Evaluation of a Policy to Integrate Physical Activity Into the School Day

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Background: Implementing physical activity (PA) within academic curricula increases energy expenditure and enhances academic achievement in elementary students. The purposes of the study were to determine the extent teachers met the 20-minute PA policy, identify how teachers met the policy, and measure the level of intensity of PA provided. Methods: Four elementary schools (grades K–5; 68 classroom teachers) implemented a district-mandated 20-minute PA policy. Teachers recorded PA for 1 week in September 2010 and February 2011. A sample of 142 students (grades K–5) wore accelerometers to measure school day PA. Results: While 40% and 4% of teachers in September and February respectively met the policy all 5 days, 72.5% and 45.7% of teachers in September and February respectively implemented PA at least 3 days/week. Accelerometry results indicated curriculum-based lessons (CBL; 59.92 ± 20.38 min) or walk/run periods (51.56 ± 18.67 min) significantly increased school day MVPA ($P < .05$) above no additional activity (30.96 ± 22.57 min). Conclusions: Although the teachers did not meet the 20-minute policy every day, the increased amount of PA achieved each week through the teachers’ efforts is a significant contributor to total daily PA levels of children.

Keywords: education, movement, accelerometer

Physical inactivity has become more prevalent throughout all populations, regardless of age, gender, ethnicity, or socioeconomic status, and it has been shown to increase the potential for obesity, cardiovascular disease, metabolic diseases, higher body fatness, depression, and other health concerns.6 The prevalence of childhood obesity has continued to increase over the past few decades as children have become more exposed to sedentary environments and increased their use of technology.7,8 As a result of No Child Left Behind,9 it appears that children are spending a higher percentage of the school day in the classroom being sedentary as instructional time increases and physical education and recess time decreases.9,10 Students may find themselves struggling to focus and maintain appropriate learning behaviors as their sitting time increases.11,12 As a result of increased seat time, recommendations have been made for schools to promote physical activity (PA) as part of Coordinated School Health.13-15

The Centers for Disease Control and Prevention’s (CDC) School Health Guidelines to Promote Healthy Eating and Physical Activity and a recent position statement from National Association for Sport and Physical Education (NASPE) recommend a Comprehensive School Physical Activity Program (CSPAP) which encourages opportunities for school-based PA to assist students in achieving the nationally recommended 60 minutes of PA each day15 through a social-ecological approach to health promotion16 allowing for multiple PA strategies at multiple levels of intervention (ie, individual, social, organizational, community, and policy).17 While quality physical education is the basis for a CSPAP, the program extends into the classroom, recess time, before and after school programs, and family and community involvement. Beyond programs, schools are recommended to create policies that encourage PA among youth, since policies often allow for formal and informal rules that help sustain PA programs.14 In schools, PA opportunities should supplement physical education time, and should be used to employ the skills, knowledge, and confidence students learn over time.15 One strategy of how a school could implement PA into its school day is by integrating PA into the classroom during instruction time.

Combining PA and academic concepts has become increasingly popular in elementary classrooms. Curriculum-based lessons, such as ‘Take 10!’ lessons1,3 and Energizers4 (East Carolina University), provide PA to students without disrupting instructional time in the classroom. Researchers have shown that implementing PA within the traditional academic curriculum increases daily energy expenditure1-3 and enhances academic achievement in elementary students.4,5 One potential barrier when incorporating PA in a classroom setting is many elementary level classroom teachers are not trained to teach PA to students. Elementary school teachers might also have low self-efficacy in teaching PA and feel inept to integrate various types of PA into their academic lessons or classroom setting.17,18 To create a sustainable school PA program, an orientation to PA opportunities through
professional development should be offered to all staff to facilitate cooperative and collaborative discussions and enhance understanding in developing a working plan of the CSPAP.13,15 Professional development opportunities should be provided to teachers and staff who supervise PA sessions outside of physical education to help them improve skills and self-efficacy, and acquire new skills.13

In August 2008, the superintendent of a Central Nebraska school district with approximately 1250 students implemented a PA policy that required elementary classroom teachers to provide their students with an additional 20 minutes of PA outside of recess and physical education every day. Initial reaction from teachers was to integrate a 20-minute outdoor walk or run into their day. Teachers reported that the walk/run often took more than 20 minutes due to factors such as putting on coats, bathroom/water breaks, and changing shoes. Teachers reported the outdoor walk/run activity was problematic due to Midwest weather changes; hence, the policy became optional in November 2008.

