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Original article

Implementing physically active learning: Future directions for research, policy, and practice

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Abstract

Objective: Identify co-produced multi-stakeholder perspectives important for successful widespread physically active learning (PAL) adoption and implementation.

Method: A total of 35 stakeholders (policy makers, $n = 9$; commercial education sector, $n = 8$; teachers, $n = 3$; researchers, $n = 15$) attended a design thinking PAL workshop. Participants formed 5 multi-disciplinary groups with at least 1 representative from each stakeholder group. Each group, facilitated by a researcher, undertook 2 tasks: (1) using Post-it Notes, the following question was answered: within the school day, what are the opportunities for learning combined with movement? and (2) structured as a washing-line task, the following question was answered: how can we establish PAL as the norm? All discussions were audio-recorded and transcribed. Inductive analyses were conducted by 4 authors. After the analyses were complete, the main themes and subthemes were assigned to 4 predetermined categories: (1) PAL design and implementation, (2) priorities for practice, (3) priorities for policy, and (4) priorities for research.

Results: The following were the main themes for PAL implementation: opportunities for PAL within the school day, delivery environments, learning approaches, and the intensity of PAL. The main themes for the priorities for practice included teacher confidence and competence, resources to support delivery, and community of practice. The main themes for the policy for priorities included self-governance, the Office for Standards in Education, Children's Services and Skill, policy investment in initial teacher training, and curriculum reform. The main themes for the research priorities included establishing a strong evidence base, school-based PAL implementation, and a whole-systems approach.

Conclusion: The present study is the first to identify PAL implementation factors using a combined multi-stakeholder perspective. To achieve wider PAL adoption and implementation, future interventions should be evidence based and address implementation factors at the classroom level (e.g., approaches and delivery environments), school level (e.g., communities of practice), and policy level (e.g., initial teacher training).

Keywords: Children; Physical activity; Physically active learning; Policy; School

1. Introduction

The majority of children and young people do not accumulate the recommended 60 min of daily physical activity (PA).[1,2] With increasingly sedentary pursuits dominating leisure time,[3] the World Health Organization[4] has identified the essential role that schools play in creating a more active society. Concurrently, schools present the only setting where all youth, irrespective of social background, can be engaged for an extended period of time.[5]

Unfortunately, a school day largely consists of seated lessons. To decrease sedentary time among children and young

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people and "expand" PA into normal curriculum lessons,[6] physically active learning (PAL), the integration of PA into lessons in learning areas other than physical education (PE),[7] has grown in prominence. Systematic reviews and meta-analyses suggest that there are beneficial effects of acute[8] and chronic[7,9–11] PAL interventions on PA, health, cognition, and academic performance. Moreover, unlike other segment-specific school-based PA interventions,[12] a recent large-scale randomized controlled trial has established that PAL can benefit all demographic subgroups.[13]

Given that the use of PAL has expanded internationally to increase PA across the school day, it is often used as a part of a whole-school approach.[14] One of the earliest examples was "Action Schools! BC", which began with a case study, expanded to a large randomized controlled trial, and was later distributed throughout the province of British Columbia.[15] A similar trajectory is occurring with the Finnish "Schools on the Move" program[16] and with Norway's "Active Smarter Kids" program,[17,18] which has lead to the establishment of a center for PAL to support schools and teachers with competence-building programs, resources, and equipment.

Despite these initiatives, the broader uptake of PAL is disappointing. Even in randomized controlled trials, more than one-third of teachers fail to implement 15 min of PAL per day.[19] This occurs despite the fact that teachers recognize PAL's benefits and the degree to which students enjoy PAL.[20–22] Barriers to implementing PAL include concern for class disruption, lack of time to prepare and implement the program, lack of knowledge and training, resistance from parents, and a shortage of appropriate space for delivery.[21,23–26] These barriers are consistent with previous curricular changes that have been attempted in schools, including increased problem solving for mathematics[27] and the inclusion of special education students in mainstream classrooms.[28] Both of these initiatives have required substantial modification of teaching approaches, new teacher training, and increased investment. Through these efforts, the 2 initiatives have now been fully embraced in countries across the world. This successful uptake of educational innovation raises the question as to how a similar change in the implementation of PAL can be achieved.

