy in teacher training, noting that many educators lack both the time and tools to challenge existing norms or foster inclusive practices. The role of changing rooms as an additional barrier may have been overlooked in this review. Research suggests that they can be particularly challenging for students who feel self-conscious about their bodies or do not conform to traditional gender norms (Frydendal & Thing, 2020). For girls aged 10–15, hormonal changes and exposure to unrealistic body standards can further discourage participation in PE. Sicilia et al. (2024) highlight that girls between 10 and 16 years old are particularly vulnerable to body shame in their transition to adolescence. Body ideals, shaped by dominant fitness and sport discourses, can also reinforce girls' expectations of a slender yet toned physique, prompting some to engage in PE for body modification while causing others to withdraw due to perceived inadequacy or fear of judgment (Walseth et al., 2017). Additionally, as gender diversity becomes more visible in schools, it is increasingly important for interventions in PE to promote inclusivity by addressing changing room concerns, providing training for in-service teachers, and fostering a more supportive school environment (Neary & McBride, 2024; Preece & Bullingham, 2022).

3. The role of motivation and self-efficacy in student engagement

Despite the central role of motivation in educational and PE settings, research on its relationship with engagement remains inconsistent, with some studies using these terms interchangeably. Future studies should explicitly distinguish between motivation and engagement, as they are closely related but distinct constructs. Following Hastie et al. (2022) and Christenson et al. (2012), this review defined motivation as an internal psychological process that serves as a precursor to engagement, which manifests as observable behaviour (Christenson et al., 2012). Furthermore, this review highlights the widespread application of SDT in studies examining student engagement in PE. SDT conceptualises motivation as a function of individual traits, environmental factors, and social interactions (Hagger & Chatzisarantis, 2008). Research suggests that self-determined

motivation and self-efficacy are closely linked and jointly predict PA behaviour (Sweet et al., 2012). In educational settings, school-related self-efficacy has been found to correlate with various forms of motivation, including amotivation, along a motivational continuum (Blanchard et al., 2013). Within this framework, task orientation is positively associated with motivational variables linked to high self-determination, whereas ego orientation corresponds to low self-determination (Ntoumanis, 2001b). Similarly, perceived competence, a key construct related to self-efficacy, predicts both highly self-determined and low self-determined motivational variables (Ntoumanis, 2001b). These findings underscore the critical role of self-efficacy in PE, as it significantly influences student motivation and engagement. To enhance both, autonomy-supportive teaching and task-involving climates have been recognised as effective strategies (Langdon & Wittenberg, 2019; Liukkonen et al., 2010; Perlman, 2013a, 2013b). By promoting student autonomy and competence, these instructional approaches align with broader evidence on the interplay between self-determined motivation and self-efficacy, further reinforcing their role in optimising motivation and participation in PE settings. Another pedagogical approach, Meaningful PE, which did not emerge in our review but has gained increasing attention in the literature, also merits consideration (Beni et al., 2021). Meaningful PE emphasises creating meaningful experiences for students, defined as experiences that hold personal value or significance within PE lessons (Bennie et al., 2017). This approach is characterised by positive social interactions, enjoyable activities, and the development of motor skills (Bennie et al., 2017). Its underlying principles partly resonate with SDT, in particular, in terms of identified regulation, which is described within the SDT literature as motivation to engage in a task because of its value or personal relevance (Ryan & Deci, 2017).

Moreover, emerging evidence suggests that positive emotions contribute to students' motivation and engagement in PE (Løvoll et al., 2020). While this area remains underexplored in PE, broader educational research supports the link between emotion, motivation, and academic performance (Pekrun & Linnenbrink-Garcia, 2012). The cognition-motivation model of emotion suggests that emotions influence both cognitive processing and motivational states, ultimately shaping engagement in learning environments (Li et al., 2020).

4. Addressing environmental and policy-level barriers

Finally, this review also highlights environmental barriers to student engagement in PE, which require policy-level reforms in PE curricula, teacher education, and resource allocation. These include curriculum limitations (e.g., PE content with insufficient emphasis on lifelong PA or inclusivity), inadequate teacher training (e.g., limited preparation in need-supportive pedagogies or specialist knowledge at the primary school level), and a lack of school resources (e.g., poor time allocation for PE, particularly in primary education). While such barriers exist across all school stages, they appear especially pronounced in primary schools, where generalist teachers often receive minimal PE-specific training and where instructional time for PE is most constrained (Lynch, 2024). Emerging research also underscores the importance of trauma-informed approaches to PE, which address the impact of students' trauma and toxic stress (often rooted in systemic challenges such as poverty, violence, and hunger) on their ability to learn and

engage (Ellison & Walton-Fisette, 2022). This perspective reinforces how broader environmental and societal-level factors shape engagement in PE and highlights the need for structural, in addition to pedagogical, solutions. Addressing these issues aligns with the social ecological model, which views behaviour as shaped by interacting influences at the interpersonal, organisational, community, and policy levels (Golden & Earp, 2012). Efforts to enhance student engagement in PE should not merely focus on motivational factors and proximal mechanisms of action but also acknowledge and target underlying factors at a broader level.

