

# The Role of Various Curriculum Models on Physical Activity Levels

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## Abstract

*Researchers have suggested that physical education curricula can be highly effective in increasing physical activity levels at school (Sallis & Owen, 1999). The purpose of this study was to investigate the impact of various curriculum models on physical activity. Total steps were measured on 1,111 subjects and three curriculum models were studied (Fitness, Game/Sport, Skill Themes). Among the curriculum models and across all grade levels, the Game/Sport Model had the most steps ( $p < .01$ ;  $M = 2,013$ ), followed by the Skill Themes ( $M = 1,750$ ), and finally the Fitness Model ( $M = 1,716$ ). The Fitness Model doesn't guarantee higher activity. Rather, the teacher should strive to create and implement lessons that provide increased time for movement or activity for all children.*

The role of physical education and what schools can do to help increase physical activity among children are paramount (Pate et al., 2006). The type of curriculum may influence activity levels; therefore, it is important to evaluate how the models impact activity levels. Recent discussion has focused on types of curriculum models used in physical education (Pate et al., 2006). Physical education curricula can be highly effective in increasing physical activity at school (Graham, Holt-Hale, & Parker, 2006). With many different types of curricula to choose from, which is preferred? The most common physical education curriculum in both elementary and secondary physical education classes seems

to be an activity-based model or a combination of features from several models (Kelly & Melograno, 2004). Others have indicated the majority of K-6 programs emphasize a skill theme approach (Graham et al., 2006), while secondary programs emphasize sport themes (Strong et al., 2005).

In the past 30 years, the percentage of youth who are overweight has tripled (U.S. Department of Health and Human Services, 2002). Researchers, teachers, and authors have suggested that teaching physical activity and physical fitness concepts be a priority in physical education (Pangrazi, 2007). Recent studies have examined the obesity prevalence among children and adolescents in the U.S. It has been estimated that 16.3% of children aged 2-19 years were obese, at or above the 95th percentile using BMI-for-age growth charts (Hedley et al., 2004; Ogden, Carroll, & Flegal, 2008).

Based on data that indicate increasing levels of obesity in youth and young adults, the most logical approach would be to utilize the fitness model in physical education. The fitness model provides the philosophy of improving the quality and length of life through fitness knowledge, attitudes, and activity, with the goal of improving the individual's fitness status. Findings from researchers studying the effectiveness of the fitness approach in physical education overwhelmingly recommend a fitness curriculum (fitness instruction and fitness activities) over other models (McKenzie et al., 1996; McKenzie, Sallis, Kolody, & Faucette, 1997; Simons-Morton, Parcel, Baranowski, Forthofer, & O'Hare, 1991). Yet

researchers also have noted numerous drawbacks (e.g., cost, time, training) to these types of fitness programs (Faucette, Nugent, Sallis, & McKenzie, 2002). For a fitness model to be effective, it must be implemented with trained physical education specialists (Sallis & Owen, 1999) and this model typically requires more money to train and hire physical education teachers.

If the fitness approach is not the primary curriculum model used in schools, then are the other models providing enough physical activity for the students? Jewett, Bain, and Ennis (1995) admitted that research findings support the important contribution of exercise to health; however, they reported mixed findings when using the fitness model. A few studies reported that a fitness approach provided more physical activity (as measured by total steps taken) than other models (McKenzie et al., 1996; McKenzie et al., 1997; Simons-Morton et al., 1991). Coupled with these mixed results, researchers have noted that more studies need to be devoted to studying practical physical education curriculum models in “real-world” settings (Faucette et al., 2002). Regardless of the physical education curriculum model selected, monitoring the activity levels can be accomplished via individual pedometers. Using such a measurement tool has been recommended (Eston, Rowlands, & Ingledew, 1998). According to Scruggs, Beveridge, Watson, and Clocksin (2005), “for a practical physical activity measurement tool, pedometry has been found to be valid and objective” (p. 174).

The purpose of this study was to investigate the impact of the three most common (Graham et al., 2006; Kelly & Melograno, 2004; Pangrazi, 2007) physical education curriculum models on physical activity. The three models used in this study were the: Fitness Model (Jewett et al., 1995; Lund & Tannehill, 2005; Rink, 2006; Steinhardt & Stueck, 1986), Skill Theme Model (Graham et al., 2006; Jewett et al., 1995; Rink, 2006),

and Game/Sport Model (Jewett et al., 1995; Rink, 2006). The models were selected because they were the most commonly used and researched. The sub-section of the Method section titled Operational Definitions provides a detailed description for each model.

