Getting a GRIP (getting research into practice) on movement integration in the school classroom

This item was submitted to Loughborough University's Institutional Repository by the/an author.

Citation: ROUTEN, A.C., CHALKLEY, A.E. and SHERAR, L.B., 2017. Getting a GRIP (getting research into practice) on movement integration in the school classroom. Physical Therapy Reviews, 22(3-4), pp.139-146.

Additional Information:

- This is an Accepted Manuscript of an article published by Taylor & Francis in Physical Therapy Reviews on 5 July 2017, available online: http://www.tandfonline.com/10.1080/10833196.2017.1306900.

Metadata Record: https://dspace.lboro.ac.uk/2134/26228

Version: Accepted for publication

Publisher: © Taylor & Francis

Rights: This work is made available according to the conditions of the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0) licence. Full details of this licence are available at: https://creativecommons.org/licenses/by-nc-nd/4.0/

Please cite the published version.
Getting a GRIP (getting research into practice) on movement integration in the school classroom

Ash C. Routen, Anna Chalkley and Lauren B. Sherar

School of Sport, Exercise and Health Sciences, Loughborough University, Loughborough, Leicestershire, LE11 3TU, United Kingdom.

Corresponding author:

Ash C. Routen Ph.D.

School of Sport, Exercise and Health Sciences

Loughborough University

Loughborough

Leicestershire

LE11 3TU

United Kingdom

a.c.routen@lboro.ac.uk

Word count including references = 6264
Abstract

In adults prolonged sitting is associated with a number of health sequelae including type 2 diabetes, cardiovascular diseases and all-cause mortality, and it has been suggested these negative health consequences may not be fully protected against by participation in physical activity. Altering ubiquitous environments for children to increase their opportunities to break or reduce extended sitting is therefore of key public health interest. Emerging research shows that physical activity can be introduced into the school classroom, through short activity breaks and by integrating movement into the learning of core academic content. This may help to improve children’s time on task, enjoyment of learning, and in some cases academic outcomes. This discussion paper briefly highlights some of the key research on movement integration in the classroom, discusses potential challenges and facilitators of implementation at a variety of levels (e.g. teacher, school, external stakeholder) and presents an on-going, innovative programme (CLASS PAL) as a case study of one approach to get research on classroom movement integration into routine teaching practice.

Keywords: School, classroom, sedentary, physical activity, implementation, co-production.
**Background**

Over the past decade there has been a proliferation of research focusing on reconceptualising ‘sedentariness’ as a distinct set of behaviours from those traditionally associated with physical activity (Tremblay et al., 2010; Owen et al., 2010; Hamilton et al., 2008). Previous scholarship in the field of physical activity and public health defined ‘sedentariness’ simply as an absence of sufficient levels of physical activity (e.g. not meeting public health guidelines focused on moderate-to-vigorous physical activity; MVPA) (Tremblay et al., 2010). In 2012 however, the Sedentary Behaviour Research Network published a now widely accepted definition (any waking behaviour characterised by an energy expenditure ≤1.5 metabolic equivalents (1 metabolic equivalent = rest) while in a sitting or reclining posture) highlighting that there is both a postural and physiological component to sedentary behaviours (Sedentary Behaviour Research, 2012).

Epidemiological evidence in adults has shown that the volume and patterning of various sedentary behaviours (e.g. workplace sitting, television (TV) viewing time) may pose a distinct risk for a range of deleterious health consequences (such as cardiovascular disease, type 2 diabetes, certain site-specific cancers and premature mortality (Biswas et al., 2015)), which may not be fully ameliorated by participation in MVPA. For example, in approximately 5,000 US adults accelerometer measured daily sedentary time was independently associated with increased mortality risk among those with low levels of MVPA, but not those with higher levels (Loprinzi et al., 2016).
In children and adolescents however, the evidence base is not as extensive and is equivocal in relation to the direction of findings (Chinapaw et al., 2015). Indeed the most recent systematic review and meta-analyses of objectively measured sedentary time and health in children and adolescents found limited evidence to support associations between the total volume or patterns of sedentary time and health outcomes when statistically removing (often referred to as accounting for) the influence of MVPA (Cliff et al., 2016).

