

Frequency and Intensity of Activity of Third-Grade Children in Physical Education

The National Institute of Child Health and Human Development Study of Early Child Care and Youth Development Network

Background: Health recommendations are for pre-adolescent children to have daily school physical education (PE) classes that engage children in moderate to vigorous physical activity at least 50% of class time.

Objective: To observe activity of children in PE classes in third grades across 10 different sites.

Design: Observational study.

Setting: Six hundred eighty-four elementary schools in 10 sites.

Subjects: A total of 814 children (414 boys, 400 girls; mean age, 9.0 years) enrolled in the National Institute of Child Health and Human Development Study of Early Child Care and Youth Development.

Methods: Each child was observed during 1 scheduled PE class.

Main Outcome Measure: The SOFIT (System for Observing Fitness Instruction Time) observation method, a validated, heart rate observation system, yields levels of activity the child is engaged in as well as the lesson context, type of teacher, and location of the PE class.

Results: Children averaged 2.1 PE lessons per week, of 33 minutes each. Only 5.9% of children had daily PE. Children accrued 4.8 very active and 11.9 minutes of moderate to vigorous physical activity per PE lesson, 15.0% and 37.0% of lesson time, respectively. Lesson length and number of minutes per week were similar for boys and girls; however, boys spent proportionately more PE time in very active and moderate to vigorous activity. This resulted in boys having a higher energy expenditure rate than girls.

Conclusion: Children observed in this study received 25 min/wk of moderate to vigorous activity in school PE, falling far short of national recommendations.

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A complete list of the participating investigators of the National Institute of Child Health and Human Development Study of Early Child Care and Youth Development Network appears in the box on page 189.

PHYSICAL ACTIVITY in youth is of concern because of increasing trends of obesity,^{1,2} type 2 diabetes mellitus,³ and lack of fitness, which are precursors of adult chronic diseases. The benefits of physical activity on improving aerobic fitness, body composition, blood lipid levels, skeletal health, and psychological health in youth have been documented in some subsamples.⁴⁻⁷ In addition, children who are active in physical activity and sports may be less likely to engage in risky health behaviors.^{8,9} Current recommendations are for preadolescent children to accumulate at least 60 min/d of physical activity.^{10,11} One opportunity for children to receive structured physical activity is through school physical education (PE) classes.

Healthy People 2010¹² recommends that PE be offered daily and consist of lessons that engage children in moderate to

vigorous physical activity (MVPA) at least 50% of class time. Physical education is both an educational and a public health resource,¹³ providing children with opportunities to be physically active and teaching them the knowledge and movement skills that lead to active lifestyles.¹⁴ However, limited data are available on the frequency and duration of PE classes in elementary schools or on the level of activity afforded children in these classes. Simons-Morton et al¹⁵ found low levels of physical activity in school PE classes. Several other studies have shown that children, particularly boys, may be more active during recess than during PE classes, and one study found the average child in 30-minute classes to be vigorously active for only 2 minutes.^{16,17} Faucette et al¹⁸ found that PE classes conducted by classroom teachers consisted mainly of game play in which a few children were active while the remainder waited for a turn. Only

5% of these classes had fitness activities as the major focus.

Daily PE is recommended for public health purposes, but mandates for PE differ by state and district.¹⁹ Recent national surveys¹² of high school students indicate that only 49% are enrolled in PE and only 27% have PE on a daily basis.

One observational study²⁰ of third-grade children's PE classes in 95 different schools in 4 states (California, Louisiana, Minnesota, and Texas) showed that children accrued only 5 to 10 minutes of MVPA in PE classes that averaged 32 minutes long. There was wide variability in student physical activity as a function of geographic region, school, teacher training, and lesson context (ie, how PE content was delivered). Boys were more active in PE than girls, but only during free play times. A follow-up intervention study²¹ demonstrated that activity levels in PE classes could be improved through curriculum change, staff development, and on-site follow-up.

The present study examines PE for the study cohort enrolled in the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development, which was conducted in 10 study sites around the United States. Data were collected when the children were in the third grade. The study asks the following questions: What is the frequency and quality of school PE classes for this cohort? How active are the children in PE classes?