5. Student engagement from childhood to adolescence

The studies included in this review covered a wide age range (6–16 years) without a strict differentation by school stage. However, it is important to discuss age- and contextspecific influences when examining patterns of engagement in PE. Student engagement can change substantially with age, due to cognitive, emotional, and social development (Fredricks et al., 2004). Younger children (ages 6–10) often display high behavioural and emotional engagement driven by curiosity and play, while adolescents (ages 11–16) show more cognitive and agentic engagement influenced by peer norms, identity, and self-consciousness (Eccles & Roeser, 2011; Wang & Eccles, 2013). These developmental shifts may influence how MoAs such as motivation, self-efficacy, and social influences are experienced. For instance, adolescents in late middle school and early high school years tend to place greater importance on reputational status than younger children (LaFontana & Cillessen, 2010). Likewise, beliefs about capabilities become more stable with age, affecting how students respond to feedback and challenge (Muenks et al., 2018). Recognising these patterns highlights the need for developmentally responsive pedagogy, e.g., by emphasising play and competence-building in early years, and agency, relevance, and social connection in adolescence (Skinner et al., 2009).

Beyond developmental differences, systemic and institutional factors also shape engagement trajectories. One critical distinction is the perceived value of PE, which often shifts over time, particularly during secondary schooling. In the later stages of adolescence, students increasingly prioritise academic subjects that are tied to exam performance and future career prospects. Consequently, core (non-examination) PE may be perceived as less valuable, especially in school systems where PE is marginalised or allocated fewer resources (Casey & O'Donovan, 2015). Academic pressure in upper secondary education may further displace engagement in PE, as students view it as less instrumental to educational attainment (Fenandez-Rio et al., 2025).

Another important structural factor is the level of teacher specialisation in PE, which varies substantially across school stages and countries. In many education systems, primary PE is delivered by generalist teachers with limited training in physical education, while secondary PE is taught by subject specialists (Hodgkin, 2018). This distinction can impact the breadth and quality of PE provision, shaping students' early experiences and influencing long-term motivation and skill development. The absence of specialist knowledge in primary school can limit exposure to inclusive, developmentally appropriate PE, potentially undermining the foundations for engagement established in early years.

6. Future directions for research and interventions

In sum, this review underscores the complex interplay of social, motivational, environmental, and psychological factors shaping student engagement in PE. While teacher-student relationships and peer interactions emerged as central determinants, gender norms, motor competence, and classroom-level motivation also played significant roles. Addressing engagement barriers will requires reforms to teacher training, curriculum redesign, and targeted behavioural interventions, such as peer-support, feedback, goal-setting strategies. Future research should further investigate the reciprocal influences between students and teachers, particularly in relation to teacher disengagement and student motivation. Additionally, clarifying the distinctions between motivation and engagement will be essential for advancing both theoretical frameworks and practical interventions in PE.

In considering these future directions, it is also important to situate our review within the broader field of PE research. A substantial body of literature has explored sociological dimensions of student (dis)engagement, including themes of marginalisation, inclusion, and gendered practices, within physical education and more general educational contexts (Kirk, 2009; Nabaskues-Lasheras et al., 2020; Riddle et al., 2024). While these contributions may not have been fully represented in this review, partly due to the use of different terminology or a lack of explicit reference to 'student engagement', they nonetheless address factors that shape engagement directly or indirectly. Future research in this area may benefit from more deliberately bridging psychological and sociological perspectives to develop a more comprehensive understanding of student engagement in PE.

Behaviour change techniques for student engagement in PE

The MoAs and contextual factors discussed above highlight several pathways through which engagement can be fostered in PE. BCTs provide a practical means of targeting these pathways, offering concrete directions for intervention design. Building on these findings, the most promising BCTs identified in this review include social support, social comparison, instruction on how to perform behaviour, behavioural practice/rehearsal, graded tasks, information about others' approval, and goal setting. These BCTs were frequently referenced across multiple MoAs, highlighting their potential relevance in enhancing student engagement in PE.