The majority of children’s weekday waking hours are spent in school where they sit for approximately 50-70% of the time (Clemes et al., 2015; Abbott et al., 2013; Aminian et al., 2015). Much of the school day is then spent within the classroom where the expectation, in most cases, is to sit quietly to receive academic instruction. Preliminary data reports that primary aged children spend 70% of class time sitting (Clemes et al., 2015), and spend more time in uninterrupted sitting in school during weekdays compared to out of school (Abbott et al., 2013). Population level accelerometer studies have shown children spend on average 7-9 hours per day sedentary (Steele et al., 2010; Abbott et al., 2013; van Stralen et al., 2014). Due to fundamental societal level trends, such as low rates of active transportation to school (McDonald, 2007) and high engagement in sedentary behaviours (e.g. TV viewing) after-school (Arundell et al., 2013), time spent sitting in the school classroom is arguably an issue of public health interest. Therefore alteration of the classroom learning environment to contribute to breaking-up and reducing the large amounts of time children spend sitting daily and to increase physical activity, holds potential as an intervention strategy and warrants further investigation.
There are two driving rationales for increasing movement in the classroom. First, whilst evidence for the health disbenefits of sedentary behaviour is unclear in children (Chinapaw et al., 2015; Cliff et al., 2016), several reviews purport that certain sedentary behaviours may track into adulthood (Biddle et al., 2010; Busschaert et al., 2015) – where prolonged exposure may have potential negative health consequences (Biswas et al., 2015). Second, there is an ever growing evidence base that supports the case for physical activity contributing to improvements in elements of cognitive/mental functioning, academic achievement, classroom behaviour (Singh et al., 2012; Donnelly et al., 2016; Buscemi et al., 2014; Norris et al., 2015), and enjoyment and task attention in the classroom (Mahar et al., 2006; Grieco et al., 2009; Grieco et al., 2016; Gibson et al., 2008). Given that the core business of schools worldwide is to support the development of educational progression of students, this is a particularly important leverage for advocating classroom physical activity.

A range of interventions that could achieve reductions or breaks in classroom sitting have been trialed and published – these can broadly be termed as movement integration strategies (Webster et al., 2015a). These include physical activity breaks (with or without associated educational features) (Drummy et al., 2016), physically active academic lessons (Norris et al., 2015), standing desks (Minges et al., 2016), and other environmental alterations e.g. active learning gym equipment (McCrary-Spitzer et al., 2015). A common feature of many of these aforementioned intervention strategies is that they were implemented and evaluated in a standardised fashion (i.e. a pre-prescribed or recommended target for the duration and frequency of intervention,
and in some cases content of intervention\textsuperscript{1}) with a focus on determining outcome effectiveness.

Scientific progress within the field of public health has largely been guided by the principles of evidence-based medicine (Rutter, 2012) – with the emphasis being on producing replicable and standardised interventions that are evaluated for effectiveness via a randomised controlled trial. This conventional approach to intervention research has to date generated evidence on ‘what works’ in relation to classroom physical activity. However through the use of tightly controlled implementation and evaluation, this approach may not fully take into account the complex social and physical environment operating in schools, and that interventions will require implementation that is flexible to the local context (Hawe et al., 2004). There is however growing recognition within the field of Public Health of a long history of failing to transfer or replicate evidence based interventions, developed in controlled settings, due to the complexity and dynamism of the ‘real world’ (Glasgow and Emmons, 2007). The field of Implementation Research/Science has been established to study the ‘processes used in the implementation of initiatives as well as the contextual factors that affect these processes’ (Peters et al., 2013).

Studies which include a component related to implementation often examine the use of programme theories and expected mechanisms and outcomes, or employ retrospective process evaluations (May et al., 2016) – neither of which focus on the processes or context of implementation from the very beginning of a programme’s development. Utilising such passive approaches to implementation (where

\textsuperscript{1} Although we acknowledge that some interventions have had a degree of flexibility in intervention content/implementation e.g. (Donnelly et al., 2009; Erwin et al., 2011).
programmes are developed in isolation from the environment/target group where use is intended, and implementation is not considered from the outset) limits progression of knowledge on how to get research into practice (GRIP) (Rowley et al., 2012).