METHODS

PARTICIPANTS

Children participating in the NICHD Study of Early Child Care and Youth Development were the focal subjects for this study. Families were recruited into the larger study at the time of their child's birth. Recruitment took place in hospitals near the following locations throughout 1991: Little Rock, Ark; Irvine, Calif; Lawrence, Kan; Boston, Mass; Philadelphia, Pa; Pittsburgh, Pa; Charlottesville, Va; Morgantown, NC; Seattle, Wash; and Madison, Wis. When the children were aged 1 month, 1364 families with healthy newborns were enrolled in the study. The recruited families came from a wide range of socioeconomic and sociocultural backgrounds and included 24% ethnic-minority children, 11% mothers with less than a high school education, and 14% mothers who were single parents (these percentages are not mutually exclusive). The recruited families did not differ significantly on major demographic variables from other families eligible to participate.

By the third grade, 1052 children were still enrolled in the study. Of these, 814 were observed during PE classes and are included in the analyses reported herein. The reasons for not observing and/or including children in analyses were: family distance and scheduling difficulties (79 children [33%]), multiple study children in a classroom (64 [27%]), teacher refusal (36 [15%]), mother refusal (24 [10%]), no PE class (21 [9%]), and child was home schooled (14 [6%]).

Children were an average of 9.0 years of age (SD, 0.3) at the time of observation and 50.9% were boys. Most of the children (79.1%) were white; 10.6%, black; 6.0%, Hispanic; and 4.3%, from another minority group. The children's mothers had an average of 14.5 years of education (range, 7-21 years).

DATA COLLECTION

Observation System

The System for Observing Fitness Instruction Time (SOFIT)¹⁸ was used to obtain information on children's activity levels during PE classes and the lesson context in which they were observed. The SOFIT has previously been used to evaluate staff development programs for PE teachers²² and to describe children's activity in a variety of PE lesson contexts.²⁰ Using the original form of the SOFIT, observers code children's physical activity levels and selected environmental factors (ie, lesson context and teacher behavior) that are associated with opportunities for children to be physically active and to become physically fit. For the present study, procedures were modified so that observers tracked the activity of a single child as he or she participated in school PE lessons rather than the activity of all children in the class. Lesson context, but not specific teacher behavior, was recorded.

Physical education observations were scheduled as part of a full-day school visit that also included observations of the study child in his or her regular classroom and at lunch. In cases where PE was not observed during the regular school visit, an additional visit was scheduled to collect SOFIT data. Visits were arranged a week or more in advance by observers in conjunction with the children's primary classroom teacher.

The observations were conducted in the late fall through the spring of the school year: November to January, n=56; February to April, n=569; and May to June, n=189. Two hundred one of the lessons were conducted outdoors and 610 were held indoors.

The entire physical activity class session was observed by trained and certified data collectors who were paced by prerecorded audiotapes that sounded at 10-second intervals to cue them to "observe" for 10 seconds and then to "record" during the next 10-second period. During each observe interval, the observer watched the focal child; during the record interval, the observer noted the child's level of physical activity and the lesson context. For each interval, the child's physical activity level was coded as follows: 1, lying down; 2, sitting; 3, standing; 4, walking; and 5, very active (expending more energy than during ordinary walking). These codes have been calibrated by means of heart rate monitoring^{22,23} and Caltrac accelerometers (Targeted Body Systems, Glen Mills, Pa).²⁴ The lesson context was coded as management, knowledge, fitness, skill practice, game play, or free play. These are indicators of how PE is taught and give a picture of the quality of the instruction taking place during PE and the emphasis on fitness and skills compared with game play and class management. Teachers also reported the minutes of scheduled PE on the 4 school days before the one observed; these data were added to the minutes of the observed day to calculate total number of minutes of PE per week per child.

Observer Training, Assessment, and Reliability

Each of the 10 data collection sites used at least 2 certified SOFIT observers. One or more observers from each site met at a single location for training and certification and then followed a standard protocol to train the other observers at their site. To be certified on the use of the SOFIT, observers were required to reach 85% of the criterion on precoded videotaped lessons. In addition, observers completed 6 reliability sessions in which 2 observers independently coded children's activity and lesson contexts. Two independent observers also assessed interobserver reliability periodically during the field data collection period. Reliability estimates ranged from 0.83 to 1.00 for mean energy expenditure rate and from 0.98 to 0.99 for total energy expenditure.

