Preventive Medicine Reports 3 (2016) 7–13

Contents lists available at ScienceDirect

Preventive Medicine Reports

journal homepage: http://ees.elsevier.com/pmedr

Increasing physical activity levels in primary school physical education: The SHARP Principles Model

Emma Powell [a,*], Lorayne A. Woodfield [b], Alan M. Nevill [c]

[a] School of Education, Newman University, Birmingham, UK
[b] School of Human Sciences, Newman University, Birmingham, UK
[c] Faculty of Health, Education and Wellbeing, University of Wolverhampton, UK

ARTICLE INFO

Available online 22 November 2015

Keywords:
Physical education
Intervention
Primary schools
Physical activity

ABSTRACT

Objectives: To evaluate the effectiveness of a one-year teaching intervention to increase moderate to vigorous physical activity (MVPA) during primary school physical education (PE). *Methods*: A quasi-experimental, non-equivalent group design involving four classes from two primary schools in the West Midlands, UK. In March 2014 schools were selected through purposive sampling to match schools in terms of size and demographics (baseline, $n = 111$: post-intervention, $n = 95$); data were collected from children in school years 3 and 4 (aged 7 to 9 years). The intervention involved developing teacher effectiveness through the SHARP Principles Model which was grounded in the Self Determination Theory (SDT), the Social Ecological Model (SEM) and three key ingredients from the Behaviour Change Taxonomy (BCT). MVPA was assessed at baseline and four weeks post-intervention using the System for Observing Fitness and Instruction Time (SOFIT). Four individual teacher interviews were conducted with the intervention school, to explore teachers' perceptions of the intervention. *Results*: A two-way ANOVA (Analysis of Variance) indicated large interaction effect sizes for time spent in MVPA ($F(1, 27) = 11.07$, $p = 0.003$, $\eta_p^2 = .316$) and vigorous activity (VPA) ($F = (1,27) = 8.557$, $p = .007$, $\eta_p^2 = .263$). PA in the intervention school increased significantly whereas in the control school MVPA remained relatively constant and VPA decreased. The qualitative findings revealed two main emergent themes: a paradigm shift and teacher's developing pedagogy. *Conclusions*: The intervention was effective in increasing MVPA in PE. Recommendations based on this evaluation would be for the SHARP Principles Model to be replicated and evaluated on a wider scale across a variety of contexts.

Introduction

Physical inactivity has been recognised as the fourth leading cause of global mortality (Kohl et al., 2012), with an international concern over childhood physical inactivity (Tremblay et al., 2014). For children, the benefits of being physically active are well documented (WHO, 2010; Lee et al., 2012). Yet, in England only 21% of boys and 16% of girls aged 5 to 15 years met the recommended 60 min of daily moderate to vigorous physical activity (MVPA) (Townsend et al., 2015; DH, 2011). Public health interventions in schools are important, as a large number of children can be reached (Dobbins et al., 2013); and there are key windows of opportunity in a primary school setting to increase children's MVPA levels such as: break times (Powell et al., 2015), in class activity breaks (McMullen et al., 2014) and Physical Education (PE) classes (McKenzie and Lounsbery, 2014). Specifically, PE is the only required curriculum subject to provide MVPA to all children, and is considered key as a public health priority (Sallis et al., 2012); thus, there are extensive implications for increasing active learning time in PE (Lonsdale et al., 2013). In England, the current aims of the National Curriculum support this (Department of Education (DfE), 2013), with the requirement that children should engage in physical activity (PA) during PE for sustained periods of time. However, current reported levels of MVPA in PE (Fairclough and Stratton, 2006; Lonsdale et al., 2013) fall below the recommended >50% (Institute of Medicine (IOM), 2013; Association of Physical Education (AfPE), 2013).