**Objectives**

The purpose of this discussion paper therefore will be a) to provide a brief narrative review (not intended to be systematic or exhaustive) on considerations (challenges and facilitators) related to the implementation of movement integration; and b) present an on-going and innovative research project as a case study on how to understand and implement movement integration into routine teaching practice.

**Discussion**

*Existing implementation considerations identified in the literature*

Alongside efficacy/effectiveness, evaluations of interventions seeking to integrate physical activity in the classroom have, in a limited number of cases, addressed implementation, typically as part of a process evaluation (Moore et al., 2015). For example, in a systematic review of experimental studies on physically active academic lessons², Norris et al. (2015) reported that 4/11 identified studies had described the level of implementation achieved using teacher records e.g. % of prescribed active lessons completed. Crucially however, none of the studies provided reasons for incomplete implementation of the full programme of lessons.

---

² A physically active lesson involves the delivery of a lesson of (or main portion) curriculum content through (or alongside) physical movement e.g. physically embodying punctuation as teacher reads a story aloud. For examples see http://classpal.org.uk/resource/list_resource.php
Since the publication of the review by Norris et al. (2015) however, a number of studies trialling physically active lessons have been published e.g. (Martin and Murtagh, 2015; Mullender-Wijnsma et al., 2015; Mullender-Wijnsma et al., 2016; Riley et al., 2016; Riley et al., 2015). Alongside outcome results, the ‘Easy Minds’ (Riley et al., 2016; Riley et al., 2015) and ‘Fit and Academically Proficient at School’ (Mullender-Wijnsma et al., 2015; Mullender-Wijnsma et al., 2016) projects have also published process evaluations. Riley et al. (2015) examined the acceptability/feasibility of the ‘Easy Minds’ programme using questionnaires exploring programme satisfaction completed by both participating teachers and students. This however generated limited quantitative information on programme appropriateness, timing, impact, instructor quality etc., providing no information on the challenges teachers might face implementing the programme in future.

In the one-year program evaluation of the ‘Fit and Academically Proficient at School’ project Mullender-Wijnsma et al. (2015) asked teachers to self-report reflections on implementation after the delivery of each lesson. The resultant data suggested teachers shortened some lessons due to time constraints, and that the movement activities/exercises and or content integration were not appropriate for the particular lesson. Whilst useful practical information, again, these data do little to understand the teacher and school level contextual barriers (e.g. lack of support from school senior management team) to implementation.

One recent pilot intervention study (Martin and Murtagh, 2015), examined teacher perceptions of movement integration using a survey which included open ended questions. The primary barrier to implementation of physically active lessons reported
by the intervention teacher was lack of space in the classroom for floor exercises, which the teacher reported was surmountable by the use of more static physical exercises. Further, it was suggested that the ability to utilise provided variants of the resources was useful for the teacher to adapt the content to suit particular curriculum topics, likely contributing to enhanced programme compliance (Martin and Murtagh, 2015). These aforementioned studies have all addressed movement integration using physically active lessons. Conceptualising movement integration on a continuum, you have active lessons at one end which use movement to support the delivery of curriculum topics, at the other end you have active breaks (without associated content) which use movement to break sitting and re-focus/re-engage learners. It is in relation to active breaks primarily that a number of qualitative studies have examined factors associated with implementation of physical activity in the classroom.

McMullen et al. (2014), for instance, interviewed twelve elementary and high school classroom teachers who were part of a wider comprehensive school physical activity intervention, which included training and resources for active breaks. Primary themes generated from these interviews were threats to classroom control, connection to academic content, ease of implementation and student enjoyment of the breaks. For example regarding classroom control, particular concern focused on the ability to get students back on task post-break; however, the teachers suggested that a period of acclimation is required, following which students may have clearer expectations on appropriate behaviour regarding readiness for and winding down after an active break. Similarly, an earlier study including interviews with teachers delivering both active

---

3 Physically active breaks are short duration (e.g. 5-10 minute) periods of physical activity to break-up sitting (e.g. dancing to YouTube video) They are often performed without associated academic content, but can involve the integration of simple curriculum concepts (e.g. Squat given number of times to answer mathematical sum). For examples see http://classpal.org.uk/resource/list_resource.php
breaks and/or movement integration to support curriculum delivery (Cothran et al., 2010) identified a range of challenges to implementation, particularly focusing on pressures associated with standardised testing, the need for a connection to learning/academic content, and a lack of delivery time. These data generated by a more in-depth examination of issues (compared to the aforementioned studies) related to implementation have particular implications for the delivery of classroom physical training in future e.g. requirement for content/modelling session on behavioural management, curriculum content integration, timing of delivery etc.