Table 1. Mean (SD) Lesson Length, Energy Expenditure, and Minutes for Student Activity and Lesson Context by Child Sex, Teacher Type, and Lesson Location

Category	Child Sex			Teacher Type		Lesson Location	
	All Children (N = 814)	Boys (n = 414)	Girls (n = 400)	Classroom (n = 78)	PE Specialist (n = 692)	Outdoors (n = 201)	Indoors (n = 610)
Total PE per week, min	68.7 (31.9)	67.9 (31.3)	69.6 (32.6)	61.6 (28.1)	69.8 (32.6)	65.3 (32.6)	69.8 (31.7)
Lesson length, min	32.5 (8.8)	32.6 (8.6)	32.4 (9.0)	24.6 (7.8)*	33.4 (8.5)	29.1 (9.1)*	33.6 (8.4)
Lesson energy expenditure, kcal/kg†	2.4 (0.7)	2.5 (0.7)	2.4 (0.7)	1.9 (0.7)*	2.5 (0.7)	2.3 (0.8)‡	2.5 (0.7)
Student activity, min§							
Lying down	0.4 (1.0)	0.4 (1.0)	0.4 (1.0)	0.0 (0.2)‡	0.4 (1.0)	0.0 (0.2)*	0.5 (1.1)
Sitting	8.4 (7.2)	8.4 (7.6)	8.5 (6.8)	2.1 (4.2)*	9.3 (7.2)	3.0 (4.3)*	10.2 (7.1)
Standing	11.8 (6.1)	11.5 (5.7)	12.1 (6.5)	12.0 (5.2)	11.7 (6.2)	13.8 (7.0)*	11.2 (5.6)
Walking	7.0 (4.2)	7.1 (4.2)	6.9 (4.2)	6.7 (4.4)	7.0 (4.1)	7.6 (4.6)	6.8 (4.0)
Very active	4.8 (3.3)	5.1 (3.3)‡	4.5 (3.3)	3.7 (3.1)‡	5.0 (3.3)	4.6 (3.3)	4.9 (3.3)
MVPA	11.9 (5.4)	12.3 (5.4)	11.4 (5.4)	10.5 (6.1)	12.0 (5.2)	12.2 (6.1)	11.7 (5.1)
Lesson context, min							
Management	7.0 (4.9)	7.3 (5.3)	6.7 (4.5)	3.4 (2.8)*	7.4 (4.9)	5.4 (4.2)*	7.5 (5.0)
Knowledge	4.6 (4.3)	4.8 (4.7)	4.4 (4.0)	1.3 (1.7)*	5.0 (4.5)	2.5 (3.3)*	5.3 (4.4)
Fitness activity	4.8 (6.4)	4.3 (5.4)	5.2 (7.2)	3.9 (6.1)	4.9 (6.3)	4.9 (6.7)	4.7 (6.3)
Skill practice	5.0 (7.6)	5.1 (7.6)	4.9 (7.5)	1.9 (4.6)*	5.4 (7.8)	2.7 (5.9)*	5.8 (7.9)
Game play	10.4 (9.4)	10.5 (9.7)	10.3 (9.1)	13.2 (8.9)‡	10.0 (9.4)	12.6 (9.7)*	9.6 (9.1)
Other	0.7 (3.6)	0.6 (3.3)	0.9 (3.9)	0.8 (3.7)	0.7 (3.6)	0.9 (4.2)	0.7 (3.4)

Abbreviations: MVPA, moderate to vigorous physical activity (walking + very active intervals); PE, physical education.

* $P < .001$.

†Estimation based on heart rate monitoring.

‡ $P < .01$.

§F statistics provide omnibus test of differences for lying down, sitting, standing, walking, and very active. For child sex, $F_{5,808} = 1.80$, $P = .11$; for teacher type, $F_{5,764} = 21.49$, $P < .001$; and for lesson location, $F_{5,805} = 41.20$, $P < .001$.

||F statistics provide omnibus test of differences for management, knowledge, fitness activity, skill practice, game play, and other. For child sex, $F_{6,807} = 1.63$, $P = .14$; for teacher type, $F_{6,763} = 19.07$, $P < .001$; and for lesson location, $F_{6,804} = 17.26$, $P < .001$.

