

Article

It's Not Me, It's You: The Disconnect of Physical Education Teachers to Physical Activity in the Gym

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Abstract: American adults and an increasing number of children, are not meeting the recommended amounts of daily physical activity. Research has documented the effects of low activity on health and increasingly new research has shown that low activity levels now impact academic achievement. Physical education (PE) can play an important role if the children participating are obtaining enough physical activity while in class and the PE program has not been targeted with cutbacks. The purpose of this study was to identify the amount and intensity of activity in PE classes. The results indicate that on average students at all levels are not meeting the activity requirements. In addition, PE teachers' perceptions of physical activity in their own class does not match actual activity levels. PE teachers must do a better job of increasing activity levels in their classrooms. Mounting research indicates students perform better academically if they are physically active. PE is the only subject where teachers can organize activities that meet both activity and intensity requirements.

Keywords: physical education; physical fitness; perceptions of PE teachers

1. Introduction

The report from the Surgeon General recommends that people of all ages perform 30 min of moderate physical activity on most days of the week [1]. This is due to the conclusive research for health benefits that are achieved from moderate levels of physical activity. Yet, many Americans do not receive the benefits of regular moderate physical activity. Healthy People 2010 reported that 85% do not engage in moderate activity on 5 or more days per week for 30 min. and 40% do not participate in any leisure-time physical activity [1]. Thus, in order to impact lifetime physical activity behavior, childhood has been identified as a critical period for nurturing lifetime activity behavior [1–3].

Recent studies have been able to identify when children are most active during the day so that interventions can be targeted to have the most effect. These studies have found that lunchtime physical activity (PA) represented the most important source of daily PA (15%–16%) obtained during school hours for both boys and girls, whereas recess accounted for 8%–9% and PE class accounted for 8%–11% of total steps per day [4]. While *unstructured play* is necessary and needed for growth and development, it is the *structured time* in physical education where continuous moderate to vigorous physical activity (which is needed for improvements to cardiorespiratory fitness) can be designed and monitored. It is also a time where health-related fitness concepts can be taught and applied [5]. Health-related fitness is the component measured by the PACER test administered by the FITNESSGRAM® (Cooper Institute, Dallas, TX, USA). Although the administration of this test has been in existence for over 30 years, results have shown a decline in students who scored in the Healthy Fitness Zone. This is an area of concern when children are becoming less active and healthy.

The results revealed age-related declines in the percentage of youth who achieved the HFZ standard for cardiovascular fitness (elementary school: 70%; middle school: 46%; high school: 34%). The increase in obesity levels has yielded a response in a number of research studies conducted evaluating the impact of physical activity (PA) on academic achievement. Significant improvement in academic achievement was found when physical activity was increased [6]. Additional studies have reported that increased fitness levels are positively associated with academic achievement [7,8]. The findings in this research are crucial because results indicate a consistent positive relationship between overall fitness and academic achievement. That is, as overall fitness scores improved, mean achievement scores also improved [6]. This is one of the most important findings to impact physical education in recent years because it is the only subject matter in schools where movement is the central theme. Physical education teachers can increase academic test performance by simply increasing movement time in their classes.

It is because of these findings that administrators, teachers, parents, and the government are calling for the increase in the physical education requirement for students [1]. The role of physical education and what schools can do to help increase physical activity among children are paramount. One of the national health objectives [1] is to increase physical activity in children. Researchers have recommended daily physical education to increase the knowledge and application of health-related physical fitness concepts [9–11]. Furthermore, it has been recommended that school-age youth should participate daily in 60 min or more of moderate to vigorous physical activity that is developmentally appropriate, enjoyable, and involves a variety of activities during their physical education class [12]. Some researchers recommend certain models or programs (e.g., CATCH, SPARK) to help PE teachers increase

activity time in their classes. This has been a good recommendation; however, measuring the amount of activity time can be difficult for the average PE teacher.

Monitoring student activity levels can be accomplished via individual pedometers. Using such a measurement tool has been recommended [13]. According to Scruggs, *et al.*, 2005, “for a practical physical activity measurement tool, pedometry has been found to be valid and objective” (p. 174) [14]. By taking student steps per minute of physical education class, researchers can identify whether classes are meeting the physical activity needs of the students or whether changes must be implemented. Additionally, pedometers are a valid measure of moderate to vigorous physical activity and provide information on intensity [15]. This is of major importance since recent published research notes that physically active and fit children tend to have better academic achievement [16]. Additional research has found students with low levels of fitness also exhibit low academic scores on achievement tests [17,18]. In particular, it has been reported that children with low levels of fitness exhibit low scores for reading and/or math [19,20].