## Method

### Design and Procedure

In the beginning of the school year, emails were sent out to physical education teachers in elementary, middle, and high schools with the operational definitions of the three models. These schools were in the midwest and the southern regions of the United States. Teachers were asked to identify one of the three models, if any, that they utilized. Teachers who did not identify a specific curriculum model were excluded. The investigators then called those teachers who responded to the emails and had them “describe their curriculum focus and their typical class.” If the teachers’ descriptions did not match one of the three models (based on the operational definitions) they were excluded. The investigators then grouped the schools according to their respective model and what the typical class consisted of for comparison. It was important to identify the typical class so that the investigators could collect data on what would normally happen during the class (the investigators didn’t want to show up on testing days to collect data, if that wasn’t what would typically happen in the class). The typical class was described as, on average, what kinds of activities do you plan for in this curriculum model. The investigators then made several “unannounced” visits prior to data collection to confirm the model accuracy and to identify what a typical class’s activities consisted of. Similarly, if incongruence was found, they were excluded from the study. On the day of data collection, the investigators again confirmed the accuracy of the model and activity used. If dissimilarity was witnessed on data

collection day, the data was collected, but not included in the analysis.

An important variable that was controlled for in this study was the types of activities conducted within each model. The investigators went to great lengths to obtain congruency within each model. For example, in the Fitness Model, if one teacher was administering fitness testing and another teacher conducting a step aerobics class the activities were not similar and thus the pedometer data was excluded from the study.

All data was collected during the fall months (August to November in the same academic year) with favorable weather conditions. Teachers had the choice of conducting class inside or outside (i.e., weather did not force teachers inside). One additional unannounced visit was made after data collection to confirm model congruency. Again, if there was not congruency, data was excluded from analysis.

## **Operational Definitions**

**Curriculum models.** The Fitness Model was defined as one that promotes the learning of fitness concepts (flexibility, cardio-respiratory endurance, muscular strength, and muscular endurance). This includes utilizing fitness games, activities, weight-training classes, aerobic dance, fitness testing, and others (Jewett et al., 1995; Lund & Tannehill, 2005; Rink, 2006; Steinhardt & Stueck, 1986).

The Skill Theme Model was defined as one that promotes basic movement skills and concepts (e.g., run, jump, throw) that are developed through skill themes (e.g., locomotor, manipulative, relationships, body awareness, balancing, and movement concepts). According to Graham et al. (2006),

The Skill Theme model includes fundamental movements that form the foundation for success in sports and physical activities in later years. Ini-

tially they are studied in isolation (one skill at a time), and then in later grades they are combined with other skills and used in more complex settings, such as those found in dance, games, and gymnastics (p. 17).

The Game/Sport Model was defined as one that promotes sports and sport themes. In this model, children learn by playing the sport (different than Skill Theme Model which emphasizes movement skills and concepts). This model, which is developed around games/sports, has traditionally been taught from a skill-based perspective, with units and lessons planned around the skills required for students to be successful (Jewett et al., 1995; Rink, 2006). Teachers often use the skill/drill approach to improve the students' performance for upcoming game play.

**Time.** Class time was defined as the number of contact minutes between the physical education teacher and the students.

## **Data Collection**

There are a number of ways to assess physical activity. The American College of Sports Medicine [ACSM] (2006) stated that the pedometer is a practical and accurate means of assessing physical activity. While heart rate monitoring is highly correlated with oxygen uptake, it has many limitations (ACSM, 2006) most notably the inability to distinguish low-intensity activities (Sallis & Owen, 1999). Since the researchers could not confirm intensity for the physical education class prior to data collection, pedometers were the recommended instrument (Scruggs et al., 2003, 2005). 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 (New Lifestyles, n.d.). Students were reminded not to open the pedometers until the end of the class period.

The physical education teachers conducted their lessons as planned and the investigators moved around the perimeter and repositioned the pedometers as needed. The investigators documented the model and activity that the students were engaged in 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.

### Participants

Participants were students enrolled in urban, suburban, and rural school districts in the Midwest and the Southern regions of the United States. The total number of schools selected were: 19 elementary, eight middle, and nine high schools (50 did not meet the requirements). A total of 1111 students (445 elementary, 302 middle school, 364 high school) 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). Content in classes utilizing the: (a) Fitness Model consisted 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 consisted of team activities (e.g., soccer, basketball, flag-football).