Previous research has used the socio-ecological framework[29] to establish factors that influence PAL implementation at each layer of the school environment.[25,26] Yet, the outcomes are generated from teachers only,[21,24–26] which may present a limited understanding of factors beyond the classroom that affect PAL implementation. To provide insights into the broader contexts needed to create the most effective PAL interventions, there is a need to capture perspectives of policymakers, the commercial education sector, teachers, and even researchers, all of whom are in a position to support PAL efforts.[14,30,31] Furthermore, from a whole-systems perspective,[30,32] these insights should be produced collaboratively (co-designed) rather than capture the understanding of each stakeholder group in isolation. Therefore, the aim of the present study was to identify multi-stakeholder perspectives deemed important for successful widespread PAL implementation and adoption.

2. Methods

2.1. Participants

Participants were invited to a PAL symposium and workshop at the lead author's institution in October 2017. The event was advertised through a regional PA network, on social media platforms, and through word of mouth. Attendees were notified prior to the event, and again on the day of the event, that the workshop would be recorded and used for data collection. Participants were informed that participating in the research was optional. In total, 35 participants provided written consent. Prior to commencement of the study, ethical clearance was provided by the Leeds Beckett University Ethics Committee (No. 38830).

The participant sample included researchers, policymakers, teachers, and representatives from the commercial PAL sector (Table 1). In total, 8 participants were qualified teachers with school-based experience, with 3 teaching in schools and 5 working in professions aligned with education ($n = 8$, with a total of 139 years of collective school-based teaching experience). Furthermore, 19 participants actively supported schools by providing PA, PE, and school sport programs.

2.2. Procedure

After the symposium, participants took part in a workshop that explored key and emerging questions around national-level implementation and adoption of PAL lessons within the UK. The workshop was informed by a design thinking approach, a method that provides a solution-based approach to

Table 1
Participant summary.

Stakeholder group ($n = 35$)	Typical roles	Time in current role, years, mean (range)	School-based experience, years, mean (range)
Researchers ($n = 15$)	PhD student, senior lecturer, research associate, reader, professor	4.3 (1.0–13.0)	2.1 (4.0–22.0)
Policy/local authority ($n = 9$)	Public health lead, active schools manager, physical activity officer, behavior change specialist	3.3 (1.0–7.0)	4.4 (0.0–40.0)
Teachers ($n = 3$)	Physical education specialist teacher, primary teacher	16.7 (8.0–32.0)	16.7 (8.0–32.0)
	Managing/commercial directors of PAL private companies, specialist PAL advisors	3.8 (1.0–9.0)	4.0 (0.0–20.0)

Abbreviation: PAL = physically active learning.

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solving problems.[33] Rather than problem focused, design thinking is an action-oriented approach toward creating a desired future.[33] The present study drew primarily from the ideation phase of design thinking, which places a strong emphasis on brainstorming.

Within the workshop, participants were arranged into 5 heterogenous and multi-disciplinary groups (e.g., Group 1 (G1), Group 2 (G2) and so forth), each with a minimum of 1 representative from each of the 4 stakeholder groups. The individuals in each group, facilitated by a researcher (paper author) were asked to introduce themselves and their backgrounds before being invited to engage with the following 2 tasks.

> *Task 1—Post-it Notes task: "Within the school day, what are the opportunities for learning combined with movement?"*

Participants were provided with Post-it Notes in order to identify opportunities for learning combined with movement within the school day. Participants were encouraged to share and discuss these among the group. During brainstorming, no idea was rejected or dismissed as being too far fetched, which is a central feature of the design thinking approach.[33] Concurrent discussions were audio-recorded in an informal focus group setting. Resulting Post-it Notes for each group were presented for viewing by other groups during a period of sharing and reflection. After this viewing, participants reconvened in their separate groups and were (1) encouraged to add further ideas to their original list and (2) asked to denote the PA intensity and school context of the identified activity opportunities.

