

Impact of goal setting on physical activity in physical education

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Abstract:

Problem Statement: School physical education has been identified as an important time for increasing children's physical activity. Unfortunately, children are not as active and recommended. Pedometers and goal setting may be one way to increase physical activity. The purpose of the project was to evaluate the effectiveness of a pedometer-based goal-setting and encouragement intervention on physical activity in physical education. Participants totaled 200 (n = 94 control, n = 106 intervention) 3rd and 4th graders, aged 8 to 10 years old in Southwest United States. The New Lifestyles NL-1000 physical activity monitor was utilized to measure step counts. Participating classes were randomly divided into 2 groups (control and intervention). The intervention group was given a step goal accompanied by encouragement feedback strategies including signs and verbal encouragement at regular intervals throughout the lesson. The control group was given the same lesson with no step goal or feedback. The goal was to reach 2,000 steps each lesson. An independent-samples t test was utilized to examine differences between groups. The intervention group showed a statistically significant difference in step counts compared to the control group, $t_{(194)} = -6.40$, $p < .001$. The goal setting and pedometer group averaged 2046 ± 406 steps while the control group averaged 1695 ± 356 . There were no differences between grades ($p = .23$). Findings indicated that setting goals and providing feedback for daily step counts in physical education have the ability to increase daily physical activity. Pedometers have the opportunity to motivate and encourage and are a relatively inexpensive tool that can be used in physical education.

Key words: pedometer, schools, health, children

Introduction

benefits of physical activity for school-aged children in well established (Janssen & LeBlanc, 2010). These benefits range from the prevention of chronic disease (Sothorn et al., 1999) to mental health (Biddle & Asare, 2011) to academic outcomes (Donnelly et al., 2016). Unfortunately, children are not accumulating the enough physical activity (Brusseau, Tudor-Locke & Kulinna, 2013; Dentre et al., 2014). The USDHHS (2008) recommends 60 minutes of moderate to vigorous physical activity daily for youth. The Institute of Medicine (2013) recommends that 30 minutes of this recommendation is accumulated at school. Colley, Janssen, and Tremblay (2012) have identified 12,000 steps/day are required to meet the 60 minute recommendation while Burns, Brusseau, Fu, and Hannon (2016) have identified 5505 steps to be equivalent to 30 minutes of MVPA at school.

Physical education has been linked to children's development across the physical, affective, and cognitive domains (Bailey, 2006). Further, physical education has been identified as essential for public health (Sallis & McKenzie, 1991). With fewer physical activity opportunities available for children, increasing physical activity in physical education is important. In fact, schools are encouraged to implement Comprehensive School Physical Activity programs in an effort to improve health and academics (Brusseau & Hannon, 2015). Physical Education has been identified as the centerpiece of any school based efforts to increase physical activity (SHAPE America, 2013). Previous studies (e.g. Brusseau et al., 2011, Morgan, Pangrazi, & Beighle, 2003; Scraggs et al., 2003) have suggested that children accumulate between 1600-2000 steps during elementary physical education highlighting the overall importance to meeting both school day and total day physical activity recommendations. Even with the clear importance of physical education's contributions to school day and overall physical activity, youth are falling well short of the recommended levels in physical education (Bevans, Fitzpatrick, Sanches, Riley, & Forrest, 2010).

One way to increase physical activity is through the use of pedometers. The use of pedometers has been linked to significant increases in physical activity (Kang et al., 2009) as well as decreases in body mass index (Bravata et al., 2007) in adults. In youth, studies using pedometers as a means to promote habitual or school day physical activity have shown increases in physical activity (Lubans, Morgan, & Tudor-Locke, 2009). Studies have had success by requiring a certain level of steps to earn screen time (Goldfield et al., 2000; Southard & Southard, 2006), setting step goals (Schofield et al., 2005), providing information and support from teachers

(Butcher et al., 2007) and peer modeling and rewards (Horne et al., 2009). More specifically, studies have suggested the merit of using pedometers to promote physical activity in physical education (Beighle, Morgan, & Pangrazi, 2004; Morgan, Pangrazi, & Beighle, 2003), however, little empirical evidence exists showing the actual use of pedometers in physical education lead to increases in physical activity.

