



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

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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.

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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 Lounsbury, 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

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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 Lounsbury, 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • This principle is based on the notion that children cannot become physically skilled if they are not engaged in active learning (McKenzie and Lounsbury, 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	<ul style="list-style-type: none"> • 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: <table border="0"> <tbody> <tr> <td>STEP</td> <td>Easier</td> <td>Harder</td> </tr> <tr> <td>Space</td> <td>Working in their own space</td> <td>Sharing multiple stations with others.</td> </tr> <tr> <td>Task</td> <td>Reducing the number of elements to be included in a sequence</td> <td>Increasing the number of elements to be included in a sequence</td> </tr> <tr> <td>Equipment</td> <td>Using the floor and mats</td> <td>Using the floor, mats and apparatus</td> </tr> <tr> <td>People</td> <td>Working with a partner</td> <td>Working in a small group</td> </tr> </tbody> </table>	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
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Reducing sitting and standing	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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'. 															

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