A Preliminary Examination of the Fitness Levels of Children Who Meet the President's Council Physical Activity Recommendation

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Abstract

Many physical educators continue to posit that the fitness levels of their students are a fair reflection of the amount of physical activity (PA) they participate in. They often assume that if children score high on a battery of fitness tests they are more active than children who do not score well. In an effort to promote daily participation in PA, The President's Council on Physical Fitness and Sports (2002) recommends that boys and girls ages six through 17 engage in at least 60 minutes of PA or accumulate 13,000 and 11,000 daily pedometer steps respectively, at least 5 days a week to achieve a healthy base. Fitnessgram's long term objective states that with regular activity all students should be able to achieve a score that will place them within or above the Healthy Fitness Zone on all Fitnessgram Items. The primary purpose of this study was to identify if a cross-sectional sample of elementary school children who met The President's Council pedometer step recommendation for one week scored in Fitnessgram's Healthy Fitness Zone on all fitness items.

Although there has been more of an emphasis on physical activity (PA) than the product of physical fitness over the last decade in physical education (Plowman, 2005), fitness testing continues to be an integral element. Many physical educators continue to argue that the fitness levels of their students fairly reflects the amount of PA they participate in (Pangrazi, 2001). Physical educators often assume that if children score high on a battery of fitness tests they are more active than children who do not score well (Pangrazi, 2001). The assumption that children who perform well on fitness tests are physically active and healthy individuals is often inaccurate and can create a variety of unanticipated problems (Pangrazi, 2001). There is some data to support that children who are fit are often more active than children who are less fit (Brittenham & Reed, 2004; Plowman, 2005); however, an individual can be physically fit, as defined by fitness test scores and not participate regularly in PA (Pangrazi & Corbin, 1990; Pangrazi, 2001; Brittenham & Reed, 2004).

In an effort to promote daily participation in PA, The President's Council on Physical Fitness and Sports (2002) recommends that boys and girls ages six through 17 engage in at least 60 minutes of daily PA or accumulate 13,000 and 11,000 daily pedometer steps respectively, at least 5 days a week to achieve a healthy base. Fitnessgram's long term objective states that "with regular activity all students should be able to achieve a score that will place them within or above the Healthy Fitness Zone on all Fitnessgram Items" (Cooper Institute for Aerobics Research, 1999, p. 5). The primary purpose of this study was to identify if a cross-sectional sample of elementary school children who met The President's Council pedometer step recommendation for one week scored in Fitnessgram's Healthy Fitness Zone on the following test items: Pacer Test, BMI, Curl-

up, Trunk Lift, Back-Saver Sit and Reach and Push-up test. The secondary purpose of this study was to determine what percentage of this sample of elementary school children accumulated enough steps to meet the President's Council pedometer step recommendation.

Methodology

Participants

Three hundred and forty six, first, second, third, fourth and fifth grade students at a public elementary school in the southwestern region of the U.S. participated in this study. Participants who wore a pedometer during their waking hours for seven consecutive days and completed The Home Activity Diary were included in the study. A total of (N = 298) students, 158 females and 140 males, met the criteria and were included in the analyses. Previous research has established that 4 days of pedometer monitoring can provide reliable estimates of a child's habitual PA level (Vincent & Pangrazi, 2002; Trost et al., 2000); therefore the investigators were comfortable that one week of PA monitoring was a fair representation of their usual activity patterns. For purposes of this study and simplicity, one age was used for an entire grade level as follows: first grade = six years of age, second grade = seven years of age, third grade = eight years of age, fourth grade = nine years of age, and fifth grade = ten years of age.

Instrumentation

Physical activity was measured with a New Lifestyles Digi-Walker pedometer, model number SW-401. The Digi-Walker (DW) pedometer, manufactured by Yamax Inc. was chosen for its accuracy and reliability in calculating daily steps taken. The Yamax brand pedometer, DW-model (predecessor to the SW-model), measured number of steps and distance covered within a 1% accuracy rate for adults on a sidewalk course (Bassett et al., 1996). Kilanowski et al. (1999) found a high correlation (r = .95) between pedometer readings and behavioral observation of PA with children age nine to eleven. Kilanowski et al. (1999) also found that pedometers were a valid method of measuring large samples and a good source of feedback for intervention studies.