Interestingly, Webster and colleagues have conducted a series of studies to examine factors associated with the adoption and reported implementation of multiple types of movement integration strategies (i.e. breaks, lessons, warm-up exercises etc.). Webster et al. (2013) investigated a range of influences on the implementation of movement integration in early career elementary teachers. Perceived compatibility for movement integration, simplicity of strategies, the production of observable results and educational/classroom innovativeness were found to be associated with self-reported implementation of movement integration (Webster et al., 2013). A second study examined elementary class teacher’s physical activity history and self-reported movement integration implementation (Webster et al., 2015b). This work identified perceived competence in movement integration delivery predicts actual implementation (41% variance explained), and may result from previous experiences of physical education, subsequent physical activity competence and current physical activity levels (Webster et al., 2015b). Taken together the findings of these studies (Webster et al., 2013; Webster et al., 2015b) highlight the importance of accounting
for attributes of teachers perceived competence, educational innovativeness and history and experiences of physical activity.

The implementation issues identified in the studies briefly reviewed above provide some indication of the considerations future interventionists need to be cognisant of. These will of course not be relevant to all school contexts, have not considered other levels of influence within schools (e.g. policies, senior-leadership support, peer-planning support etc.) and crucially do little to actively address how to routinely get physical activity into the classroom. For a more comprehensive overview of the literature and factors associated with movement integration readers are pointed to the excellent review by Webster et al. (2015a).

**GRIP Case Study**

The first section of this discussion paper has outlined a selection of key findings on issues related to the implementation of classroom physical activity. For future interventionists this information is required to ensure that developed programmes have the greatest likelihood of being adopted and changing teacher’s routine practice. Some public health researchers have however called for more proactive approaches to generating research evidence, moving beyond considering implementation (often referred to as process evaluation) as a ‘bolt on’ at the end of a research project, and simply showing if an intervention has efficacy/effectiveness or not (Demiris et al., 2013).
The following section will provide a brief account of a movement integration research project as a case study of an approach to considering implementation from the very outset. This will be framed around key GRIP learning messages/principles that the research team have encountered, or have drawn upon from existing literature and the project’s funder’s ethos (Heaton et al., 2016, 2015).

**Project Overview**

CLASS PAL (Physically Active Learning)™ is a collaborative project led by researchers at Loughborough University, Nottingham University and Leicester University, UK, which aims to co-produce (alongside key school stakeholders) and evaluate the implementation of an intervention to support primary school teachers to utilise movement integration in the school classroom.

CLASS PAL has therefore taken a shared approach with stakeholders to inform intervention development and evaluation, and to maximise the likelihood of sustained and successful implementation. The series of steps taken by the research team (See Table 1 below) across the project’s three main phases do not subscribe to a particular implementation science theory, and have been shaped by the time and resources available. They do however provide a salient example of how future movement integration research project teams might consider GRIP.

*Insert Table 1 Near Here*
**Key GRIP Learning Messages**

**Co-Production – End-User Driven**

Applied health research has often been conducted with limited involvement of those who may commission or use the generated service (Heaton et al., 2016, 2015). Such an approach risks producing evidence of little relevance to potential users. CLASS PAL is funded by the NIHR Collaboration for Leadership in Applied Health Research and Care East Midlands (CLAHRC EM)\(^4\), which specifically fund projects on translating health research into routine practice. A key premise of the approach to research advocated by CLAHRC-EM is that barriers to implementation can be overcome if knowledge is ‘co-produced’ by academic and end-user staff (e.g. teachers) taking account of the organisational context in which it is to be applied (Rowley et al., 2012; Roe et al., 2014). The concept of end-users and researchers working together to generate research knowledge and produce services has been termed ‘co-production’ (Heaton et al., 2016). This is analogous to community based participatory research, which is postulated to play an important role in school physical activity promotion (Webster et al., 2015c). Mindful of this, we aimed to put local end-users (i.e. teachers) at the heart of the research project (Heaton et al., 2015) from the outset.