During the 2009–10 academic year, teachers were provided with professional development on how to integrate PA into their school day through curriculum-based lessons, indoor games, and song and dance. The 20-minute PA policy was then implemented again in all elementary schools in the fall 2010 semester for the entire academic year.

The purpose of the current study was to determine the extent classroom teachers were implementing a mandated 20-minute PA policy. Furthermore, the investigators identified how teachers were meeting the policy and whether the additional 20 minutes of PA were of moderate to vigorous intensity.

**Methods**

Four elementary schools (grades K–5; 68 classroom teachers; 1284 students) of a Central Nebraska school district implemented a 20-minute PA policy as mandated by the district administration. The elementary schools are located in a rural community with a predominantly Hispanic population (77%; Caucasian 17%, Other 6%). The study was approved by the Institutional Review Board at the University of Nebraska Kearney.

**Study Overview**

In August 2010, the district superintendent mandated a PA policy requiring elementary school teachers to provide all students with 20 minutes of daily PA outside of recess and physical education, beginning the first day of school. Before implementation, an optional PA professional development session was offered to all elementary classroom teachers providing them with multiple resources, knowledge about PA, and model teaching opportunities for incorporating PA into the school day. The professional development session was created based on feedback from staff and administration through 2 conducted focus groups, a 6-week pilot study, and meetings with staff during their monthly scheduled meetings. To evaluate the implementation of the 20-minute policy, teachers were asked to record their classroom PA outside of recess and physical education for 1 week in September 2010 and February 2011 on a tracking sheet provided by the investigators. Data were collected in September to gauge the initial implementation level of classroom teachers early in the school year, while February allowed the researchers to evaluate how implementation of the policy could be affected by extended holiday breaks and cold weather. In the Midwest, students are often confined indoors during the winter months due to cold temperatures and inclement weather conditions. To determine the intensity level of PA, classrooms (grades K–5) were randomly selected to wear MTI Actigraph accelerometers to objectively measure moderate to vigorous PA during the school day. Written parental consent and child assent were obtained from 142 students (11.1% of population) before participation. Figure 1 shows the timeline for the intervention and data collection.
Physical Activity Professional Development

Fifty-five district elementary classroom teachers (80.9% of eligible classroom teachers) attended the optional 3.5-hour PA professional development session and were educated about the importance of PA, introduced to curriculum-based PA lessons, and provided multiple PA resources. The overall purpose of the professional development was to provide teachers with a variety of options to implement the 20-minute PA policy. Due to their direct tie to content standards, teachers were introduced to, participated in, and modeled Take 10! lessons in peer groups. The session also included an overall introduction of PA in the classroom and the effects of PA on overall health and the learning process. Each school was provided Take 10! notebooks once professional development was completed. Other online resources such as Energizers, PE Central, and Brain Breaks were also sent electronically to all teachers.

Classroom Physical Activity Tracking Sheets

All K–5 grade level classroom teachers from 4 schools were asked to track PA provided to their students outside of physical education and recess for 1 week during September 2010 and February 2011. Fifty-four of 68 classroom teachers (79.4%) completed the tracking sheet in September and 45 of 68 in February (66.2%). Information collected on the classroom PA tracking sheets included type of classroom activity (walk/run, Take 10!, song/dance, Brain Gyms, etc.), self-reported duration of activity (start/stop times), subject integrated if curricular based activity, and an area was provided for subjective comments about the day’s activity or the policy.