Procedures

Written permission was obtained from the participants and their parents or guardians prior to participation. University Human Subject's Review Board Procedures were followed. Each student's school identification number was used to preserve the integrity of the data and to maintain subject confidentiality. Participants were taught how to properly place the pedometer on their waistband and calculate stride length as specified in the New Lifestyles Digi-Walker pedometer User's Guide and Record Book (2001). Participants were advised to wear the pedometer on either side of the body. Bassett et al. (1996) concluded the Yamax step counter registered the same number of steps independent of which side of the body the pedometer was worn. Pedometer security straps were attached to participant's clothes to prevent dropping or losing the pedometer.

The investigators examined each student throughout the school day to ensure that the pedometer was used correctly. Participants were also recurrently examined to ensure correct placement of the pedometer on their waistband, which was verified with a twenty-step test. All students practiced wearing a pedometer in physical education during a three-month period prior to the study. Students were familiarized with the pedometer to avoid the novelty of using the instrument. Those students who decided to participate in the study who did not wear the pedometer correctly were not included in the analyses.

Prior to distribution of pedometers, each student's school identification number and homeroom were written on a 3/4" round label and taped on the front of the pedometer for identification purposes. The researchers provided a pedometer with security strap and two PA diaries to each

participant the day before the project began during physical education class. The participants kept the Home PA Diary at home during the study. Participants were asked to place the pedometer on the hip immediately after getting dressed. Once each participant placed the pedometer and security strap on their waistband they zeroed out the pedometer. Each morning, the participant's parents or guardians verified that the pedometer was reset to zero. Participants wore the pedometer until bedtime (excluding bathing) for seven consecutive days (five school days and two weekend days). At the end of each day the participants recorded their total number of daily steps. Participants were instructed to maintain their regular routine during the study and to wear the pedometer until they went to bed. Outside of school hours, parents or guardians checked to make sure the pedometer was worn properly and participants were instructed to not open the pedometer during the day. Parents or guardians assisted in the recording of the total number of steps at bedtime in the Home PA Diary. This diary was a piece of 8.5/11 piece of paper adjusted for each day of the week. Parents or guardians verified and signed the Home PA Diary at the end of the week to record daily steps accumulated. All of the data was kept in a confidential file following the week of pedometer recordings. Only the researchers had access to this data to protect the confidentiality of the subjects.

Participants stored their School PA Diary (daily steps accumulated during school hours) at school during the study. Third, fourth, and fifth grade students folded the diary in half (for confidentiality reasons) and taped the diary to the top of their desk. Third, fourth, and fifth grade classroom teachers assisted students in recording the number of steps at the beginning of the school day and at the end of the school day. Students also recorded mode of transportation to and from school. First and second grade teachers recorded the number of steps for their students in their School PA Diary, at the beginning and end of the school day. After wearing the pedometers for an entire week, participants returned the pedometer with security strap and both PA diaries to the investigators during physical education class. Each grade level was scheduled during a normal week of school, specifically avoiding weeks in which academic testing occurred in the classroom. One or two grade levels were assessed each week over a three-week period. Content in physical education during the study was standardized across grade levels for consistency.

Fitnessgram

The selected Fitnessgram test items (Pacer Test, BMI, Curl-up, Trunk Lift, Back-Saver Sit and Reach and Push-up test) were administered to participants during their 35-minute physical education classes. Prior to testing, students practiced the tests to familiarize themselves with the procedures. Students practiced watching a partner perform each test to learn how to identify proper/improper form. Students were unaware of Fitnessgram's Healthy Fitness Zone of scores. Only half of the class participated in the Pacer Test at one time. Intermediate grade students were tested three at a time during the Curl-up test and Push-up test, with a partner assisting and the researchers observing for proper form. The researchers tested one student at a time during the curl-up test and the push-up test in the primary grades. The researchers tested students individually on the remainder of the tests. Participants who missed a day of recording PA were monitored on the same day of the week they missed. The battery of tests was re-administered, as the schedule allowed, for participants absent on testing days.