MEASURES

Dependent Variables

Variables describing children's total time in the PE class, in each of the lesson contexts, and in each level of physical activity were obtained from the SOFIT observations. These variables were expressed as total minutes (with 3 observe-record intervals making up a minute) and as percentage of intervals observed. In addition, the time children spent in MVPA was calculated by summing the walking and very active categories (levels 4 and 5). An energy expenditure rate for each child during the PE class was calculated following the formula of McKenzie et al²⁰: proportion of time lying down (level 1) \times 0.029 kcal/kg per minute + proportion of time sitting (level 2) \times 0.047 kcal/kg per minute + proportion of time standing (level 3) \times 0.051 kcal/kg per minute + proportion of time walking (level 4) \times 0.096 kcal/kg per minute + proportion of time very active (level 5) \times 0.144 kcal/kg per minute. Estimating energy expenditure during observed periods gives an overall summary score that is a meaningful physiological metric of the intensity of activity during the observed session. The total energy expenditure (in kilocalories per kilogram) for each child for the entire PE lesson was calculated as follows: energy expenditure rate (in kilocalories per kilogram per minute) \times lesson length (in minutes).

Independent Variables

Differences in the SOFIT variables were examined on the basis of child sex, teacher type (PE specialist or general classroom teacher), lesson location (indoors or outdoors), class size, and data collection site.

Data Analyses

Means, SDs, and frequencies were used to summarize and describe the sample and SOFIT variables. Separate multiple analy-

ses of variance were conducted to discern differences in student activities (lying down, sitting, standing, walking, or very active) and lesson context (management, knowledge, fitness activity, skill practice, game play, or other) as a function of child sex, teacher type, lesson location, and data collection site. Independent 2-tailed *t* tests were used to differentiate total minutes of PE, lesson length, lesson energy expenditure, energy expenditure rate, and minutes and proportion in MVPA as a function of child sex, teacher type, and lesson location. Correlations were used to determine variation between SOFIT measures and class size. The α level was set at $P < .01$ for all tests.

Given the possibility that variations in site and/or time of year of data collection might alter results reported, separate multiple analyses of variance were rerun controlling for data collection site and time of year (fall, winter, or spring). No meaningful differences were found when time of year was controlled. Only minor differences were noted when site was controlled, and these are noted in the "Results" section. Data are presented as mean values, unless otherwise indicated.

RESULTS

GENERAL

The children averaged 2.1 PE lessons per week, for a reported total of 68.7 minutes. Only 5.9% of the children had PE 5 times per week, whereas 30.2% had PE once per week; 45.3%, twice per week; 16.0%, 3 times per week; and 2.6%, 4 times per week. Overall, children accrued 4.8 very active and 11.9 MVPA minutes per PE lesson (15.0% and 37.0% of lesson time, respectively) (**Table 1** and **Table 2**). Game play was the lesson context that accounted for the largest number of minutes (10.4 minutes [33.8%]), followed by management (7.0 minutes [21.0%]), skill practice (5.0 minutes [15.2%]), fitness (4.8

Table 2. Energy Expenditure and Proportion of Lesson Time for Student Activity and Lesson Context by Child Sex, Teacher Type, and Lesson Location*