There is a strong correlation between a student's fitness level and his/her academic success [21]. A study conducted by the Cooper Institute in 2009 found that cardiovascular health, as measured by a walking/running test, had a higher correlation to school success than did Body Mass Index (BMI). Researchers investigated children in the third and fifth grades and the different contributions of the FITNESSGRAM® subcomponents. The study examined the individual contributions of aerobic capacity, muscle strength, muscle flexibility, and body composition to performance in reading and mathematics on the Illinois Standardized Achievement Test among a sample of 259 children [16]. The findings of this study were similar to those reported by the California Department of Education indicating a relationship between fitness and achievement performance [22]. When the individual components of the FITNESSGRAM® were broken down, the researchers concluded that only aerobic capacity was related to test performance.

Physical education teachers, regardless of how many days per week they see each student, should design and structure their classes to meet minimum activity requirements no matter what curriculum model the teacher selects. So the question that needs to be addressed now is: *do our students currently meet the activity requirements in physical education classes today?* There seems to be a misguided assumption that simply walking into a PE class achieves the activity recommendations that experts are calling for [14,23]. If they do, then daily physical education can play a vital role in helping our students to be healthy and improve their academic test performance. If they don't, then more work is needed in training teachers to monitor the activity levels of their students. PE teachers who believe, no matter what curriculum is being taught, that the students they teach are active may not make the necessary changes needed to improve the student scores on tests such as the FITNESSGRAM®. Simply increasing lunchtime PA is not enough to improve scores on these types of tests.

Purpose

The purpose of the study was to identify the activity time spent in physical education classes and compare the findings to the teachers' perception of the physical activity levels in their classes. In addition, steps per minute were assessed to identify if the activity intensity during the class was at the recommended level.

2. Methods

2.1. Participants

Participants were students enrolled in urban, suburban, and rural school districts in California, Minnesota, and Texas. The total number of schools involved was: 19 elementary, eight middle, and nine high schools. A total of 1111 students (445 elementary, 302 middle school, 364 high school students) were selected to participate in the study.

All classes were taught by physical education specialists with a minimum of five years of teaching experience (range = 5–20 years, mean = 12.3 years). The mean age was thirty-one years (range = 27–48 years). There were twelve elementary teachers (females = 9), eight middle school teachers (females = 3), and eleven high school (females = 8). Content in classes ranged from the: (a) Fitness Model consisting of aerobic/fitness games; (b) Skill Theme Model consisted of activities that developed and promoted fundamental skills and concepts (e.g., throwing to partners, hitting off tees, and progression to modified games); and (c) Game/Sport Model, consisting of team activities (e.g., soccer, basketball, flag-football). The Skill Theme approach is a method where teachers design experiences that encourage students to actively and successfully participate in class. Skill themes are the physical movement skills necessary to successfully participate and enjoy various activities and sports students participate during the school year. These experiences take place within themes such as locomotor skills (e.g., running, jumping, and skipping) dance (e.g., tapping, stomping, and shaking), gymnastics (e.g., rolling, spinning, and tumbling) and sports (e.g., basketball, volleyball, and soccer). Teachers whose classes exhibited this approach were categorized accordingly.

2.2. Data Collection

Teachers were contacted before the school year to volunteer their classes for the study. At this time each teacher was asked whether in general students obtain enough physical activity in physical education classes in their state. They were then asked if the children in their own classes obtained enough physical activity.

At the beginning of each class, investigators provided instruction on the correct placement for the pedometer. Correct placement for the pedometer is: (a) held firmly to the body; (b) clipped onto the belt or waistband; (c) in line with the knee; (d) worn so that it remains upright and not tilted forward or backward, and (e) worn so that it is level and not tilted to either side [24]. Students were reminded not to open the pedometers until the end of the class period. Class time is the “on paper” time assigned to the class, while activity time is the time spent in lesson, not transitioning between classes and changing.

The physical education teachers conducted their lessons as planned and the investigators moved around the perimeter of the gym and repositioned the pedometers as needed. The investigators documented the model and activity in which the students were engaged to be later analyzed for congruency. At the end of the class period, the investigators collected the pedometers and recorded the total number of steps accrued by each student.

2.3. Intervening Variables

Since gender might have an impact on the number of steps taken, it was used as a variable to explain potential differences [1]. Class time and grade level might also cause an effect since most elementary schools have 30-min classes and secondary schools have either a 50- or 90-min class period. The class time and grade level data were recorded and included in the analyses.