For example, in Phase one, to ensure from the beginning that decisions (e.g. how to contact schools, what stakeholders require consulting etc.) regarding the direction of the project were collaborative we appointed two ‘knowledge brokers’ to the research team i.e. a practicing primary school teacher, and an experienced children’s physical

activity practitioner. A knowledge broker is an intermediary between research and practice (Ward et al., 2009) and in this case brought ‘front line’ teaching/practitioner knowledge into the project.

Concurrently, more traditional academic activities were conducted. To identify potentially successful intervention strategies and associated implementation issues, a systematic review of the literature was conducted, from which active breaks and physically active lessons were identified as effective (Routen et al., 2015). This gave direction as to what interventions would be efficacious and limited guidance on barriers to implementation, but could not provide information on implementation challenges pertinent to local teachers and/or schools.

To explore more local and UK school specific implementation drivers we conducted a series of focus groups/interviews with Leicestershire (UK) primary school teachers (class teachers and head teachers; n=26) and pupils (n=10). Whilst not truly co-production (i.e. teachers were participants in research) this generated initial practical information (e.g. teacher fears over behavioural control, need for supporting school policy etc.). More pertinently, views of the teachers directly informed two key project decisions: the initial intervention idea for the project, namely a continuous professional development workshop and supporting resources; and the approach taken for advocating movement integration with teachers – namely to focus on benefits to educational outcomes/learning of classroom physical activity over health related outcomes. These are salient examples of how the views of end-users drove the research direction (i.e. intervention components), and ensured that CLASS PAL would address issues most relevant to teachers (i.e. educational outcomes and learning
behaviour). This also illustrates how teachers views were given equal weight in the research process, one of the fundamental principles of co-production of knowledge for influencing practice (Heaton et al., 2016).

At the end of Phase One, the project had some indication of what movement integration strategies might work and what implementation challenges have been reported previously, how UK primary teachers and pupils viewed these interventions, and what teachers might require to deliver these strategies (i.e. training workshop and resources). At this stage it was decided that piloting of these approaches to better understand implementation challenges in the UK school context was required, and that development of a training workshop and resources would require much closer collaboration with teachers and school stakeholders.

**Co-Production – Harnessing and Developing Respective Assets**

Nine rules and associated mechanisms for guiding ‘close-collaboration’ between researchers and practitioners have been identified (Heaton et al., 2016, 2015). One of these is the concept of utilising existing (or creating new) assets to facilitate the conduct and implementation of research. “Assets” can include: people with particular knowledge and skills; continuing professional development opportunities; routine data; websites for sharing learning; publications etc. (Heaton et al., 2015).

At Phase Two the aim was to pilot movement integration strategies and develop the intervention package. It was recognised that teacher/education stakeholder assets would be required for accessing schools (e.g. through existing local education
networks), the design of the pilot work (e.g. how and where to collaborate with teachers) and the intervention.

Therefore the research team first sought partnership with a local teaching school alliance\(^5\) for the recruitment of pilot schools. Alongside, the project also partnered with a national school physical activity/wellbeing programme provider and charity, the Youth Sport Trust\(^6\), for the co-production and design of the pilot phase, and the intervention development and delivery. We formed a group of primary class teachers (7 class teachers from 6 schools) with the intention of giving brief movement integration training delivered by the Youth Sport Trust and asking the teachers to pilot test movement integration in the classroom, and feedback on implementation issues in later ‘co-production’ meetings.

An initial meeting with the pilot teachers was held (co-delivered with the Youth Sport Trust). Following advice from the teaching school alliance on reflective practice/teacher development, each teacher was given a video-led professional development tool\(^7\) (IRIS Connect), to allow them to trial and video movement integration strategies, share these with the research team and pilot teachers, and provide reflective comments via a secure online platform. This innovative reflective practice tool permitted a richer understanding of what movement integration looks like in a UK context, and helped teachers communicate implementation challenges.

\(^5\) [http://www.affinitytsa.co.uk](http://www.affinitytsa.co.uk); teaching school alliances are groups of outstanding schools that work with others to provide high-quality training and development to new and experienced schools/school staff.