Since gender might have an impact on the number of steps, it was used as a variable to explain potential differences (U.S. Department of Health and Human Services [USDHHS], 2000). Class time and grade level might also cause an effect since most elementary schools have 30-minute classes and secondary schools have either a 50- or 90-minute class period. The class time and grade level

data were recorded and included in the analysis.

### Results

Descriptive statistics are presented in Table 1 for grade level, gender, curriculum model, total steps for the students controlled by class time, and the corresponding partial eta score. Because class time has an impact on the total number of steps accrued, an Analysis of Covariance (ANCOVA) was utilized to control for the differences among elementary, middle, and high schools to determine significance for steps regarding the curriculum models. The ANCOVA was significant,  $F(1,2) = 12.642, p = .013$ . Post hoc tests were used to determine directionality. There was a significant difference in number of steps between the Fitness and Game/Sport Models, ( $p < .001$ ) and the Skill Themes and Game/Sport Models ( $p < .001$ ). There was no difference in number of steps between the Fitness and Skill Theme Models ( $p = .582$ ). To determine the influence of class time for steps by grade level, an ANCOVA was conducted and a significant difference existed,  $F(1,2) = 20.127, p < .001$ . The mean steps (class time controlled for) for grade and by model are also presented in Table 2. A significant interaction between the curriculum model and grade level was also found,  $F = 8.873, p < .001$ . Post hoc tests were utilized to determine that significance exists ( $p < .001$ ) across grades.

Steps per minute (SPM) were determined by dividing the total number of steps by class time (Scruggs et al., 2005). Table 2 provides data on class time and SPM for grade level. Data on SPM for grade level by model are also presented. Significance exists ( $p < .001$ ) across grades and models except for the Skill Theme Model between middle and high school ( $p = .422$ ).

A hierarchical multiple regression analysis was conducted to determine the influence of gender, the curriculum model, and grade level

**Table 1***Descriptive Statistics for Data Controlled by Class Time*

<b>Groups</b>	<b>N</b>	<b>Steps <i>M/SD</i></b>	<b><math>h_p^2</math></b>
Elementary	445	1535.74/626.87*	.061
Middle	302	1995.35/857.01*	
High	364	2454.04/715.55*	
Class time*Grade			.315
Males	576	2302.88/837.89*	.135
Females	535	1820.75/801.01*	
Class time*Gender			.446
Game/Sport	13	2416.27/969.84*	.022
Fitness	14	1967.03/682.51*	
Skill Themes	09	1480.42/438.66*	
Class time*Model			.336

\*  $p < .001$ **Table 2***Class Time, and SPM for Grade Level and Model*

<b>Grade Level</b>	<b>Class Time Min <i>M/SD</i></b>	<b>Steps/Min <i>M/SD</i></b>
Elementary	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	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 <sup>a</sup> *
High		81.18/18.15*
Fitness		31.24/8.99*
Game/Sport		26.87/2.36*
Skill Themes		32.36/8.30*
		39.95/7.60 <sup>a</sup> *

<sup>a</sup> No significant difference between middle and high school for the Skill Theme Model\*  $p < .001$

**Table 3***Summary of Hierarchical Regression Analysis for Variables Predicting Steps*

Variable	B	SE B	$\beta$
Step 1 (Enter)			
Class Time	-31.35	6.63	-1.05
Step 2 (Stepwise)			
Gender	-461.87	40.80	-.28
Curr. Model	-189.51	28.52	.17
Grade Level	523.49	25.43	.52

*Note.* Class time was controlled for in the regression analysis.  $R = .643$  for Step 1;  $R = .705$  for Step 2.

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,  $F(5, 1106) = 202.51, p < .001$ . 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 about 41% of the variance. In other words, the various curriculum models don’t contribute as much (less than 9%) toward overall physical activity as class time. Simply stated, 50% of the variance in this model is unexplained. There may be one or several other variables that are contributing to the total steps accrued.

### Discussion

The primary focus of this investigation was to examine the use of three curriculum models and their impact on the level of physical activity in physical education classes. One of the national health objectives (USDHHS, 2000) is to increase physical activity in children. Because of this, researchers have rec-

ommended the fitness model to increase total physical activity, knowledge, and application of health-related physical fitness concepts (McKenzie et al., 1996; McKenzie et al., 1997; Simons-Morton et al., 1991).