Background/rationale

The majority of interventions designed to increase children's MVPA in PE fall into two categories, those that target teaching strategies and those focusing on fitness (Lonsdale et al., 2013). Examples of interventions which have targeted teaching strategies include: Child and Adolescent Trial for Cardiovascular Health (CATCH) (McKenzie et al., 1996, 2001); Sports, Play and Active Recreation for Kids (SPARK) (Sallis et al., 1997); and Middle School Physical Activity and Nutrition (M-SPAN) (McKenzie et al., 2004); these types of interventions have evidenced improvements of %MVPA during PE. For instance, results from the CATCH intervention

* Corresponding author.
E-mail addresses: e.powell@newman.ac.uk (E. Powell), l.a.woodfield@newman.ac.uk (L.A. Woodfield), a.m.nevill@wlv.ac.uk (A.M. Nevill).

http://dx.doi.org/10.1016/j.pmedr.2015.11.007

increased MVPA by 12% to meet the 50% MVPA guidelines (McKenzie et al., 2001). However, it is the fitness interventions that have reported greater increases in MVPA (Ignico et al., 2006; Quinn and Strand, 1995; Scantling and Dugdale, 1998; Eather et al., 2013). The success of the fitness interventions is not surprising, due to the specific focus on vigorous activity and the types of activity included such as resistance training. Even though it has been argued that PE should be placed in a public health context (Sallis et al., 2012), this needs to be facilitated through a focus on active learning time; which will increase opportunities for children to develop in other areas of a PE lesson, such as their physical, social and cognitive skills (McKenzie and Lounsbery, 2014; DfE, 2013).

Internationally, there is a current need for effective school based interventions that are designed to increase children's MVPA levels during PE (Webber et al., 2008; Sallis et al., 2012). In regard to primary PE, the majority of intervention studies have been implemented in the US (McKenzie et al., 1996; Sallis et al., 1997), with only a small number of primary PE interventions in England (Lonsdale et al., 2013). For that reason, the overall aim of this study was to design and evaluate a teaching strategy intervention, which supported teachers in increasing children's MVPA during primary school PE lessons. The intervention has been informed by the authors' ongoing research project that investigates children's MVPA levels in primary PE; along with previous interventions such as CATCH (McKenzie et al., 1996, 2001) and SPARK (Sallis et al., 1997). Utilising this knowledge, a set of teaching principles were developed which became the core element during the intervention. These were termed the 'SHARP Principles' and involved the following key pedagogical aspects: Stretching whilst moving; high repetition of motor skills; accessibility through differentiation; reducing sitting and standing; and promoting in class physical activity. An overview of each principle is provided in Table 1. Specifically, this article focuses on the evaluation component of the intervention.

Methods

Schools and research design

The intervention had a quasi-experimental design, involving one control school and one intervention school. In March, 2014 schools were selected through purposive sampling to match schools in terms of school size and demographics. Both schools were located in areas of high social deprivation, in the West Midlands, UK, with similar numbers of children on role (intervention school = 275 children; control school = 210 children). At baseline (boys = 60; girls = 51) and post-intervention (boys = 51; girls = 44), data were collected from children in school years 3 and 4 (aged 7 to 9 years) and their class teachers (baseline = 9, post-intervention = 6). A total of 28 PE lessons were observed, seven lessons at baseline and seven lessons at post-intervention in each school. At baseline 28.6% of the lessons were taught by male teachers and 71.4% were taught by female teachers. The post-intervention lessons were taught by 35.7% male teachers and 64.3% female teachers. The average class size was 30 ($SD = 1$) children. In both the control and intervention schools there was one specialist PE teacher, with the remaining teachers being non-PE specialists. The study was reviewed and approved by the Research Ethics Committee at the lead researcher's institution. Written informed consent was provided by the Head Teacher, teachers and guardians of the children involved. In addition verbal consent was also sought from the children. Children's PA levels were assessed at baseline and at a four week follow-up post-intervention, using the System for Observing Fitness and Instruction Time (SOFIT) (McKenzie, 2012). Four individual teacher interviews were also conducted with the intervention school to explore their perceptions of the intervention.

Table 1
SHARP Principles — increasing active learning time in primary physical education.