Results

The findings indicate that the average number of daily steps taken increased from first (M = 9,551) through fourth grade (M = 12,512) for females. Fifth grade females' daily step average (M = 9,618) was 2,894 steps less than fourth grade females. First grade females' daily steps average was 67 less than fifth grade females' daily steps average. The daily average number of steps

increased for males from first grade (M = 10,798) through third grade (M = 14,092), decreasing at fourth grade (M = 12,796) and increasing at fifth grade (M = 13,268). Males averaged more steps than females at each grade level. The largest difference between genders was at fifth grade, with males averaging 3,650 more steps than females. The smallest difference between genders was at fourth grade, with males averaging 284 more steps than females. Students who met the President's Council pedometer step recommendation (N = 121) had a combined average of 14,553 steps per day compared to those students who did not accumulate the recommended number of weekly steps (N = 177). These students had a combined average of 9,766 steps per day, a difference of 4,787 daily steps. Means and standard deviations for first through fifth grade students' daily pedometer steps are listed in Table 1.

Table 1

First through Fifth Graders' Means and Standard Deviations for Daily Average Steps

Grade	*N*	*M*	*SD*	*Minimum*	*Maximum*
Females					
First	29	9,551	2,140	5,843	13,350
Second	33	10,249	2,400	5,215	15,502
Third	29	12,185	3,031	5,384	18,663
Fourth	36	12,512	2,895	7,204	18,959
Fifth	31	9,618	2,239	5,357	15,720
Males					
First	28	10,798	2,340	5,798	16,460
Second	20	11,947	3,110	6,380	19,438
Third	28	14,092	2,890	9,680	18,631
Fourth	27	12,796	2,611	8,994	19,874
Fifth	37	13,268	3,426	8,363	21,143

The results of the first through fifth grade students' performance on Fitnessgram test items were not surprising. In general, test scores improved with age with a few exceptions. Measurements of the Fitnessgram's Back-Saver Sit and Reach test decreased with age. As expected, the body mass index (BMI) increased with age, as did percent body fat. Males performed better on the physical fitness tests than females with the exception of two tests: Fitnessgram's trunk lift and Fitnessgram's Back-Saver Sit and Reach. The percentage of qualifiers for Fitnessgram's Healthy Fitness Zone ranged from 5.6% to 57.1% for both genders. Fitnessgram evaluates a student's performance on each individual test and provides recommendations for improvement, but does not require students to meet the criterion in all events in order to be

considered in the "Healthy Fitness Zone." However, for the purposes of this study, only students with scores within Fitnessgram's Healthy Fitness Zone in all events qualified. The highest percentage of students scoring within the Healthy Fitness Zone for all test items was at the third grade level for both genders (31.0% and 57.1% for females and males, respectively). Fitnessgram's Healthy Fitness Zone showed a decrease in the percentage of qualifiers in fourth grade for both genders. The percentage of qualifiers increased at the fifth grade level for both genders. A greater percentage of males scored in Fitnessgram's Healthy Fitness Zone than females at each grade level. Frequencies and percentages of students meeting The President's Council pedometer step recommendation and placed in Fitnessgram's Healthy Fitness Zone are listed in Table 2.

Table 2

Frequency and Percentage of Students Meeting the Weekly Pedometer Step Recommendation and Scoring in Fitnessgram's Healthy Fitness Zone (all Fitnessgram Items)

Grade	N	Met Pedometer Step Recommendation		Healthy Zone	
		f	*P(%)*	*f*	*P(%)*
Females					
First	29	5	17.2	3	10.3
Second	33	6	18.2	7	21.1
Third	29	13	44.8	9	31.0
Fourth	36	18	50.0	2	5.6
Fifth	31	4	12.9	9	29.0
Males					
First	28	10	35.7	7	25.0
Second	20	11	55.0	8	40.0
Third	28	22	78.6	16	57.1
Fourth	27	13	48.1	5	18.5
Fifth	37	19	51.4	11	29.7

The number of elementary school children accumulating enough daily pedometer steps to meet The President's Council recommendation (N = 121) was greater than the number of children who qualified for Fitnessgram's Healthy Fitness Zone (N =77) for all tests. The percentage of

females accumulating the recommended dose of pedometer steps ranged from 12.9% to 50.0%. The percentage of males who accumulated the recommended dose of pedometer steps ranged from 35.7% to 78.6%. Overall, a higher percentage of males met The President's Council pedometer step recommendation than females at each grade level with the exception of fourth grade (females = 50.0% and males = 48.1%). Means for daily pedometer steps of children who met the recommended number of pedometer steps are listed in Table 3.