What this study showed was that those who utilized the fitness approach were not assured of obtaining more physical activity in physical education classes. In this study, the students who participated in Fitness Model had the lowest number of steps among the models ( $M=1967.03, SD=682.51$ ), see Table 1. Surprisingly, the students in the Game/Sport Model obtained the highest number ( $M= 2416.27, SD=969.84$ ) of steps, see Table 1. It is important to note that the data collected from the Fitness Model classes did not occur on days of fitness testing or strength training. Activities that teachers utilized in the Fitness Model included aerobic/fitness games; by controlling for these activities, this allowed the investigators to make the conclusion that students participating in the Game/Sport Model obtained more steps. While the differences are statistically significant, the partial eta squared value of .022 means that only two percent of the variance can be accounted for by the individual model. If the curriculum

model does not account for the main difference in total number of steps, then what does?

Future research may or may not be needed to explore this difference. What should be examined are things that teachers plan for so they can increase overall physical activity with whatever model they choose. The biggest contributor to the total number of steps accrued during physical education classes was class time (which was why it was controlled for in our analysis).

Class time was the largest contributor of variance for total steps ( $R^2 = .416$ ). Class time is the one area that a teacher can use to his or her advantage when planning lessons. The teacher can use a particular curriculum model to provide structure for units and lessons, but the curriculum model doesn't guarantee higher activity. Rather, the teacher should strive to create and implement lessons that provide increased time for movement or activity for all genders.

Results from this study highlighted the need to continually monitor the number of steps between males and females. Males obtained more steps (2302.88/837.89) than females (1820.7/50.01) and gender was the second most influential variable in the regression model ( $\beta = -.28$ ). It is imperative that teachers continue to provide the necessary incentives, opportunities, and activities to motivate females to be active. This is especially important since the Centers for Disease Control (CDC) has documented greater physical inactivity among females than males (USDHHS, 2000).

The most surprising finding from this study was the lack of total steps in physical education classes at the secondary grade levels. As noted in the regression model, class time negatively influenced total number of steps ( $\beta = -1.05$ ). In the average 80-minute class, students in the high school obtained only enough steps ( $M = 2454.04$ ,  $SD = 715.55$ ) to equate to running a mile (Welk et al., 2000). Similarly in a 70-minute middle school class, the stu-

dents only obtained 1995.35 ( $SD = 857.01$ ) steps. Really the question that needs to be addressed is: is accruing steps that equate to a mile in an 80-minute class okay? It would be, if the teacher's objectives were teaching to the affective domain (i.e., enjoyment) and not solely on increasing levels of physical activity. Whatever the objectives, the investigators recommend that the teachers in both of these settings provide periods where sustained physical activity can be accomplished and students can meet the USDHHS (2000) recommendation to be physically active for at least 50% of the physical education class time.

In the average 30-minute elementary class period students accrued more steps ( $M = 1535.74$ ,  $SD = 626.87$ ) as compared to the middle and high school settings in their allotted time. But is it enough? In 2005, Scruggs et al. quantified physical activity via pedometry for first- and second-grades and third- and fourth-grades using cut-scores for steps per minute. According to Scruggs et al. it appeared that the elementary students in this study did not obtain the required amount of steps per minute ( $M = 51.14$ ,  $SD = 20.89$ ) necessary to be active at the moderate and/or vigorous levels.

A disappointing observation in this investigation was that when collecting data across the sites (Midwest and South), the investigators observed extended periods of low activity across the three curriculum models and grade levels. Future research should examine the consequences of these low periods of inactivity. The authors recognize that different grade levels have a responsibility to teach different content (elementary should teach and address fundamental movement while secondary should teach broader life skills). These differences should not discount high activity levels during the physical education period regardless of the content as recommended by National Association of Sport and Physical Education [NASPE] (2007).

Increasing the amount of steps should not be the guiding force in any physical education class. Nor should one particular curriculum model be assumed to provide the benefits for student learning. Rather the guiding force should be the teacher's planning, organizing, and developing a curriculum that meets NASPE standards. The teacher should also use best practices during each class to provide developmentally appropriate lessons that meet all four domains: cognitive, affective, psychomotor, and the health-fitness domain.

Physical education teachers have a responsibility to provide learning experiences for all students, not just supervised recess. Based on the findings of this study, researchers should continue to take a critical look at what is being taught in physical education classes across our states. Given the influence of class time and gender on total steps, a teacher's goal should be to develop lessons that: (a) are high in activity time, (b) are connected to developing lifetime physical activity habits, which are vital to decreasing our nation's obesity epidemic, and (c) meet the NASPE recommendation of teaching to all domains not simply having children be busy, happy, and good.

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