Physical Activity Assessment

A representative sample of 142 students (K–5 grades; age = 8.68 ± 1.8 years; BMI = 19.61 ± 4.29 kg/m²) wore a MTI Actigraph accelerometer for 3 consecutive days (Tuesday, Wednesday, Thursday) to identify minutes of moderate to vigorous PA (MVPA) accumulated during the school day (8 AM to 3 PM). Data were collected in 15 second epochs and summed over 1 minute. Counts per minutes were converted to METs using the equation developed by Trost et al.20 (kcal·min[sup – 1] = –2.23 + 0.0008 (counts·min[sup – 1]) + 0.08 (body mass in Kg) and MVPA was then defined as any movement ≥ 4 METs.20 Participants were instructed to wear the accelerometer attached to their waistband via an adjustable elastic belt with the monitor worn above the right hip during school hours. In addition, during these 3 days, teachers were asked to record PA duration time (start/stop times) and the type of activity implemented in the classroom. School day MVPA was compared based on types of activity (curriculum-based lessons, walk/run period, other movement activity, and no activity) reported by the classroom teachers. Teachers also recorded recess and physical education times, which were included in the calculation of school day MVPA, since total minutes were analyzed.

Statistical Analysis

Descriptive statistics for type of classroom activity (walk/run, Take 10!, song/dance, brain breaks, etc.), minutes of additional PA per day, minutes of PA per activity session, and number of sessions per were calculated using SPSS 18.0 (IBM® Corp., Somers, NY). MTI Accelerometer data were analyzed using SAS version 9.1 (Cary, NC). Analysis of variance (ANOVA) was used to determine the difference in minutes of MVPA between the 5 identified groups: 1) Take 10! lesson plus another activity, 2) a walk/run period, 3) a walk/run period plus another activity, 4) other movement activities, and 5) no extra activity.

Results

Classroom tracking sheets were used to determine the percentage of teachers that met the policy during September 2010 and February 2011. Of the tracking sheets received, 54 denoted activity duration times (90.32%). Level of implementation was examined based on the number of days per week classroom teachers met the 20-minute PA policy. To meet the mandated policy time, teachers were not restricted to specific physical activities, so various strategies were implemented that included a combination of curriculum-based lessons, walk/run periods, and other movement activities, such as Brain Gyms and song/dance, oftentimes incorporating more than 1 session in a day. During September, teachers implemented 1.82 ± 0.75 activities per day which provided 17.36 ± 6.98 minutes of PA in addition to recess and physical education. Analysis indicated teachers completed 9.05 ± 3.14 activities per week and provided 86.79 ± 34.89 minutes of PA of the expected 100 minutes per week. While all participating teachers reported implementing some PA into the school day, only 39.9% of the teachers met the mandated PA policy of 20 minutes per day.

February results indicated teachers implemented 1.44 ± 0.8 activities which provided 14.56 ± 6.31 minutes of PA daily of the mandated 20 minutes. Weekly, 7.20 ± 3.31 activities were implemented providing 72.82 ± 31.54 minutes. Overall, only 4.4% of teachers met the 20-minute PA policy all 5 days.

While results showed very little overall differences in the level of implementation in September based on a teacher’s attendance of the professional development session, teachers attending a professional development session had a higher implementation rate in February 2011 (Table 1). In February, 4.4% of teachers were able to meet the mandate policy all 5 days of the week, and all
of these teachers attended the professional development session. When looking at 3 days or more met, the rate of teachers meeting the daily 20 minutes increases to 45.7% of those attending a professional development session versus 20.0% of teachers who did not attend.

Table 2 represents the physical activities by level of implementation used by classroom teachers in a single session to meet the PA policy. Teachers used all strategies fairly evenly and no preference was given to walk/run sessions, curriculum-based lessons, or other movement-based activities, such as Brain Gyms and song/dance, during September 2010. The teachers who met the mandated policy in September 2010 most commonly used curriculum-based lessons for 9.95 ± 2.60 minutes per single session (39.2%). February 2011 indicated a change in PA single session use as curriculum-based lessons took a distinct preference over a walk/run session or other movement activities. Classroom teachers fully meeting the policy did not rely on a walk/run session, but preferred using the curriculum-based lessons (80.0% of activity sessions).