> *Task 2—Washing-line task: "How can we establish physically active learning as the norm?"*

After completing Task 1, participants wrote key objectives for policy (red pen), research (black pen), and practice (green pen) on postcards. Each group's cards were hung on the lowest of 3 horizontal string lines. Each group then ranked its objectives from highest priority (top line) to lowest priority (bottom line). To encourage critical discussion, a maximum of one-third of the responses were allowed on the top line. Each group was then encouraged to view the lines of the other groups. Afterward, each group was prompted to review its own objectives, add new objectives, and re-prioritize if appropriate. Finally, each group prioritized the objectives that were on the cards on the top line (highest priority). All of the discussions during these activities were audio recorded on Dictaphones.

2.3. Data analysis

Group discussions were transcribed verbatim and analyzed inductively.[34] Four authors (ADS, TQ, VSJA, and JLM) read the transcripts and coded the data via a process of open coding.[35] The authors then met to discuss their independent analysis and emerging patterns. This process required the data to be coded into main themes and subthemes, with all 4 authors describing their individual justifications.[35] Discussions among the 4 authors resulted in a consensus regarding theme selection. These patterns were identified using primarily an inductive (bottom-up) approach, which ensured that emergent themes were strongly linked to the data without trying to fit them into a preexisting coding frame. As a part of this process, negative cases were sought in order to expand, adapt, or restrict the emerging themes,[35] although no negative cases were identified. Afterward, the emergent themes were assigned to 4 predetermined categories: (1) PAL design and implementation, (2) priorities for practice, (3) priorities for policy, and (4) priorities for research. These categories were chosen due to the requirements of a whole-system approach to co-design an active lifestyles intervention.[30] The main themes are highlighted within each category and then subsequently discussed, based on the underlying subthemes.

3. Results and discussion

3.1. PAL design and implementation

Four subthemes emerged: (1) PAL opportunities, (2) delivery environment, (3) learning approaches, and (4) intensity of PAL (Appendix A, Table 1).

3.1.1. PAL opportunities

> *Is the outcome of active learning to use learning or education to get people more active or is it to help people to learn whilst being active? Which way round is it, or is it both?* (G1)

Participants suggested multiple opportunities for PAL delivery, including outside the classroom. Opportunities beyond the classroom were framed around questioning if PAL is a means of integrating PA into the school day, or a tool to enhance learning through PA. It could be argued that this is a false dichotomy—PAL provides the means to achieve a dose of PA sufficient to improve health[17,19] while also improving the approach to learning.[36] Further discussion identified when opportunities might occur within the school day. This notion reflects the flexibility inherent in PAL. Implementation could focus on curriculum delivery, learning methods, or key periods when pupils sit the longest. There was consensus that delivery could occur throughout the school day, and that a chronological structure is useful for framing delivery opportunities, especially to those new to PAL. Delivery opportunities identified across the school day included classroom lesson time, break or recess and lunch time, homework, before and after school clubs, school trips, sports days, celebration days, and school challenges.

3.1.2. Delivery environment

A key theme to emerge within the discussions around PAL implementation focused on the need to embrace a wider definition of the term "classroom."