Beyond the use of pedometers, setting physical activity goals have been successful in increasing step counts of children during summer camp (Wilson, Sibthorp, & Brusseau, 2017) and across the school day (Burns, Brusseau, & Fu, 2017). Goal setting has been identified as a leading psychological strategy for improving performance (Locke & Latham, 1990) and that goal setting can lead to behavior change due to the fact that they guide an individual's attention and effort in order to obtain a specified level of proficiency (Locke & Latham, 2006).

To date, little is known about the impact of goal setting with pedometers in physical education classes. The usefulness of these combined tools could be an important and low cost way to increase physical activity behavior in children. Therefore, the purpose of this study was to examine the impact of pedometers; specifically step count feedback and step count goal setting on step counts in physical education class. A secondary purpose was to look at the number of days the students met the 2,000 step threshold.

Methods and Materials

Participants

A total of 200 3rd and 4th grade youth from the Southwestern US were invited to participate (3rd grade=102; males=101). Eight classes were randomly assigned as the control (no goal setting and step count feedback) or intervention condition. All procedures were approved by the University Institutional Research Board, School District Research Board and school principal. Parental permission and child assent were obtained prior to implementing the project. Children had physical education once per week for 45 minutes.

Instrument

Children wore the New Lifestyles (Lees Summit, MO, USA) NL-1000 physical activity monitor for each of the eight lessons. The NL-1000 has been shown to be a valid and reliable measure of free living physical activity in elementary school children (Hart, Brusseau, Kulinna, McClain & Tudor-Locke, 2011) and has been used in previous studies to measure physical activity in physical education (Burns, Brusseau, & Hannon, 2015). Each student was assigned a physical activity monitor with a unique identification number. Students put the monitor on their waist above their right knee as soon as they arrived at class and returned the monitor at the conclusion of the lesson.

Intervention

The intervention group was given a step goal accompanied by verbal encouragement and signs with step targets around the gym throughout the lessons. The control group was given the same lessons with no step goal or encouragement. The goal was to reach 2000 steps each lesson. 2000 steps was chosen as previous physical education studies have identified a range of 1200-2000 steps in elementary physical education (Brusseau et al., 2011; Morgan, Pangrazi, & Beighle, 2003; Scruggs et al., 2003).

Procedures

Prior to the beginning of the study, all participants were given an opportunity to practice wearing the physical activity monitor in class to minimize reactivity (Prewitt et al., 2013). A step test was completed to ensure the accuracy of the instrument for each participant (Vincent & Sidman, 2003). Participants wore the pedometer for each of the 8 classes. The research team recorded step counts after every lesson. The physical education teacher provided the lesson context of each lesson ensuring that both groups were exposed to the same lesson.

Data Analysis

Means and standard deviations were calculated for the intervention and control groups. SPSS was used to analyze data. Independent samples t tests were used to examine differences between groups overall and also by grade and sex.

Results

The intervention group showed a statistically significant difference in step counts compared to the control group, $t_{(194)}=-6.40$, $p<.001$. The goal setting and pedometer group averaged 2046 ± 406 steps while the control group averaged 1695 ± 356 . There were no differences between grades ($p=.23$). Boys were significantly more active than girls $t(194)=-4.59$, $p<.001$. Figure 1 shows the changes by sex in the intervention and control groups. Figure 2 shows the changes in the intervention and control groups by grade. The intervention group showed a statistically significant difference in the number of days the step goal was met compared with the control group, $t(190.7) = 26.81$, $p, .001$. The control group on average met their goal for 1.5 days ($M = 1.52$, SD

= 1.63), whereas the intervention group more than doubled the amount of days they met their goal ($M = 3.41$, $SD = 2.25$).

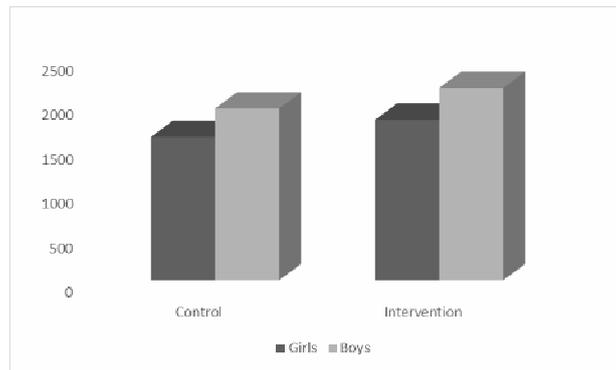


Fig. 1. Goal setting and encouragement by sex and intervention group.