Stretching whilst moving	• During the warm up section of a PE lesson, activities are to include dynamic movements and stretches, replacing the traditional static stretching routines (Bukowsky et al., 2014). • Dynamic movements should be designed to elevate and maintain a higher core body temperature, whilst also engaging children in a fun, active and purposeful warm up. A dynamic warm up includes various movements that engage the lower and upper body (Faigenbaum and McFarland, 2007). • A dynamic warm up assists in increasing children's MVPA and could therefore allow for greater explosive effort during subsequent activities (Sale, 2002). Examples of dynamic stretches include: side shuffles, jump and twist, high knees, heel flicks, jumping jacks and skipping (Faigenbaum and McFarland, 2007).		
High repetition of motor skills	• This principle is based on the notion that children cannot become physically skilled if they are not engaged in active learning (McKenzie and Lounsbery, 2013). In order to increase active learning time, teachers must ensure that each child has the opportunity to engage in the task at hand. • For instance: reducing/eliminating queues so that children are not waiting their turn; having small sided games or group work such as 3 v 3 (which will increase the amount of times children have to develop/apply their skills. This will help to eliminate children being on the peripheral of, or excluded from a game/activity); and increasing the amount of equipment available to the children and/or increasing the number of stations.		
Accessibility through differentiation	• All children should be set tasks that are appropriate to their physical, cognitive and social development, which will enable them to engage in active learning time. • Teachers should ensure that they are familiar with the STEP framework (space, task, equipment and people) for effective differentiation of activities (Doherty and Brennan, 2014). An example of the acronym STEP for a gymnastics lesson would be:		
	STEP	Easier	Harder
	Space	Working in their own space	Sharing multiple stations with others.
	Task	Reducing the number of elements to be included in a sequence	Increasing the number of elements to be included in a sequence
	Equipment	Using the floor and mats	Using the floor, mats and apparatus
	People	Working with a partner	Working in a small group
Reducing sitting and standing	• As PE is the only required curriculum subject to provide MVPA to all children (Sallis et al., 2012); this principle aims to develop teachers' awareness of the amount of time children are sitting and standing during the lesson in relation to knowledge transfer, teacher feedback and organisation of equipment (similar to the SPARK PE programme which placed an emphasis on efficient teacher feedback (Sallis et al., 1997)). Examples of this principle include: • When a teacher is providing feedback or questioning learners, often they do not need to stop the whole class, instead they can just target and stop a group of learners or an individual child. • Engaging children in activity as soon as possible at the start of the lesson through concise questioning and feedback. • Ensuring equipment is ready, organised and accessible at the start and throughout the lesson.		
Promoting in class physical activity	• This principle is based on teachers encouraging children's in class physical activity through positive praise. Examples of the promotion of in class PA includes 'great team work, keep moving and looking for space'.		

PE intervention

The intervention was based on the development and implementation of the 'SHARP Principles Model' (Fig. 1). The triangular model reflects the important foundations required in order to increase active learning time in primary PE. The Head Teacher is at the base of the triangle, reflecting their supporting role in the intervention, followed by the PE Coordinator and the individual teachers. To interlink the roles of the Head Teacher, PE Coordinator and the individual teachers, the Self Determination Theory (SDT) (Ryan and Deci, 2000) was applied. The SDT holds the principle that self-determined behaviour will vary according to the extent to which the behaviour is autonomous or controlled. Thus the components of the intervention were implemented through a supportive autonomous role (autonomy), along with developing teachers' social networks (relatedness) and knowledge (competency). In addition, the model was grounded in three key elements (organisational, interpersonal and individual) of the Social Ecological Model (SEM) (McLeroy et al., 1988). At the organisational level, initial support from the Head Teacher allowed for the development of a new PE and PA school policy and the creation of a new curriculum map. At the interpersonal level, ongoing support was provided for the PE Coordinator from both the lead researcher and the Head Teacher. The individual level involved developing teachers' awareness and knowledge of children's PA in PE. Working alongside the SDT and the SEM were three 'active ingredients' from the Behaviour Change Taxonomy (BCT) (Michie et al., 2011), which were: 'Barrier identification/problem solving' (collecting baseline data), 'Action planning' (creating a detailed plan with the PE Coordinator), and 'Provide instruction on how to perform the behaviour' (joint planning sessions with teachers, integrating the SHARP principles). An overview of the theoretical constructs has been provided in Table 2.