Table 3

Means for Daily Steps of Students Who Met and Did Not Meet the Weekly Pedometer Step Recommendation

	Weekly Pedometer Step Recommendation (i.e.,13,000 boys; 11,000 girls)				
		Met		Did Not Meet	
Grade	*N*	*n*	*M*	*n*	*M*
Females					
First	29	5	12,073.23	24	9,025.90
Second	33	6	13,579.14	27	9,509.20
Third	29	13	14,514.11	16	10,293.65
Fourth	36	18	14,543.55	18	10,482.31
Fifth	31	4	13,545.00	27	9,036.52
Males					
First	28	10	13,267.97	18	9,427.00
Second	20	11	13,969.88	9	9,475.02
Third	28	22	15,226.79	6	9,933.69
Fourth	27	13	14,711.27	14	11,018.63
Fifth	37	19	15,889.29	18	10,501.69
Total	298	121	14,553.47	177	9,766.05

Discussion

Fitness testing is often utilized as an assessment method to measure PA (Plowman, 2005), because most fitness test batteries are valid, reliable (Morrow, 2005) and are often considered appropriate measures of PA accountability in the gymnasium. Regrettably, fitness tests are not measuring a behavior, but rather an outcome (Morrow, 2005; Pangrazi, 2001). Although, the health benefits are greater for those individuals who choose to be fit, this type of curricular focus has not increased the fitness and/or PA levels of elementary school children (Sallis & Owen, 1999; Morrow, 2005). Fitness tests are frequently used to evaluate progress, but seldom do physical education curricula change as a result of the test scores.

Many physical educators continue to equate physical fitness with PA, when it is clear that physical fitness and PA are not strongly related (Brittenham & Reed, 2004; Pangrazi & Corbin, 1990) and do not influence lifelong PA patterns (Ernst, Pangrazi & Corbin, 1998). According to Freedson and Rowland (1992) "there appears to be a large degree of independence between fitness attributes and activity behavior" (p. 134). Researchers have found a weak relationship between physical fitness levels and PA levels (Beighle et al., 2001). A study conducted by Pate and colleagues (1990) found only 21% of the variance in run-walk fitness scores for children were accounted for by PA, gender and age.

The President's Council on Physical Fitness and Sports (2002) posits that daily PA will improve the components of physical fitness. According to Gallahue and Cleland (2003), for elementary age children to enhance their health related physical fitness (i.e., muscular strength and endurance, cardiorespatory endurance, flexibility and body composition), close to 200 minutes a week would need to be allocated to these types of activities. In addition, Payne and Morrow (1993) over a decade ago reviewed 28 studies examining the effects of training and determined that fitness gains are minimal to moderate in prepubescent children. Since a significant amount of variability in fitness tests performance is explained by heredity and maturation, these factors have more of an impact on fitness test scores than PA level (Bouchard et al., 1992; Pangrazi & Corbin, 1990; Plowman, 2005).

The present study illustrates that students who met The President's Council (2002) pedometer step recommendation did not necessarily qualify for Fitnessgram's Healthy Fitness Zone in all test items. Recently, the use of physical fitness testing with elementary age children has resurfaced as a result of Standards-Based Education. Two of the six National Association for Sport and Physical Education (NASPE) Standards address PA and physical fitness. Standard three addresses PA and standard four addresses physical fitness (NASPE, 2004). Many schools have traditionally failed to measure PA because it is more difficult and requires more time, thereby using fitness testing as a measure of both PA and physical fitness combined.