\(^6\) [https://www.youthsporttrust.org](https://www.youthsporttrust.org)

\(^7\) [http://www.irisconnect.co.uk](http://www.irisconnect.co.uk)
A series of two further meetings were held in local schools focusing on implementation issues, co-designing the requirements and content of a training workshop, and the development of a supporting resources website. This information has been used collaboratively with the Youth Sport Trust to develop a one-day practitioner delivered workshop and a website with a repository of searchable, editable and shareable movement integration resources – www.classpal.org.uk. The training and online resources will enable teachers to deliver a full range of movement integration strategies such as physically active lessons, physical activity breaks (with or without associated academic content) and physical activity routines (e.g. stand up to give the answer to a question).

**Social Influence/Using Local Leaders**

Social influence has been identified as a mechanism by which research impact may be increased (Walter et al., 2003), and has been conceptualised as the influence of others, such as colleagues and role models, to inform potential users about research and to persuade them of its value (Walter et al., 2003). Whilst this refers more to ‘pushing out’ completed research to users, the utilisation of local education ‘leaders’ and their social influence has been critical to the engagement of teachers and schools from Phase Two of CLASS PAL.

For example, as noted above, partnership with a local teaching school alliance was sought in Phase Two. On a basic level, having being affiliated with the alliance facilitated recruitment to the pilot work by ensuring a degree of credibility with schools and giving direct in-person access to school head teachers and senior
leadership. However, closer reflection on this partnership reveals that authentic engagement from schools and teachers in the pilot was arguably only gained by serendipitously harnessing the influence of the alliance business manager. Whilst tacit, examples of this include communication of the value/benefit of the research conveyed through formal (e.g. emails) and informal channels (e.g. conversations at head teacher meetings) to the teachers involved. Such communication gave class teachers the necessary legitimacy from their senior school leaders to alter their routine practice to pilot movement integration. Without the ability to ‘experiment’, the co-production of knowledge on implementation challenges in this specific UK primary context would undoubtedly have been a much less valuable process.

Dissemination Plan

The developed intervention, in Phase Three, will be evaluated in a small group of Leicestershire Primary schools (n=7) starting in September 2016 with a focus on understanding the level of implementation achieved, the processes of implementation, and the individual and school level factors that influenced implementation. These schools have been selected from a wider group of 27 schools in the alliance to provide a range of different contexts and settings based on level of deprivation, school size, geographical location and ethnicity.

The series of steps in the first two phases of this research have ensured that from the very start, GRIP has been considered, leading to a greater likelihood of successful implementation. Following this evaluation, refinement to the intervention will likely be required, and consideration of the most sustainable mode and model of delivery
given attention. CLAHRC-EM recommends that projects develop a plan of how new innovations will reach local, regional, national and international audiences – a dissemination plan. For example, by partnering with a local teaching school alliance, the project has one potential route to local dissemination via the inclusion of the CLASS PAL workshop as part of the alliance’s regular training offerings. Such a model could be scaled up within the region through other alliances. Whilst the formation of this plan is in its infancy, we will need to be mindful of mapping who potential audiences (at a number of levels) for this research are beyond the regional level (e.g. national teaching associations, policy makers etc.). Furthermore, the timing and format of the approach chosen will require tailoring for specific audiences (Brownson et al., 2013). Readers are oriented to a useful paper by Brownson et al. (2013) for guiding principles relating to the design of a dissemination plan.

**Challenges to taking a GRIP approach**

Despite the noted advantages, considering implementation from the start of a research project brings with it a number of practical and scientific challenges. Practically, a great deal of time and resource is required to maintain regular and meaningful engagement with practitioners/stakeholders to ensure ‘co-production’ occurs. In our case this has included weekly email and telephone contact with teachers, the alliance and the Youth Sport Trust. Further, alongside the ‘co-production’ teacher group meetings, individual meetings with teachers in their schools have been used. Scientifically, the evaluation planned for CLASS PAL has placed focus on implementation and not outcome. The study design will therefore take a longitudinal approach without a control group, and focus not on effect outcomes (e.g.
accelerometer-measured sedentary time), but measures of the level of uptake of the intervention and implementation processes used (e.g. via weekly teacher logs, semi-structured interviews, and lesson observations). Such an approach requires a shift in scientific mind-set that is challenging in a field that is ‘dependent on forms of putatively robust and defensible evidence’ (Rutter, 2012).