Data collection: quantitative

System for Observing Fitness and Instruction Time (SOFIT)

SOFIT (McKenzie, 2012) was used as the primary method to assess the baseline and post-intervention PA levels of the children during primary PE. SOFIT is a comprehensive tool for assessing PE as it allows for the simultaneous collection of data across the three variables of: children's activity levels (lying, sitting, standing, walking or very active), lesson context (management, knowledge, fitness, skills, games or other), and teacher promotion of PA (in class promotion of PA, out of class promotion of PA or no promotion of PA). At baseline and post-intervention 1610 observed intervals took place, totalling 9 h of pre- and post-direct observation. The baseline and post-intervention observations involved a range of activities including: dance, swimming, athletics and games. Six children were observed during each PE lesson on a rotational basis (4 min for each child until the end of the lesson). The observation period began when 51% of the class arrived in the working area and the observation ended once 51% of the class had left the observation area (McKenzie, 2012). Full details of the SOFIT protocols can be found elsewhere (McKenzie, 2012).

SOFIT validity, reliability and observer training

Direct observation has a high internal validity and has been used as a criterion for validating other PA measures (McClain et al., 2008); and has been frequently used to provide objective baseline data (McKenzie, 2012). Data were collected by two trained observers and training included: lectures and discussions, using pre-coded 'gold standard' digitally recorded examples and field practice. Observers set inter-observer agreement criterion before baseline data were collected, before the post-intervention data were collected and an infield inter-observer reliability check took place. All reliability checks were above 92% in each SOFIT category.

Statistical analysis

The mean percentages of the dependent variables (SOFIT categories) were calculated in each lesson and then these scores were analysed using a two-way Analysis of Variance (ANOVA). Group (intervention and control) and time (baseline and post-intervention) were treated as fixed factors (independent variables); and the interpretation of the interaction effect size for changes in baseline and intervention data were calculated using partial eta squared (η_p^2) (small (0.01), medium (0.06) and large (0.14)). All statistical analyses were conducted using the Statistical Package for the Social Sciences v. 21, with the alpha level set at $p < .05$.

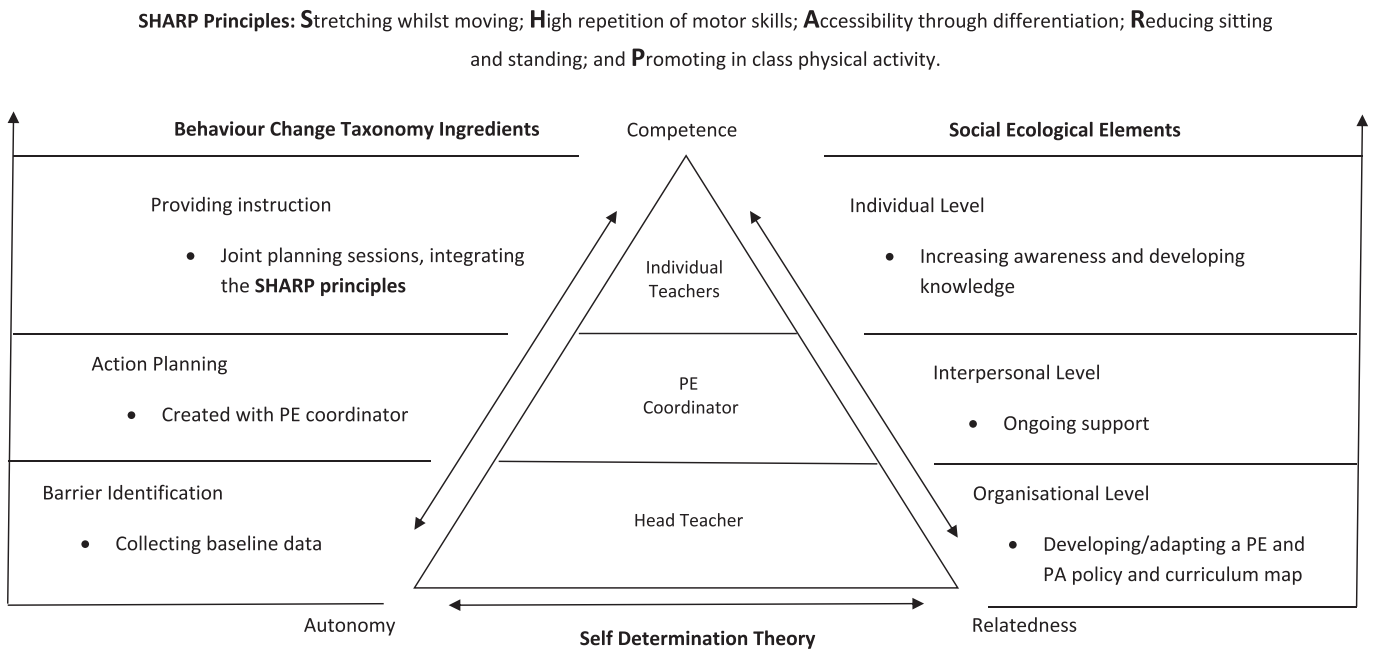

Fig. 1. 'The SHARP Principles Model' to increase active learning time during primary physical education.