While various strategies for increasing PA were used in both September and February, accelerometry results indicated that bouts of PA using curriculum-based lessons, such as Take 10! lessons or a modified Take 10! lesson (59.92 ± 20.38 min MVPA), or a walk/run period (51.56 ± 18.67 min MVPA) significantly increased school day (including recess and PE) MVPA compared with days when students accumulated activity through other movement based physical activities, such as Brain Gyms or song and dance (32.92 ± 31.65 min MVPA), or did not accumulate additional PA beyond recess and PE (30.96 ± 22.57 min MVPA) (P < .05; Figure 2). In both September 2010 and February 2011, curriculum-based lessons were used readily throughout implementation. These lessons were integrated into all subjects, but most often into math and language arts. In September, math was used 39.2% of the time, while language arts was integrated 47.8% of the time. February brought similar overall subject results with math and language arts being integrated most often, though the frequency of use changed to 48.1% and 39%, respectively.

### Table 1 Level of Implementation of the 20-Minute Physical Activity Policy Based on Attendance to a Professional Development (PD) Session

<table>
<thead>
<tr>
<th>Days met/week</th>
<th>September 2010</th>
<th>February 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Overall (n = 54)</td>
<td>Attended PD (n = 44)</td>
</tr>
<tr>
<td>5</td>
<td>39.9%</td>
<td>38.6%</td>
</tr>
<tr>
<td>3–4</td>
<td>32.6%</td>
<td>29.5%</td>
</tr>
<tr>
<td>0–2</td>
<td>27.6%</td>
<td>31.9%</td>
</tr>
</tbody>
</table>

### Table 2 Physical Activities Implemented by Classroom Teachers to Meet the 20-Minute Physical Activity Policy (Single Session)

<table>
<thead>
<tr>
<th>Days met/week</th>
<th>Implemented physical activity</th>
<th>September 2010</th>
<th>February 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Average minutes</td>
<td>Frequency of use</td>
</tr>
<tr>
<td>5</td>
<td>Walk/run</td>
<td>15.07 ± 6.18</td>
<td>26.5%</td>
</tr>
<tr>
<td></td>
<td>Curriculum-based</td>
<td>9.95 ± 2.60</td>
<td>39.2%</td>
</tr>
<tr>
<td></td>
<td>Movement activity</td>
<td>11.68 ± 4.96</td>
<td>34.3%</td>
</tr>
<tr>
<td>3–4</td>
<td>Walk/run</td>
<td>13.22 ± 6.22</td>
<td>38.3%</td>
</tr>
<tr>
<td></td>
<td>Curriculum-based</td>
<td>8.64 ± 2.45</td>
<td>23.7%</td>
</tr>
<tr>
<td></td>
<td>Movement activity</td>
<td>7.34 ± 4.81</td>
<td>38.0%</td>
</tr>
<tr>
<td>0–2</td>
<td>Walk/run</td>
<td>12.86 ± 4.16</td>
<td>27.3%</td>
</tr>
<tr>
<td></td>
<td>Curriculum-based</td>
<td>7.40 ± 3.04</td>
<td>40.8%</td>
</tr>
<tr>
<td></td>
<td>Movement activity</td>
<td>6.31 ± 2.52</td>
<td>31.9%</td>
</tr>
</tbody>
</table>

*Note. Average minutes = Mean ± SD. Movement activity = physical activity session that is not a walk/run session or curriculum-based lesson, such as Take 10!.*
Discussion

Although the 20 minutes of additional PA was a district mandate, the majority of teachers were not able to provide the 20 minutes of PA every day for their students. Level of implementation was overall higher during September 2010 than in February 2011 which may be attributed to weather in the Midwest. Although many teachers did not reach the daily goal of 20 minutes of PA, we view this as an achievable goal. It is important when examining programs and policies to identify various barriers that might arise during implementation and continuation of the program. Three out of every 4 teachers indicated fulfilling the 20 minutes of PA on 3 days or more in September, but the ratio drops to 2 of 5 teachers in February. Possible causes for the reduction in the frequency of 20 minutes of PA could be time issues, weather changes, no ongoing professional development session, and possibly changes in administrator support or teacher support of the policy.