> *[S]o changing the word "classroom" but without necessarily changing the classroom. So, yeah, just moving in different environments of the school, taking our association of what the classroom is.* (G2)

For PAL delivery within the classroom, discussions focused on tensions between the desire to achieve higher PA intensity and to increase learning. Suggestions for enhancing PA and

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overcoming typical classroom barriers[25] included making small adaptations to the classroom such as "chucking the chairs away" (G3) or introducing "exercise balls" (G1). G1 was keen to stress that such changes *"immediately changed the way the children learnt."* Although these approaches would likely decrease the time spent sedentary and enhance light PA,[8] which is supported by previous research, it was suggested that more intense activity could be achieved if PAL were implemented outside the classroom.[37]

Embracing nontraditional learning spaces provided a novel insight. As 1 group suggested, *"We've got specialist schools that use absolutely every element of their school including corridors. So that whole thing of not hanging round corridors, it doesn't exist in this school"* (G2). While challenging the typical use of corridors, these were still seen as confined spaces. Greater potential was seen if the entire school was used as a learning space, including halls, playgrounds, and green space.

3.1.3. Learning approaches

The classroom-based learning approaches identified in the current study, matched those seen in previous research,[9] and were summarized as drill and practice of (new) factual information, answering questions using physical responses and active quizzes.[36] Although G2 was unable to provide research evidence showing positive educational outcomes, the value of other approaches, including learning circuits, was discussed:

> *So I did a history lesson with primary school kids. . . . there was one table where I buried artefacts in sand, then they had to solve an Egyptian puzzle with hieroglyphics. It was such a nice lesson; even though it was quite labor intensive to set up, it ran itself perfectly. And every time the music started they'd move on, so if we could have more lessons like that.* (G2)

The approach to PAL seems to vary with the setting. For example, participants suggested that environments beyond the classroom could be used to provide a greater opportunity for more moderate-to-vigorous PA (MVPA): *"retrieving letters in the playground"* (G2), *"matching games in the hall"* (G2) and *"computing skills games through moving*" (G3). In addition, green space was highlighted as an approach to achieve learning objectives: *"go outside and measure lengths of grass"* (G2). In this case, PA was seen as a byproduct of the outdoor lesson rather than a key outcome for the lesson. Thus, the matching of the approach to the environment was central to the expected dose of PA, defined by duration and intensity.

3.1.4. Intensity of PAL

Stakeholders discussed the intended outcome of PAL as a factor that influences the intensity of delivery: *"Sometimes you only have it as a light activity, sometimes you may want to have it as a vigorous activity"* (G5). There was a recognition that the intensity required to deliver health benefits is important. However, this was tempered by an appreciation that it may not be feasible for schools to focus on meeting intensity targets when starting to implement PAL, for example, *"to try to contribute to 60 min of MVPA"* (G1). Moreover, the intended intensity level may be dependent upon the desired learning outcome: *"the classroom constraint is it's not a physical environment and if most activities are moderate to vigorously active you're not going to be able to learn"* (G3). These issues related to the intensity of PAL are a particularly novel finding that has received little or no attention in previous literature.

Finally, 1 participant stated that the intensity of delivered PAL may be dependent upon the school culture toward PA and the *"capability and the confidence of the teachers"* (G5) in delivering varying levels of intensity.

3.2. Priorities for practice

This second category discusses the main emergent themes for practice and practitioners and explicitly explores challenges associated with (1) teachers confidence and competence, (2) resources to support delivery, and (3) a community of practice (Appendix A, Table 2).

3.2.1. Teacher confidence and competence

Despite an awareness of the potential positive experiences that PAL can facilitate for pupils,[38] in agreement with previous studies there was recognition among participants that a lack of awareness and knowledge about how to effectively introduce PA into classroom learning was a potential barrier and area for future consideration.[20,23,25,26] This finding seemed to center around a lack of competence due to minimal training or continuing professional development:

> *Teachers could have all the knowledge in the world about the benefits of physical activity but if they don't know how to implement it then there's just no point having it.* (G5)

Alongside a lack of awareness about how PAL might be implemented, where and when to use it, and how it might be sustained throughout a period of time, participants also identified a lack of teacher confidence as a central barrier to implementation, for example, "*knowledge, passion, skill base, confidence, the main thing is confidence isn't it?"* (G2). This lack of confidence was central and is in agreement with previous research in that it stems from worries around classroom management.[23,25] In order for teachers and teaching assistants to use more PAL methods, it seemed imperative to the participants in our study that the teachers and teaching assistants feel confident with a more "chaotic" classroom and with being less "in control" of the pupils.[23,25]