Table 2
The 'SHARP Principles Model' theoretical constructs.

Self determination theory (Ryan and Deci, 2000)	Behaviour change taxonomy (Michie et al., 2011)	Social ecological components (McLeroy et al., 1988)
Competence	Barrier identification/problem solving	Individual level
• Teachers' competence developed through joint planning sessions and the SHARP Principles. • PE Coordinator's and Head Teacher's competence developed through baseline data collection.	• An initial decision to change behaviour from Head Teacher and PE Coordinator. • Collection of baseline data provided understanding of the current behaviours in the school. Baseline data collection included: MVPA in primary physical education lessons (SOFIT tool) and teachers' perceptions of teaching physical education (individual interviews). • Meeting between the researcher and PE Coordinator to discuss barriers and identify possible ways of overcoming then. Including the implementation of the SHARP Principles.	• Increasing teachers' awareness of children's PA levels in PE through the collection of baseline data. • Developing teachers' knowledge and skills of PE through a joint planning session; SHARP principles where integrated to increase active learning time.
Relatedness	Action planning	Interpersonal Level
• Teachers' sense of belonging; intervention was supported by the Head Teacher and PE Coordinator which provided an instant support network for the teachers involved. • The joint planning meetings assisted in providing social belonging and support from the lead researcher and their supporting year group teacher.	• Creation of detailed action plans with the PE Coordinator. Targets were set based on the information collected at baseline including children's MVPA levels during PE and teachers' and children's perceptions of PE. • Action planning included: 'target', 'rationale', 'action', 'timescale' and 'evidence/outcome'. • Examples of targets where: 'to increase teachers' subject knowledge, confidence, planning and assessment strategies in primary PE' and 'to increase the percentage of active learning time in primary PE to above 50% MVPA through implementation of the SHARP Principles'.	• Ongoing support for teachers from the lead researcher and the school's PE Coordinator. • Ongoing support for the PE Coordinator through regular emails and meetings; action plan and progress were reviewed. • Ongoing reference to the SHARP Principles.
Autonomy	Provide instruction on how to perform the behaviour	Organisational level
• Teachers to be in control of their own behaviour. So although instruction was provided in relation to the SHARP principles, they chose the content of the lesson and were actively engaged in the planning stage of the lessons.	• Providing instruction, involved 'telling' the teachers 'how' to perform the behaviour (Michie et al., 2011). In this instance, joint planning sessions took place with year group teachers and the lead researcher. • In the planning sessions there was a focus on the integration of the SHARP principles to increase children's active learning time to above 50% MVPA.	• Ongoing support from the Head Teacher. • Development of a PE and PA policy and action plan with the PE Coordinator, integrating SHARP Principles. • Creation of a curriculum map, which was used as a starting point.

Data collection: qualitative

Teacher interviews

Four individual teacher interviews were conducted with teachers in the intervention school (1 male, 3 females) to explore their perceptions and experiences of the intervention. The use of qualitative data can assist in the development of our understanding when considering the effects of PA interventions in schools (Castelli et al., 2014). The interview questions reflected the components of the intervention and included questions such as 'what is effective teaching in PE?' and 'which elements of your practice did you change?'. A Dictaphone was used to capture the verbal interactions and to maintain consistency all interviews were conducted, transcribed and analysed by the lead researcher.

Qualitative analysis

A systematic and detailed analysis of the interview data were conducted using Interpretative Phenomenological Analysis (IPA) (Smith, 1997). IPA is grounded in three areas of philosophy: phenomenology, ideography and hermeneutics (Smith et al., 2009). An IPA approach was adopted as it aligned with the epistemological position of exploring teachers' perceptions and experiences of the intervention. Further information regarding IPA can be found elsewhere (Smith et al., 2009).