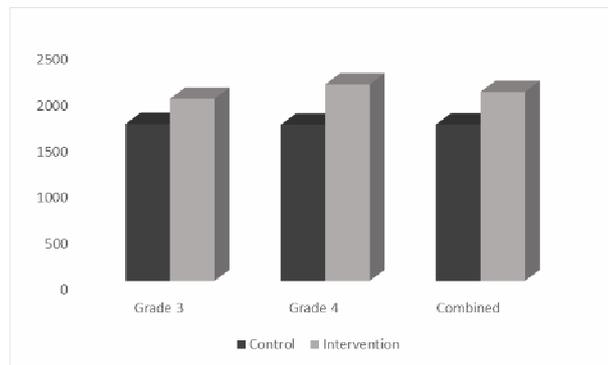


Fig. 2. Goal setting and encouragement by grade and intervention group.

Discussion

The purpose of this study was to examine the impact of using pedometers with goal setting and encouragement on step counts in physical education class. Findings suggest that the use of pedometers with the goal setting and encouragement led to students meeting their 2000 step goal with an average increase of 350 steps per physical education class compared to the control group. The intervention was simple and low cost and led to a 20% increase in steps during physical education classes. Silva and Weinberg (1984) have suggested that goal setting can improve dedication, commitment, and perseverance for long-term self-motivation. The use of goal setting may help young people develop the mindset and motivation to be physically active.

The ability of the children to accumulate 2000 steps is on the top end of expected values during an elementary physical education class (Brusseau et al., 2011, Morgan, Pangrazi, & Beighle, 2003; Scruggs et al., 2003). This level of step count accumulation is 36% of the daily school day recommendation (Burns, Brusseau, Fu, & Hannon, 2016). When considering normative school physical activity levels (e.g. Brusseau & Kulinna, 2015), the contributions is likely much higher. These extra steps have potential to have a meaningful impact as previous school day program research has shown that even small increases (i.e 500 steps) in daily step counts at school can positively influence classroom behavior (Burns, Brusseau, Fu, Myrer, & Hannon, 2016), student health-related fitness (Brusseau, Hannon, & Burns, 2016) or even some health markers (Burns, Brusseau, & Hannon, 2017). The increases shown in this study couple with other study related to recess (Larson, Brusseau, Chase, Heinemann, & Hannon, 2014) and classroom physical activity breaks (Bershwiner & Brusseau, 2013) could have a significant impact on student health and behavior.

Our findings are similar to other studies showing that goal setting using pedometers in elementary school aged children can have a positive effect on their physical activity levels (Burns, Brusseau, & Fu, 2017; Hardman, Horne, & Lowe, 2011; Horne, Hardman, Lowe, & Rowlands, 2009; Larson et al., 2018; Wilson, Sibthorp & Brusseau, 2017). This current study did not include rewards (Hardman et al., 2011; Horne et al., 2000). This is important as rewards may weaken a child's intrinsic motivation impacting the long term value of the goal setting (Ryan & Deci, 2000).

Strengths of the current study include the low cost and ease of implementation of pedometers with goal setting. This may make it more likely that other researchers and practitioners may be able to implement something similar. Furthermore, the study had matched classes with the exact same lesson plans as a control which allows us to link the improvements in step counts directly to the goal setting and encouragement. Future research may need to explore whether the goal setting itself or the regular encouragement was most important for increases in physical activity. The study was not without limitations. The use of only one school in one city in

the US limit the ability of the findings to be generalized to other populations. Similarly, the study lack a follow-up time point which is important to determine the sustainability of goal setting in physical education class.

Conclusions

In conclusion, this study highlighted the potential use of pedometers with a step count target and teacher encouragement as a means to increase physical activity in physical education classes. Physical education has been highlighted (Sallis & McKenzie, 1991) as an important means for public health and it is important that we continue to find ways to improve the physical education experience and maximize physical activity opportunities for children during these opportunities.

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