These findings are reflective of the broader literature, which suggests that the integration of PA into classroom lessons could pose problems for teachers who lack confidence.[25,39] Similarly, self-efficacy has been suggested as a key barrier to integrating activity into classroom contexts.[40,41] In addition, the present study points to reasons why the "table-centric" concept consistently prevails in classrooms, with an inhibition and fear to deliver PAL methods leading to a lack of creativity and innovation in teacher practice.[25,40]

3.2.2. Resources

In line with developing teachers confidence and competence, participants recognized the availability of resources as a

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potential barrier and highlighted the need to support practitioners in better ways. When discussing the priorities for practice, one of the participants suggested:

> *It's a little bit of understanding but for me where that falls down is we don't necessarily have the resources for teachers to be able to implement that in lessons. So, we'll give all this information, but then it's up to the teacher to go on and write the lesson plans and maybe that's something.* (G1)

> *I suppose for practitioners it could be incorporation with schemes of work. So every scheme of work or schemes of work has to have an active learning component in a scheme of work.* (G4)

Hence, in order to support teachers confidence and competence and provide them with the knowledge of how to incorporate PA into their lessons, resources and ready-made schemes of work could be made available. Providing resources to support the facilitation of PA may also reduce the time required for preparation, which may act as an additional barrier for practitioners.[21,25,26]

3.2.3. A community of practice

Finally, participants spoke about the need for practitioners to engage in a community of practice.[42] They identified the need for teachers to share their passion and enthusiasm for PAL with colleagues in a supportive environment, and one in which they could learn from each other.

> *A sharing of best practice yeah, I think that's something that's always, you know leaders, lead practitioners, leaders or active learning within an authority. Lead schools? Active learning lead school? Like we have active learning, like we have sport colleges, so we're an active lead.* (G4)

While specific to PAL, our findings reflect the use of community of practice described within the broader whole-school PA literature.[43–45] Given PAL's similarity to whole-school PA implementation, participants recognized the need for an in-school "PAL champion" at the micro-level to actively lead PAL provision.[26,46] Connecting to the wider PAL community at the macro-level was also deemed important. However, widening the community of practice beyond trusted networks has previously proved challenging due to a lack of trust and familiarity. One solution is the use of private, tailored virtual networks.[45] Yet, at present, there is a limited understanding about the essential characteristics required to create successful virtual PAL multi-stakeholder networks.

3.3. Priorities for policy

This third category explores key emergent themes of (1) self-governance (the role of senior management teams), (2) the Office for Standards in Education, Children's Services and Skill (Ofsted), UK Schools Inspectorate (its power in governance, accountability, and competence) and (3) the need for policy investment in initial teacher training (ITT) and curriculum reform (Appendix A, Table 3).

3.3.1. Self-governance: the role of senior management teams

> *With the head teacher on board it helps massively. It really does yeah … outstanding schools have an active policy within their curriculum. So they have active aspects of what they're actually doing, which is huge.* (G5)

The UK National Activity Plan[47] came into effect in 2011, offering educational authorities the opportunity to integrate PAL within schools. Coupled with the Primary PE and Sports Premium Scheme allocation of £320 million per year (approximately £16,000−£20,000 per school),[48] this provides a prime opportunity for UK schools to adopt PAL. However, as previously identified, embracing PAL across the core curriculum and creating policy reforms are significant challenges.[26]

Encouragingly, the Department for Education[48] (DfE) has now recognized PAL (under the caveat of "active teaching") within the Sports Premium guidance. However, delegates stressed, as has been suggested in previous literature, that the extent to which PAL can be successful is still subject to the "*systems, support, permission or even obligation*" (G4) by the senior management team and ultimately by the head teacher.[20,26,49] While the Teacher Standards Framework (Standards 2, 4, and 5) emphasizes the need for schools to self-govern their approach,[50] a focus on the school is often determined by the policy direction of the external school education inspectorate.