Results

Outcome measures (SOFIT)

Large interaction effects for time spent in MVPA ($F(1,27) = 11.07$, $p = 0.003$, $\eta_p^2 = .316$), vigorous activity (VPA)($F(1,27) = 8.557$, $p = .007$, $\eta_p^2 = .263$) and skill practice ($F(1,27) = 14.87$, $p = .001$, $\eta_p^2 = .383$) were evident in the intervention school. The proportion of time children were engaged in MVPA during PE lessons in the intervention school increased significantly between baseline ($M = 42.51\%$ $SD = 12.41\%$) and post-intervention ($M = 72.59\%$, $SD = 10.05\%$) (Fig. 2). Teachers' promotion of PA in the intervention school also increased significantly from baseline to post-intervention; whereas for the control school, MVPA remained relatively constant, and VPA and teachers' promotion of PA decreased (Table 3).

Process measures (teachers' perceptions of the teaching strategy intervention)

The qualitative findings revealed two main themes: 1) a paradigm shift and 2) developing pedagogy.

A *paradigm shift* (emergent themes: rethinking their approach to primary PE, raising awareness, and a whole school approach). It was evident from the teacher interviews that the intervention assisted in raising teacher's awareness of children's PA levels in PE lessons and also developed the status of PE as a subject area in the school. For instance: '*Well it has definitely got a higher status than it did before, I don't remember there being a focus on PE*'. The teacher's also expressed how the intervention had changed their thinking and approach towards primary PE in regard to active learning time and their organisation within the lesson, '*it taught me to rethink how I'm teaching those skills and to ensure that the activity levels are much higher than they were, I'd say much, much higher than they were before*'. The teacher's also conveyed the importance of a whole school approach (relatedness) in regard to increasing children's PA levels in PE '*If it's not a shared kind of ethos and ideas then it's not going to work, everyone needs to be on board*'.

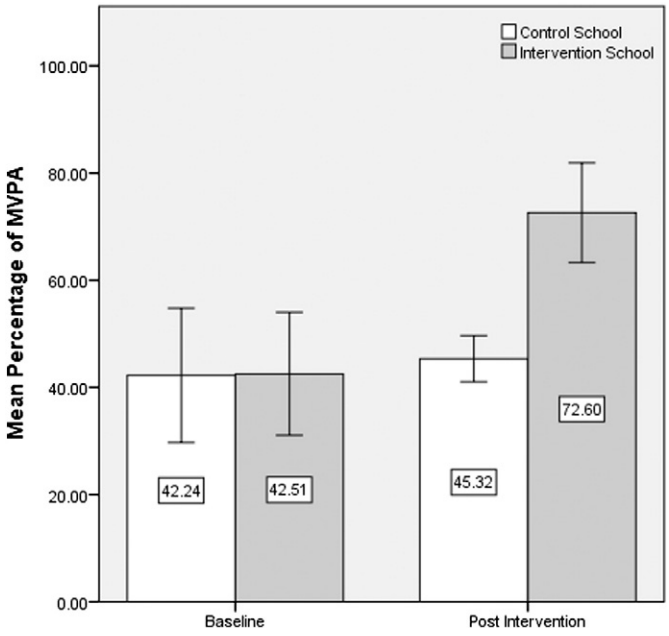

Fig. 2. Mean percentage of time children engaged in MVPA at baseline and post-intervention.

Developing pedagogy (emergent themes: planning is the foundation, being comfortable in chaos, and PA as the main aim of primary PE). All of the teachers stated that planning was a key element to changing their practice and increasing children's PA levels. For example one teacher highlighted the importance of having a structure in their approach to planning '*I think definitely having some structure in planning has 100% improved it*'. The teachers also voiced that for them PA was a main priority in PE and that they constantly reflected upon children's active learning time throughout a lesson. For example '*I've changed all the lessons that I teach and how I teach them to be honest with you, as a result of the work that we have done…the activity now comes at the forefront of my mind when I'm planning and when I'm teaching, so I am always thinking what are the children doing, are they moving are they active, how could this be more active*'. In addition, teacher's reflected upon their organisation within lessons and how it increased children's activity levels, for instance, '*from the outset I try get their heart rate going and not to reduce that*' and '*for swimming, whereas before you might have them all on the side, watching how to do something, now you get them all to do it, three times, instead of just the once, so that they are all moving all of the time*'.