When implementing a PA policy or plan, it is necessary to provide classroom teachers with resources for sustainability. One barrier identified by teachers in the early stages of implementation was not knowing how to provide their students with activity. The initial idea was to provide students with a walk/run period each day to meet the policy mandate. However, they soon discovered that it often required more than 20 minutes away from instruction due to putting on/taking off jackets, more bathroom and water breaks and simply a disconnect between curriculum instruction and activity time. Curriculum-based PA lessons are done in a classroom setting, and tended to eliminate some of the barriers found during a walk/run period. Furthermore, curriculum-based lessons can be easily integrated in any subject, though in the current study, language arts and math lessons were used most often.

Our study indicated that classroom teachers are able to meet a 20-minute PA policy when given the proper resources and professional development before implementation of such a policy. While results showed that only 40% of teachers in September and 4% of teachers in February met the policy for 5 days, it is important to note that 72.5% and 45.7% of teachers in September and February respectively implemented PA at least 3 days per week. We believe that this is a positive step toward changing the school environment because implementing some additional PA is better than no additional PA. Receiving additional ideas for meeting the PA policy before implementation was helpful, and it allowed the teachers to create a classroom PA plan going into the school year. While some teachers initially indicated their plan was to only allow for a walk/run period or curriculum-based lessons, many of the teachers eventually found that using a combination of the various strategies, such as curriculum-based lessons and a walk/run period, to meet the policy was more feasible. When integrating curriculum-based physical activities, such as Take 10! lessons, or a walk/run period, teachers are providing additional minutes

![Figure 2](image-url) — Accumulated minutes of school day moderate-to-vigorous physical activity (MVPA) using a physical activity policy. * Significantly different at the $P < .05$ level. CB+Other = 1 curriculum-based lesson + 1 other session (curriculum-based lesson, walk/run, Brain Break, etc.). Walk/Run = Single session of walk/run. Walk+Other = 1 walk/run session + 1 other session (except curriculum-based lesson). Movement Activity = 1 or more physical activity sessions; no curriculum-based or walk/run session.
of MVPA during the school day. While MVPA would additionally allow for health benefits, movement alone reduces the amount of sitting time during the school day. The 20-minute PA policy increased the amount of additional PA students were receiving during a school day, which previously only included physical education and recess.

Accelerometer results showed that students participating in at least 1 curriculum-based lesson plus another activity session, or at least 1 walk/run period plus a second activity, or simply a single walk/run period accumulated approximately 20 minutes of activity at an intensity level greater than 4 METS (MVPA) above the activity accumulated during other activities such as song and dance. Although they were moving, it was not of MVPA intensities. Significant differences were found between the curriculum-based lesson combined with another PA session or a walk/run period and other movement activities or no extra activity. This finding agrees with previous research that curriculum-based lessons promote meaningful energy expenditure and reach levels of moderate-to-vigorous intensity.1,2 Curriculum-based lessons increase energy expenditure to levels that could help prevent excessive weight gain in children.2 While MVPA was not required for meeting the mandated policy, aerobic activity has been shown to benefit student in both academics and health.2,21,22

With priority being placed on academic lessons, teachers sometimes feel overwhelmed with the amount of information that has to be covered in a single day and also implementing PA. In September, teachers were not averaging 20 minutes a day from the start of the policy mandate (17.36 ± 6.98 minutes), yet 41.1% of the teachers were providing 100 minutes or more over the 5-day period. In February, 15.6% of the teachers provided 100+ minutes in a week. Subjective comments indicated that other academic lessons or events took priority on some days, while other days allowed for more than the 20-minute mandate.