**Conclusions**

The use of this particular case study (CLASS PAL) as an exemplar of how to consider GRIP in the development of movement integration projects is not put forward as a ‘gold standard’ by which other research teams must follow. It is hoped however that this discussion paper highlights the potential of research that is co-produced and actively takes into account context and setting specific intricacies and needs of schools and teachers. By combining knowledge from extant literature on implementation challenges and applying GRIP principles such as presented above, intervention models developed in future may have a greater chance of fostering the required engagement and commitment from schools and teachers to change practice to include movement integration as a matter of routine.
Table 1. Overview of CLASS PAL project phases and core activities (white boxes represent more traditional academic activities, shaded boxes represent GRIP related activities)

<table>
<thead>
<tr>
<th>Project Phase and Core Aims(s)</th>
<th>Core Project Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>One (2014-2016)</strong></td>
<td></td>
</tr>
<tr>
<td>To identify effective MI</td>
<td>Appointment of two</td>
</tr>
<tr>
<td>strategies and associated</td>
<td>‘knowledge brokers’ to</td>
</tr>
<tr>
<td>implementation challenges</td>
<td>research project team</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Two (2015-2016)</strong></td>
<td>Partnership with local</td>
</tr>
<tr>
<td>To pilot test effective MI</td>
<td>teaching school alliance</td>
</tr>
<tr>
<td>strategies and further</td>
<td>for formation of pilot</td>
</tr>
<tr>
<td>understand implementation</td>
<td>group</td>
</tr>
<tr>
<td>challenges</td>
<td></td>
</tr>
<tr>
<td>To develop the CLASS</td>
<td>Recruitment of schools</td>
</tr>
<tr>
<td>PAL intervention</td>
<td>for ensuing</td>
</tr>
<tr>
<td></td>
<td>implementation</td>
</tr>
<tr>
<td></td>
<td>evaluation via</td>
</tr>
<tr>
<td></td>
<td>teaching school</td>
</tr>
<tr>
<td></td>
<td>alliance</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Three (2016-2018)</strong></td>
<td>Implementation</td>
</tr>
<tr>
<td>To perform an implementation</td>
<td>evaluation of co-</td>
</tr>
<tr>
<td>evaluation of the CLASS</td>
<td>produced CLASS PAL</td>
</tr>
<tr>
<td>PAL intervention</td>
<td>intervention</td>
</tr>
<tr>
<td>To refine the CLASS</td>
<td></td>
</tr>
<tr>
<td>PAL intervention and</td>
<td></td>
</tr>
<tr>
<td>begin wider scale</td>
<td></td>
</tr>
<tr>
<td>dissemination</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MI = Movement Integration; CPD = Continuous Professional Development Workshop
Disclaimer Statements

Contributors

ACR drafted the manuscript. LBS and AC contributed to manuscript editing and critical comments. All authors read and approved the final manuscript.

Funding

This research was funded by the NIHR Collaboration for Leadership in Applied Health Research and Care East Midlands (CLAHRC EM). The views expressed are those of the author(s) and not necessarily those of the NHS, the NIHR or the Department of Health.

Conflicts of Interest

No conflicts of interest to report.

Ethics Approval

Not applicable.

Acknowledgements

We are very grateful to the knowledge brokers, teachers and project partners for their continual willingness to ‘co-produce’ this research. We would also like to acknowledge the co-investigators of CLASS PAL who have contributed to the conception, planning and design of the study, namely Professor Kamlesh Khunti, Professor Cris Glazebrook, Professor Stuart Biddle, Dr Stacey Clemes, Dr Natalie Pearson, Dr Charlotte Edwardson, Dr Deirdre Harrington and Dr Danielle Bodicoat.
References


Martin, R.; Murtagh, E.M. Preliminary findings of Active Classrooms: An intervention to increase physical activity levels of primary school children during class time. Teaching and Teacher Education. 2015 11//;52:113-127.


Cothran, D.J.; Kulinna, P.H.; Garn, A.C. Classroom teachers and physical activity integration. Teaching and Teacher Education. 2010 10//;26(7):1381-1388.


Walter, I.; Nutley, S.; Davies, H. Developing a taxonomy of interventions used to increase the impact of research. St. Andrews, Scotland, UK: University of St Andrews; 2003.