Importantly, the BCTs identified in this review align closely with those reported in previous research in educational settings, including but limited to PE. While school-based PA is broader than curricular PE, Kelso et al. (2020) systematic review of school-based interventions for PA found that 82% of included studies were conducted in PE lessons, underscoring the direct relevance of these BCTs. The strong overlap between their findings and ours further supports the effectiveness of the TaT Tool in detecting potentially relevant BCTs. However, the successful application of these BCTs depends on their alignment with SDT principles, particularly their ability to support students' basic psychological needs for autonomy, competence, and relatedness (Ryan & Deci, 2017). For example, social support can enhance engagement, yet its effectiveness depends on how it is conveyed by teachers. To foster engagement, teacher-provided social support should be delivered in a way that respects students' perspectives, demonstrates unconditional

regard, and offers constructive feedback to facilitate skill development (Ahmadi et al., 2023). Likewise, goal setting is most effective when framed in a self-referenced and competence-supportive manner, rather than as a means of external comparison or pressure. While the identified BCTs show promise for improving student engagement in PE, their successful implementation relies on adequate teacher training. Increasing student engagement requires parallel shifts in instructional strategies and class climate. Thus, beyond student-directed BCTs, additional techniques may be necessary to support teacher training and ensure the sustained adoption of engagement-enhancing practices in PE lessons. Further research is also needed to determine which BCTs are most effective for increasing engagement among amotivated students. A crucial first step in this direction is to examine the factors contributing to amotivation. For instance, Ntoumanis et al. (2004) identified learned helplessness beliefs, low psychological need satisfaction, and contextual barriers as key contributors to amotivation in PE. Encouragingly, these findings closely align with those of the present review, reinforcing the importance of addressing these mechanisms in future interventions. Finally, while existing interventions in PE have incorporated elements of BCTs and MoAs, they often lack explicit references to these constructs in intervention manuals and training materials. This highlights an urgent need for future interventions to systematically integrate BCTs into programme design and implementation. Future studies should evaluate these BCTs within the most critical MoAs identified in this review, ensuring that they are rigorously tested and applied in ways that optimise engagement outcomes in PE settings. Notably, several of these BCTs may be already present in PE teacher training and pedagogical practice, but without standardised behaviour change terminology. Their alignement with the BCT literature can, therefore, enhance comparability and integration into intervention design.

In summary, this review highlights the key BCTs that can enhance student engagement in PE, emphasising their alignment with previous research and their dependence on SDT principles. While these techniques hold promise, their effectiveness relies on adequate implementation, particularly through teacher training, instructional adaptation, and structural changes within schools. Addressing amotivation and systematically integrating BCTs into intervention design remain critical areas for future research. By rigorously testing these techniques aligned with the most relevant MoAs, future interventions can better foster students´ motivation and participation in PE.

Limitations and strengths

This study has some limitations and strengths that warrant consideration. First, as a scoping review, it does not assess methodological quality and risk of bias and therefore cannot provide conclusive evidence on our research questions (Pollock et al., 2023). Only one fifth of the included studies were randomised controlled trials or systematic reviews, most of which focused on the effects of need-supportive teaching and pedagogical models on students' motivation and engagement in PE. Hence, the findings should be interpreted with caution. Nonetheless, this review lays the foundation for trials examining the role of MoAs and the effects of relevant BCTs in interventions taking place in PE. Secondly, given the importance of SDT and need-supportive interventions in educational settings, the TaT Tool may be limited as it does not include detailed motivation-related BCTs (i.e., relatedness-support, autonomy-support, and competence-support techniques) (Teixeira et al., 2020). Future

research should assess how the teacher motivational behaviours classification in Ahmadi et al. (2023) map on the MoAs and explore ways to expand the TaT Tool. Thirdly, interpretation of age- or grade-related differences was limited, as studies reported age in various formats (e.g., ranges, single ages, or means), and school grades (i.e., year groups) differ across countries. No study compared all year groups within the same school system; comparing different year groups across countries may introduce confounding of age with country-specific effects. Future research should examine age-related differences more systematically within a single country or school system.

Despite these limitations, the study offers several strengths that contribute meaningfully to the field. This review makes a novel contribution to research on interventions in PE and student engagement, as previous studies applying MoA and BCT frameworks in this context are non-existent. By identifying key MoAs and corresponding BCTs, this study lays the groundwork for more targeted and theoretically informed interventions in PE. The use of the 26 MoAs in the coding process provided a structured, evidence-based approach for categorising MoAs. The application of frameworks, such as the TaT Tool, to map MoAs onto BCTs supports ongoing efforts in behavioural science to facilitate comparisons across studies and synthesise evidence, enhancing the quality of the evidence base in the field of behavioural science. Overall, this review offers valuable insights and a solid foundation for future research aimed at developing more targeted, evidence-based interventions to enhance student engagement in PE.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Data availability statement

Data is available upon request to the corresponding author.

ORCID

Chiara Cimenti http://orcid.org/0009-0002-7302-4911
Cecilie Thøgersen-Ntoumani http://orcid.org/0000-0003-0255-1263
Kristina Pfeffer http://orcid.org/0009-0001-3680-0048
Peter Krustrup http://orcid.org/0000-0002-1461-9838
Paulina M. Schenk http://orcid.org/0000-0002-5239-1977
Nikos Ntoumanis http://orcid.org/0000-0001-7122-3795

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