3.3.2. Ofsted: Its power in governance, accountability, and competence

> *Certainly the academic performance is the driver, and Ofsted are increasingly looking at health and well-being. So if you can have an additional offer in your school it can give you … well it won't be measured officially, it's one of those additional things that they … The impact measured might be improved academic grading, but it will also increase activity levels as well.* (G1)

The current UK-based Ofsted Assessment Framework[51] and inspectorate provides judgements on the overall effectiveness of leadership and management, quality of teaching, learning and assessment, personal development, behavior and welfare, and outcomes for pupils.[51] In agreement with previous literature,[26] most discussions supporting this theme emphasized that if PAL did "*not directly support academic results then it was questionable whether it would be likely to be supported by the educational setting*" (G4). A need for PAL to be compatible with Ofsted criteria was considered and discussed extensively within the workshop. Concurrently, participants also highlighted their concerns with the lack of expertise that inspectorates currently hold when assessing PA, PE, or PAL.

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The inspectorate aren't probably the people that would be, shouldn't be looking at PA. part of my role was tracking Ofsted reports over the last couple of years with regard to Ofsted comments around PE and Sport Premium and PA and sport. . . . ninety percent of reports there wouldn't even have a comment. (G5)

Moreover, delegates stressed a need for top-down curriculum reform by the DfE: *"The government . . . where it all comes from ultimately. . . where the DfE will say 'right . . . like you have to . . .', it has to be a national (strategy)"* (G2). Additionally, solution-focused discussions around current DfE enforcements were also suggested, for example, "*get rid of SAT(s) . . . So policy, remove what's the barrier, which then has a knock on effect"* (G5). Finally, on top of the recognition of Ofsted being essential in PAL implementation, the requirement for PAL to be embedded in ITT programs was emphasized.

3.3.3. Need for policy investment in ITT and curriculum reform

Students who are going into teacher training, they're getting a minimal amount of PE training. They get 2 h out of the full . . . that sort of needs to be changed so they can have a better understanding. (G1)

Investment in more hours for PAL within ITT was seen as a policy that could positively impact PAL implementation. Integration of PAL within ITT has previously shown promise in increasing teachers' confidence and creating more in-service PAL opportunities.[31] However, because there continues to be limited "accountability" of policy benchmarks, it is questionable how sustainable this may be after ITT.

In conclusion, a rethink of the Ofsted inspectorate "accountability" framework is needed. Curriculum reform could be seen as an opportunity for policymakers, commissioners, school management teams and teachers to adopt PAL within school strategies,[20] with self-governance at the school level. The School Sports Premium funding also offers schools an opportunity to move beyond the historic "sports" discourse and effectively implement PAL across the whole-school system.

3.4. Key research priorities

The final category explores 2 main research themes: (1) establishing a strong evidence base of PAL benefits and (2) exploring how PAL can be implemented in schools. In addition, the overarching theme of a whole-school system to support the implementation and sustainability of PAL within schools was discussed (Appendix A, Table 4) by the participants.

3.4.1. Need for a strong evidence base

If you haven't got the evidence to demonstrate that it's going to work then are you gonna get the buy in? . . . Is there any point trying to parachute in with this if actually the schools don't buy into it? (G1)

The discussions among participants in our study indicated that practitioners and policymakers wanted evidence on the effectiveness and sustainability of PAL, particularly for outcomes of relevance to them, such as academic achievement. Several studies have reported positive effects of PAL, including improved PA, learning outcomes, on-task behavior, enjoyment during lessons, and decreases in student body mass index.[7,8–10,52] Consistent with our workshop discussions, previous research identifies a need for more high-quality studies (to strengthen the evidence base), longer term follow-up measures (to understand sustainability) and more studies conducted in real-world settings to understand the external validity of PAL benefits that have been observed in controlled settings.[53]