3. Results

Frequency data is presented in Table 1 regarding teacher perceptions of children physical activity. Descriptive statistics are presented in Table 2 for grade level, gender, curriculum model, total steps for the students controlled by class time, and the corresponding partial *eta* score. Steps per minute (SPM) were determined by dividing the total number of steps by class time [14]. Table 3 provides data for class time and SPM for grade level. Data on SPM for grade level by model are also presented. Significance exists ($p < 0.001$) across grades and models except for the Skill Theme Model between middle and high school ($p = 0.422$).

Table 1. Frequency statistics for teacher perceptions of physical activity time.

Grade Level	Does PE Provide Enough PA		Does Your Class Provide Enough PA	
	Yes	No	Yes	No
Elementary School	15.8%	84.2%	89.5%	10.5%
Middle School	6.3%	93.7%	74.6%	25.4%
High School	11.2%	88.8%	72.1%	27.9%

Table 2. Descriptive statistics for data controlled by class time.

Groups	N	Steps <i>M/SD</i>	h_p^2
Elementary School	445	1535.74/626.87 *	0.061
Middle School	302	1995.35/857.01 *	-
High School	364	2454.04/715.55 *	-
Class time*Grade	-	-	0.315
Males	576	2302.88/837.89 *	0.135
Females	535	1820.750.01 *	-
Class time*Gender	-	-	0.446
Game/Sport	13	2416.27/969.84 *	-
Fitness	14	1967.03/682.51 *	-
Skill Themes	09	1480.42/438.66 *	-
Class time*Model	-	-	0.336

Note: * $p < 0.001$.

A hierarchical multiple regression analysis (Table 4) was conducted to determine the influence of gender, the curriculum model, and grade level on total number of steps. Input for class time was entered using the “enter” function in block one first (as a covariate) followed by the remaining variables as a “stepwise” comparison in block two. The combination of variables was significantly related to total number of steps, ($F(5, 1106) = 202.51, p < 0.001$). Table 3 presents the regression data for the covariate

of class time with curriculum, grade level, and gender. The regression model with only Class Time accounts for approximately 41% of the variance explained while the total model accounts for an estimated 50%.

Table 3. Class time, and SPM for grade level and model.

Grade Level	Class Time Min	Steps/Min
	<i>M/SD</i>	<i>M/SD</i>
Elementary School	27.67/2.54 *	51.19/20.89 *
Fitness	-	53.93/20.16 *
Game/Sport	-	57.64/15.02 *
Skill Themes	-	34.83/5.82 *
Middle School	71.46/24.42 *	27.84/10.92 *
Fitness	-	23.08/2.36 *
Game/Sport	-	32.36/8.30 *
Skill Themes	-	39.95/7.60 _a *
High School	81.18/18.15 *	31.24/8.99 *
Fitness	-	26.87/2.36 *
Game/Sport	-	32.36/8.30 *
Skill Themes	-	39.95/7.60 _a *

Notes: _a No significant difference between middle and high school for the Skill Theme model; * $p < 0.001$

Table 4. Summary of hierarchical regression analysis for variables predicting steps.

Variable	<i>B</i>	<i>SE B</i>	β
Step 1 (Enter)	-	-	-
Class Time	-31.35	6.63	-1.05
Activity Time	85.76	10.70	1.86
Step 2 (Stepwise)	-	-	-
Gender	-461.87	40.80	-0.28
Curr. Model	-189.51	28.52	0.17
Grade Level	523.49	25.43	0.52

Notes: Class and activity time were controlled for in the regression analysis. $R = 0.663$ for Step 1; $R = 0.730$ for Step 2.

4. Discussion

The data represent some good news and some bad news and indicate some rather worrisome trends in physical education. High school students in this sample were not active in their classes (steps/min = 31.24). Scruggs, Mungen, and Oh [23] recommended 81.97 steps/min (traditional schedule = 82–88 steps/min; block schedule = 84.04–90.05 steps/min) and the current sample was not on track to meet this requirement. This is a discouraging finding since the high school years are when a traditional decline in overall physical activity is seen [2,3]. High school physical education (PE) teachers must be aware that their classes did not meet the minimum steps per minute to be considered as moderate intensity for the class period [23]. High school PE classes must redesign their classes so that they increase the amount of activity.

The middle school students only achieved approximately 27 steps per minute (SPM), and the elementary students had 51 SPM which is below the recommendation that Scruggs, *et al.*, [23] have published. The biggest concern raised is with the elementary students as the recommended SPM is approximately 60 SPM for elementary students and this sample had a mean of 51 SPM. This finding was surprising to the researchers as none of the elementary curriculum models achieved the level needed. The Fitness and Game/Sport Model were close, but were still short on activity levels.