Discussion

The main aim of this research was to evaluate a one year teaching strategy intervention which supported teachers in increasing children's MVPA and active learning time during primary PE. Both the quantitative and qualitative results indicated that the intervention was effective, as the mean %MVPA levels of children in the intervention school increased by 30%, exceeding MVPA guidelines (IOM, 2013; AfPE, 2013) and producing a mean MVPA of 72.6% of lesson time. The quantitative results evidenced large effect sizes and produced greater increases in %MVPA (30%) than previous intervention studies that had a teaching strategy focus, such as CATCH (12% MVPA increase) (McKenzie et al., 2001) and M-SPAN (18% MVPA increase) (McKenzie et al., 2004). This provides further support for the effectiveness of teaching strategy interventions to increase children's MVPA, particularly in England where there is currently a lack of primary PE intervention data. This research also provides further insights through the addition of qualitative data to assist in evaluating the effectiveness of the intervention, which highlighted a paradigm shift (Kuhn, 1962), in regard to the teachers' approaches to PE and also the advancement of their pedagogical development in terms of increasing active learning time.

The teaching strategy intervention involved the unique combination of the SDT (Ryan and Deci, 2000), SEM (McLeroy et al., 1988) and BCT (Michie et al., 2011), and the introduction of the SHARP principles. Thus, teachers were provided with a new platform that raised awareness, provided a clear focus and re-directed their approach to teaching primary PE. It was evident from the qualitative data that teachers began to think about primary PE in a very different way, in short their approach to PE at baseline did not align with their new awareness of

Table 3
Mean proportion of lesson time (% + SD) (and number of minutes + SD) representing children's activity levels, lesson context and teacher promotion of PA in intervention and control school during baseline and post-intervention.

SOFIT category	Baseline		Post-intervention		Interaction	
	Mean proportion of lesson time % (SD)					
	Control school (1)	Intervention school (2)	Control school (1)	Intervention school (2)	*P*	Effect size (partial eta squared)[b]
Physical activity						
Lying	0.34 + 0.89	0.86 + 1.08	0.00 + .00	1.66 + 2.02	.245	.056
Sitting	16.62 + 13.86	23.69 + 14.96	6.06 + 7.33	1.69 + 3.75	.182	.073
Standing	40.68 + 7.09	32.79 + 12.69	48.25 + 7.88	23.60 + 8.51	.025*	.192
Walking	28.07 + 12.12	30.23 + 12.66	34.83 + 5.09	42.59 + 10.03	.483	.021
Vigorous	14.17 + 5.50	12.28 + 12.71	10.49 + 4.36	30.00 + 12.79	.007*	.263
MVPA [a]	42.23 + 13.58	42.51 + 12.41	45.32 + 4.66	72.60 + 10.05	.003*	.316
Lesson context						
Management	18.26 + 5.05	17.90 + 11.53	14.11 + 5.24	16.43 + 5.33	.635	.010
Knowledge	21.29 + 7.41	17.30 + 8.71	22.30 + 7.89	18.38 + 6.84	.991	.000
Fitness	10.43 + 5.13	26.36 + 21.66	13.18 + 6.75	10.47 + 7.60	.055	.145
Skills	17.49 + 14.18	6.84 + 8.69	9.25 + 5.45	29.78 + 12.30	.001*	.383
Games	32.48 + 24.76	23.84 + 19.61	40.88 + 13.29	23.23 + 15.87	.534	.016
Other	0.00 + 0.00	7.66 + 10.04	0.63 + 1.17	1.88 + 4.69	.142	.088
Teacher promotion of PA						
In class promotion	21.36 + 13.08	18.72 + 14.28	6.89 + 3.91	42.29 + 13.89	.000*	.420
Out of class promotion	0.00 + 0.00	0.00 + 0.00	0.00 + 0.00	0.00 + 0.00		
No promotion	78.47 + 13.09	81.28 + 14.28	92.86 + 3.42	57.60 + 13.84	.000*	.422

[a] MVPA, moderate to vigorous physical activity (walking + vigorous).
[b] Partial eta squared was used in SPSS to calculate the effect size.
* Significant interaction effect at $p < 0.05$.