Workshop attendees suggested that measures of program effectiveness relevant to policymakers and practitioners (e.g., academic achievement and mental health) may facilitate greater buy-in and adoption.[54,55] Analysis of differential effects of PAL interventions may also provide evidence for the value of PAL, particularly if found to benefit demographic groups commonly identified as priority targets for public health or educational interventions, for example, low socio-economic status groups or overweight children.[13] Furthermore, it was suggested that more effective dissemination strategies might be required to draw the attention of policymakers and practitioners to the current evidence base on PAL effectiveness.[56]

3.4.2. Need for evidence on successful implementation

Teachers could have all the knowledge in the world about the benefits of physical activity. . . . if they don't know how to implement it then there's just no point. (G5)

Workshop discussions indicated a need for evidence on how teachers and schools can effectively implement PAL. Research on PAL implementation is in its infancy.[55] The few studies exploring implementation of PAL strategies have identified predictors (e.g., the teacher's perceived competence) and challenges (e.g., standardized testing pressures) and have suggested that intervention among pre-service teachers could increase the implementation of PAL.[57,58] Initial findings on predictors and barriers provide valuable guidance for the design/delivery of PAL interventions, but more evidence on effective implementation is needed, particularly given the wide range of PAL strategies and variation in school environments. To provide greater insights, future studies should progress beyond retrospective process evaluations and instead collect context-specific information on implementation throughout the PAL program.[55]

Workshop attendees expressed the need for specific guidance on how to implement PAL within the classroom. More research on implementation and outcomes is needed before evidence-based recommendations on the type, time, intensity, and frequency of PAL strategies for preschool, elementary/primary, and high/secondary schools can be recommended.[58] The widely

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varying physical and social environments of schools means that any guidance resources must allow for context-specific tailoring.[59] Process evaluations capturing context-specific tailoring of PAL will be particularly helpful for identifying effective strategies for integrating movement into the classroom.

Evidence suggests that the implementation of PAL provides benefits for—or at least does no harm to—children's PA, learning, attention, and enjoyment during class and weight status.[7,8–10] More evidence is needed on the benefits and sustainability of different types of PAL (e.g., active lessons *vs.* movement breaks) across different school settings (e.g., preschools, primary/elementary schools, high/secondary schools). PAL implementation research is emerging and has the potential to elucidate differences in outcomes across settings and support the effective introduction and maintenance of PAL. High-quality studies in real-world settings are needed, and rigorous process evaluations that begin at initial implementation and capture context-specific tailoring will be particularly helpful for informing the direction, design, and delivery of PAL interventions.

4. Summary

This is the first study to examine multi-stakeholder perspectives on a broad range of challenges and opportunities regarding the design and implementation of PAL in schools. The unique results move beyond teacher views that dominate the current literature,[25,26] providing a co-produced perspective from policymakers, teachers, the commercial education sector, and researchers. As a result, the outcomes have implications beyond the classroom setting and raise the importance of school- and national-level contextual factors, such as the need for funding and national policies. While it is challenging to establish and maintain multi-stakeholder partnerships, the unique insights from each stakeholder group are essential to the initial design and sustained implementation of PAL interventions. To increase success, programs must address challenges at the class, school and national policy levels of the socio-ecological framework.[29]

To enhance the translational impact of the current findings, we present a future directions model that summarizes our study outcomes in combination with the extant literature (Fig. 1). The model is underpinned by a socio-ecological framework and presents key implementation drivers within the context of the classroom, the school, and national policy. In the classroom context, competence and confidence among teachers influence their willingness to implement varied PAL approaches across different school environments. Combining the PAL approach and delivery environment influence PA and learning outcomes, which in turn determine the mode and level of implementation.