Although the immediate health benefits of PA are not completely understood in childhood (Morrow, 2005) the benefits of PA are well documented in adulthood. The Surgeon General's Report included a recommendation of at least 30 minutes of moderate PA most days of the week for children and adults (USDHHS, 1996). The report did not refer to the importance of physical fitness levels to receive optimal health benefits. Updyke (1992) acknowledged there is little evidence supporting that high levels of fitness are necessary to attain health benefits. Even the definition of physical fitness refers to the ability to perform PA (Caspersen et al., 1985).

Bouchard and colleagues (1992) over a decade ago reported that heredity and maturation have more to do with fitness scores than does activity level. One wonders if it is necessary to spend time testing children's fitness levels during physical education classes when the performance on fitness tests is a product that is not related to the behavior of PA (i.e., as measured with pedometer steps). With considerably more children in the present

study not meeting The President's Council pedometer step recommendation, perhaps physical educators should focus their energy on a process measure that can be modified, such as PA.

Results of Janz' (1990) study over 12 years ago indicated that PA was not an important determinant of cardiorespiratory fitness for children or adolescents. Janz (1990) cautioned physical educators of assuming performance on fitness tests was indicative of PA level and suggested the abandonment of physical fitness assessment for physical education in the year 2000 (Janz, 1990). However, in the 21st century it appears there is a resurgence of the use of physical fitness tests as a result of the emphasis on standardized assessments. Physical educators tend to use fitness tests to assess children's PA levels because it is what they know.

It has been argued that one of the benefits of fitness testing is that it motivates students to become more active (Hopple & Graham, 1995). Yet, inactive adults have reported unfavorable experiences in elementary school during fitness testing such as: the embarrassment of being tested in front of classmates, unsuccessful attempts, fear of failure and physical discomfort. Students who have been "turned off" by fitness testing often associate PA with physical fitness testing and refuse to participate in any PA (Hopple & Graham, 1995). In addition, Hopple and Graham (1995) claimed physical fitness tests are the most common memories adults have of their experiences in physical education, good or bad. It is difficult to believe the award programs are motivating to children to increase physical fitness when so few are able to meet the standards.

The President's Council weekly pedometer step recommendation has the potential for motivating more children to increase PA in comparison to fitness tests and is a behavior not directly affected by genetic attributes. The majority of children examined in the present study had the ability to take the recommended number of daily steps five days a week and consequently could be recognized for those efforts. Little time was lost in physical education classes by teaching children to use the pedometers and checking them out to the students for one week. On the other hand, administering physical fitness tests takes a substantial amount of time away from physical education classes and the outcome is partially dependent on factors outside of a child's control (Pangrazi, 2001, Bouchard et al., 1992).

Limitations

There are a variety of limitations associated with this study that need to be addressed. To begin with, this was a cross-sectional study of elementary school children attending one elementary school. In addition, some of the health related components of physical fitness (i.e., muscular strength, flexibility, etc.) are not activities measurable with a pedometer and perhaps would not influence these fitness components. Although Fitnessgram does not specifically distinguish between the health-related components of fitness and their specific influences on types of PA, the authors' believe this is a possible limitation associated with the study. Furthermore, the sample size was not large enough to assume that the majority of elementary school children who met The President's Council pedometer step recommendation cannot achieve scores on the selected Fitnessgram test items to be placed in Fitnessgram's Healthy Fitness Zone. However, the purpose of the study was to illustrate that children who do meet The President's Council pedometer step recommendation will not necessarily score in Fitnessgram's Healthy Fitness Zone. Lastly, seasonality in which the data was obtained could have affected the weekly measurement of pedometer steps. The students were assessed in the fall, however, if the study was conducted during the winter and summer seasons, there could have been variations in weekly pedometer steps.

Implications

It is important for physical educators to recognize that PA and physical fitness are different constructs and require different assessments. Furthermore, it is integral that physical educators recognize the genetic predispositions of their children and how these dispositions can influence the outcomes on the physical fitness scores of their students. It is not the authors' intentions to remove physical fitness from a comprehensive physical education curriculum, but rather, to highlight some of the problems with using fitness scores as a means to assess PA levels of students.

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