increasing active learning time at post-intervention. Therefore, the application of the SHARP principles could be seen as the first step towards improving pedagogical practice in PE when used with a curriculum focused school programme, thus having the potential to improve the quality of PE in primary schools. By placing PE within a public health context in the intervention school, this assisted in raising the status of PE as a subject area; which has been declining in importance since the 1970s (Puhse and Gerber, 2005). The evaluation of the intervention highlighted that it is possible for primary teachers to think about PE in a very different way, offering considerable potential for major advances in the subject area through the re-direction of an entire field of practice. The consideration of a paradigm shift is based on a phenomenon that there is an abandonment of current ideas and the adoption of a new way of thinking (Kuhn, 1962). Therefore we speculate that the SHARP Principles Model has the potential to shift current thinking in primary PE towards a focus on increasing children's active learning time.

The SHARP principles provided the teachers with key elements to focus on in both the planning stage and the delivery of their PE lessons. One important factor was the introduction of dynamic stretches which the intervention teachers integrated into the warm-up elements of their lessons, replacing their traditional static stretching routines (Bukowsky et al., 2014). Another important factor was the high repetition of motor skills which provided children with increased active learning time. The teachers in the intervention school became conscious of queues and children waiting for their turn, as a priority of the intervention was to increase the opportunities children had to practise and apply their skills during PE lessons, as discussed by one of the teachers: '*we are always trying to teach skills but now it's teaching those skills in an active way*'. The SHARP principles are unique as they can be applied to any activity area in English primary PE National Curriculum such as swimming, dance, gymnastics and games activities. The SHARP Principles are not based on a specific pedagogical approach such as traditional direct teaching styles or game-based approaches; and therefore we speculate that they can be applied to a range of pedagogical approaches. Developing an approach to teaching primary PE which increases children's active learning time suggests that primary PE can make a valuable contribution towards minimum PA guidelines of 60 min MVPA (DH, 2011), on days when PE is timetabled. The findings indicate that the SHARP Principles Model has been an effective intervention strategy to increase active learning time in the intervention school's primary PE lessons; thus future interventions to test its effectiveness across different school contexts is recommended.

Limitations and strengths

Limitations of this study include the small sample size of one control school and one intervention school, along with the non-randomised design. This therefore limits the generalisability of the findings to other school contexts. The design was also limited to one method for the assessment of children's MVPA during PE; a future recommendation would be to use accelerometers alongside the SOFIT tool. Furthermore follow-up data collection points were not taken, therefore, the sustainability of the intervention cannot be inferred. With these limitations in mind, it is suggested that further research using the SHARP Principles Model is implemented on a wider scale.

One of the main advantages of the evaluation process was the mixed method approach to evaluate the effectiveness of the intervention, which increased the trustworthiness and validity of the data through method triangulation. The quality of the interview data was aided through discussions of the researcher's assumptions with critical colleagues (Norris, 2007). In addition the intervention was grounded in theory (Ryan and Deci, 2000; McLeroy et al., 1988) and elements of the BCT (Michie et al., 2011), with the method of direct observation allowing the researcher to collect quantitative data but also reflect in the PE environment, providing contextually rich data (McKenzie, 2010). Given the importance of the teacher's role in PE interventions, the credibility of the design and evaluation of the intervention was increased by the lead researcher's understanding of a school setting, who has experienced teaching in primary schools and developing primary PE pedagogy modules in Initial Teacher Education (ITE).

Conclusion

Findings from this research highlight the importance of a mixed method approach and its contribution to understanding the effectiveness of school based PA interventions. The intervention itself produced significant increases in children's MVPA during PE through re-directing teachers' approaches and thinking towards primary PE as a subject. As a result, the SHARP principles assisted teachers in utilising their role to effectively increase children's active learning time in PE. Recommendations based on this evaluation would be for the SHARP Principles Model to be replicated across a variety of contexts; and evaluated using both quantitative and qualitative measures.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of interest

The author declares there is no conflict of interest.

Acknowledgments

We give our sincere thanks to all the children, teachers and schools that took part in this study, particularly the PE co-ordinator and the Head Teacher at the intervention school for their support in the design and implementation of the intervention.

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