A reflection on these outcomes should inform future PAL delivery. In the school context, implementation is influenced by the senior leadership team, governors, school mission and vision, teacher performance management and appraisal, school improvement priorities, and parents.[25] In the national context, national education and health policies and ITT are essential in determining implementation. In Fig. 1, arrows are included within the model to demonstrate the direction and range of influence. Both bottom-up and top-down processes are required for sustainable and effective systems change.[32] Finally, the model is underpinned by research, which highlights the importance of evidence-informed decision making.

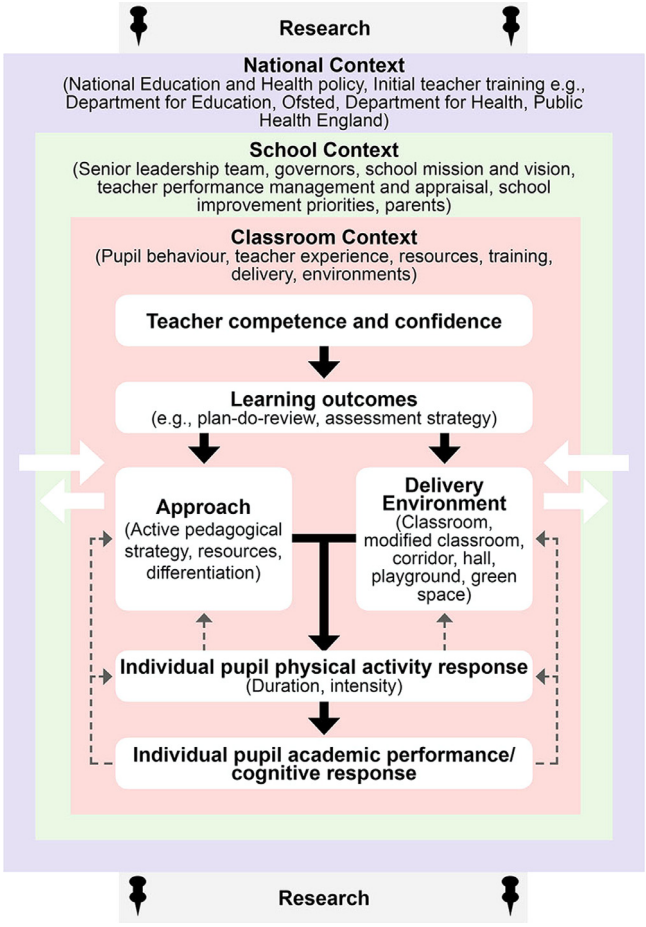

Fig. 1. A research-informed physically active learning (PAL) implementation framework. Ofsted = Office for Standards in Education.

This research supports and expands upon the current knowledge base on PAL adoption and implementation, both within and beyond the classroom. The main strength of the study is that it engaged policymakers, the commercial education sector, researchers, and teachers in co-producing outcomes. While the study outcomes are UK centric, they may be used to influence PAL implementation in culturally similar countries. To deepen understanding and address limitations of the current study, future work should (1) include head teachers, governors, parents, and pupils, (2) capture the number of years of the participants" PAL expertise, and (3) increase the number of practicing teachers within the sample.

In conclusion, our findings, summarized in Fig. 1, can inform future PAL intervention design through (1) establishing the importance of cooperation and communication among different PAL stakeholder groups, (2) highlighting challenges and opportunities for PAL implementation within the classroom, school and national contexts, and (3) providing a model that can inform future research, policy, and practice in relation to PAL.

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Authors' Contributions

ADS and TQ led the study conception and design, acquisition of data, analysis and interpretation of data and drafting the manuscript. VA and JM, ACR, CGBL, RA, and HD contributed to the acquisition of data, analysis and interpretation of data, and drafting the manuscript. JBB and GKR contributed to the analysis and interpretation of data and drafting the manuscript. All authors revised and edited the manuscript. All authors have read and approved the final version of the manuscript and agree with the order of presentation of the authors.

Competing interests

The authors declare that they have no competing interests.

Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.jshs.2019.05.007.

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