Another possible explanation for the difference in level of implementation could be weather differences between September 2010 and February 2011. Midwestern weather is often unpredictable, so multiple strategies need to be in place when mandating a PA policy. While a walk/run period could easily be implemented for September 13–17, 2010, due to average temperatures of 83.58°F ± 2.69°F, it was not as feasible during the week of February 21–25, 2011, as temperatures dropped to an average of 40.34°F ± 15.59°F degrees. Professional development offered to the teachers increased the number of ideas for meeting the 20 minutes of daily PA, expanded their knowledge of classroom based PA, and increased confidence in teaching PA. While September results did not indicate a difference in the level of implementation based on professional development attendance, February showed that the only teachers meeting the PA policy attended the professional development session. Gibson et al23 found in a similar study that teachers who attended a professional development session were able to incorporate active lessons at a significantly higher rate. As temperatures dropped, teachers who attended the professional development used the curriculum-based lessons due to their understanding and familiarity with them. This agrees with previous research that indicated a need for professional development for teaching PA since many classrooms teachers are not taught how to do this.17,18,24

Ongoing and embedded professional development has been identified as a key strategy for continuous improvement for health-promoting schools.25 Providing ongoing professional development could have increased the level of implementation of the PA policy during the spring semester. Although there was a decrease in the percentage of teachers meeting the 20 minutes 5 days a week (4.4%) during the February reporting week, 60% of teachers provided 61 to 100+ minutes of additional PA outside of recess and physical education over a 5-day period. This gives the indication that teachers are providing some PA to their students, though time issues may be the larger factor in meeting the daily 20 minutes.

Administrator involvement and support for policies is an integral part of the success of a PA policy as part of a Comprehensive School Physical Activity Program.15 A lack of school level administrative support possibly contributed to the decrease in policy adherence between September and February. Qualitative feedback from a participating teacher indicated that increasing PA for the upper elementary grade levels was not supported by the principal following winter break. The decline in support could be explained by the Nebraska State Writing exam that 4th grade students complete in February. Other teachers indicated that other state subject tests taken by Grades 3–5 in March could also have contributed to a decline in support of the policy by school level administrators. Due to the difference in administrative support between the school and district administrators, the teachers were unclear as to how to proceed. When planning a PA policy or CSPAP and garnering administrative support, ongoing and embedded professional development should be included to help ensure continued administrative commitment.

Academic performance can potentially be affected by increasing PA throughout the school day. Increased amounts of activity have been shown to improve time on task, increase concentration, and decrease classroom fidgeting.4,11,26,27 Teacher feedback indicated positive classroom behavior changes once PA had been implemented. They recognized positive changes in attention during class time, overall focus, and alertness, though no objective measures were taken. Teachers most commonly merged PA into their math and language arts lessons, more specifically spelling and phonics. Research has shown positive relationships between physical education, PA and increased scores in math and reading.28–30

A limitation of the study is that not all teachers returned the classroom PA tracking sheet. While we had a good return rate in both September (79.4%) and February (66.2%), we cannot determine the extent of implementation of the policy or the types of activities, if any, of those
teachers who did not return the tracking sheet. Future research should examine the sustainability of a 20-minute PA policy in a school district when offering ongoing and embedded professional development opportunities to teachers throughout the school year and continuously increasing available resources and strategies. In addition, establishing a long term evaluation process would allow the district to examine the overall sustainability of a mandated PA policy and the integration into the school culture and climate. Future research should also address the effect of the curriculum-based lessons on overall academic achievement and classroom behavior.

Conclusion

Implementing a district mandated 20-minute 5-day-a-week PA policy is a way for schools to increase PA opportunities for students during the school day. Although the teachers did not meet the 20-minute policy every day, the increased amount of PA achieved each week through the teachers efforts is a significant contributor to total daily PA levels of children. From our results, a policy of increased PA 3 days a week seems to be more feasible. This removes the stress of teachers fitting in physical activities on days where time is a significant issue. Various strategies can be used to meet the policy; these strategies may reduce sedentary time and could increase daily minutes of MVPA, which may provide students with health benefits and academic benefits. Providing teachers with multiple strategies for meeting a PA policy through professional development or acquisition of appropriate resources may increase the likelihood of PA opportunities during the school day for a Comprehensive School Physical Activity Program.

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