A concerning trend that was found is that physical education teachers know that students are not obtaining enough physical activity in physical education; but only in other classes. A disconnect does seem to be occurring in teachers who believe they are doing an acceptable job in their classes when, in fact, the data does not support this conclusion.

The benefits of exercise on the body both psychologically [25] and physiologically [26–28] are well documented. Physical activity in PE classes has had a long history on what role it should play, from a strictly fitness standpoint to a motor development sport technique ideology. While this debate will most likely continue, mounting research on the benefits of physical activity on academic performance cannot be ignored. It is evident that PE teachers must use their classroom time to increase the activity levels of their students.

This study illustrated what many have thought, but have failed to publish: some classes are good at getting students moving, but most do not get their students' activity levels high enough. The demands placed on PE teachers are great and the stresses are increasing as PE is routinely being reduced or cut from schools' curricula. Teachers need an easy and efficient way to document the amount of activity students obtain. Unlike FITNESSGRAM®, where teachers measure HFZ once a year, pedometers and SPM offer the most valuable *real-time* data to increase physical activity. It is easy and teachers can use spot testing on two or three students to check SPM during a class, whereas, FITNESSGRAM® usually takes a week or more to conduct and can be difficult to administer to 60–100 students in a gym setting.

Increased physical activity can and should be accumulated throughout the school day. While it may seem that longer breaks (longer recess or lunch time) are the key, research consistently shows that the intensity of that PA is not enough. PE offers the structure needed to plan longer bouts of increased activity in various curriculum models [29].

A limitation for the study is the use of pedometers. Although, pedometers are a simple and inexpensive means for determining activity levels, these body-worn motion sensors have been used by teachers and researchers to assess and motivate physical activity behaviors. For healthy adults, 10,000 steps/day is a reasonable estimate of daily activity; however, recent evidence suggests that a goal of 10,000 steps/day is probably too low for children, particularly if the goal is to target the war against obesity. Recommendations have been made for Americans to accumulate a minimum of 150 min per week of moderate level intensity of physical activity. Studies support the use of pedometry steps per minute values as an accurate indicator of MVPA. Pedometry demonstrates a viable large-scale surveillance instrument for measuring MVPA in physical education [15]. The misconception that pedometers don't measure intensity is not generalizable. However, as new technology becomes available, devices such as Fitbit, Jawbone UP2, Moov, and Garmin Vivofit demonstrate the demand for interpreting physical activity more efficiently for teachers. These physical activity trackers measure more than just steps taken (as seen in pedometers), they offer the ability to measure distance, heart rate,

and much more than just steps taken. Perhaps PA trackers could better increase school and public awareness of the health impacts of physical activity and interventions.

Research demonstrates students who perceive a supportive environment exhibit greater levels of competence and have higher levels of self-determination. Students should be motivated positively in PE [30]. Although P.E. teachers believe they are motivating their students to be actively engaged in their physical education setting, actual steps per minute counts demonstrate they fall short of that goal. PE teachers must do a better job of increasing activity levels in their classrooms. PE teachers should make a concerted effort to not only motivate their students to be physically active in gym class, but use measures such as pedometers for assessing the activities they plan as well as the activity levels achieved.

PE teachers must do a better job of increasing activity levels in their gyms and classrooms. Current research is mounting that indicates students perform better academically if they are physically active. PE is the only subject where teachers can organize activities that meet the SPM requirement. While recess/play time is important, it cannot be adjusted to meet the demands of individual students. As physical educators, we now stand at a crucial crossroad with vital decisions to be angry. The role of the schools is to produce healthy productive citizens. As obesity levels rise and physical activity levels decline, we must do a better job at keeping children active in our gyms/classrooms. PE can encourage (force) those students who lack motivation to move to start moving!

5. Conclusion

Previous research has confirmed many adolescents between the ages of 12 and 21 years of age do not engage in vigorous activity regularly and that physical activity (PA) declines as children reach adolescence. This is a primary time for promoting an active lifestyle. Concerted efforts should be made by physical educators to promote PA and strive to provide activities that increase the number of steps taken during their PE classes. Pedometers are not only inexpensive and easy to use, but provide a method for PE teachers to assess activity levels while promoting healthy activity. Taking advantage of modern technology by the use of pedometers can assist teachers in the evaluation of the children's activity levels in the lessons they provide.

Author Contributions

Lorraine Killion contributed to the review of literature, discussion, conclusion, and editing of this manuscript. Dean Culpepper contributed to the results, data analysis, and editing of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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