Category	Child Sex			Teacher Type		Lesson Location	
	All Children (N = 814)	Boys (n = 414)	Girls (n = 400)	Classroom (n = 78)	PE Specialist (n = 692)	Outdoors (n = 201)	Indoors (n = 610)
Energy expenditure rate, kcal/kg per minute†	0.074 (0.010)	0.075 (0.011)‡	0.072 (0.010)	0.076 (0.013)	0.073 (0.010)	0.077 (0.012)§	0.072 (0.010)
Student activity, %							
Lying down	1.1 (2.8)	1.1 (2.6)	1.1 (2.9)	0.2 (0.6)‡	1.2 (2.9)	0.2 (0.7)§	1.4 (3.1)
Sitting	24.8 (18.7)	24.2 (19.0)	25.3 (18.5)	8.1 (12.2)§	26.9 (18.3)	10.0 (12.4)§	29.6 (17.9)
Standing	37.1 (17.5)	36.2 (17.3)	37.9 (17.7)	50.2 (19.2)§	35.4 (16.6)	47.8 (18.9)§	33.6 (15.5)
Walking	22.0 (12.6)	22.5 (13.3)	21.5 (11.9)	26.6 (14.3)§	21.4 (12.3)	26.2 (13.4)§	20.6 (12.0)
Very active	15.0 (9.6)	15.9 (9.5)‡	14.1 (9.6)	14.8 (11.6)	15.1 (9.3)	15.7 (10.5)	14.8 (9.2)
MVPA	37.0 (15.1)	38.3 (15.9)‡	35.6 (14.2)	41.5 (19.0)	36.5 (14.5)	42.0 (17.5)§	35.4 (14.0)
Lesson context, %							
Management	21.0 (12.8)	21.7 (13.6)	20.2 (11.9)	13.4 (9.6)§	21.7 (12.8)	17.7 (12.1)§	20.0 (12.9)
Knowledge	13.6 (11.2)	14.1 (12.1)	12.9 (10.2)	5.1 (6.4)§	14.6 (11.4)	8.1 (8.7)§	15.4 (11.4)
Fitness activity	14.4 (18.1)	13.3 (16.4)	15.5 (19.7)	13.8 (20.4)	14.6 (18.0)	15.9 (19.7)	13.9 (17.6)
Skill practice	15.2 (22.5)	16.0 (23.6)	14.3 (21.4)	7.7 (19.5)‡	16.1 (22.7)	8.9 (19.1)§	17.3 (23.2)
Game play	33.8 (30.2)	33.1 (30.2)	34.5 (30.3)	56.1 (35.3)§	30.9 (28.5)	46.4 (34.7)§	29.4 (27.3)
Other	2.1 (10.6)	1.7 (10.4)	2.5 (10.7)	3.7 (16.3)	2.0 (9.9)	2.9 (14.0)	1.8 (9.2)

Abbreviations: MVPA, moderate to vigorous physical activity (walking + very active intervals); PE, physical education.

*Data are presented as mean (SD).

†Estimation based on heart rate monitoring.

‡ $P < .01$.

§ $P < .001$.

||F statistics provide omnibus test of differences for lying down, sitting, standing, walking, and very active. For child sex, $F_{5,808} = 1.83$, $P = .11$; for teacher type, $F_{5,764} = 18.03$, $P < .001$; and for lesson location, $F_{5,800} = 47.35$, $P < .001$.

¶F statistics provide omnibus test of differences for management, knowledge, fitness activity, skill practice, game play, and other. For child sex, $F_{6,807} = 1.48$, $P = .18$; for teacher type, $F_{6,763} = 17.38$, $P < .001$; and for lesson location, $F_{6,804} = 18.64$, $P < .001$.

minutes [14.4%]), knowledge (4.6 minutes [13.6%]), and other activities (0.7 minute [2.1%]).

Table 1 presents mean values for minutes of PE per week, lesson length, lesson energy expenditure, and minutes for student activity and lesson context overall by child sex, teacher type (classroom teacher vs PE specialist), and lesson location (indoors vs outdoors). Table 2 provides energy expenditure rate and proportion of lesson activities and context overall by child sex, teacher type, and lesson location.

SEX

Lesson length and the number of minutes of PE per week were similar for boys and girls. Boys, however, engaged in MVPA a significantly greater proportion of lesson time (38.3% vs 35.6%). As a result, boys had a higher energy expenditure rate (0.075 vs 0.072). No sex differences were found for minutes of lesson context or proportion of lesson time.

TEACHER TYPE

Most observed lessons (89.9%) were taught by PE specialists. Physical education specialists taught longer lessons and, as a result, children accrued more very active minutes and expended more energy in them. In addition, children in PE specialists' lessons had more minutes of knowledge and skill practice, but spent less time in game play than did children taught by classroom teachers. Children taught by classroom teachers spent greater proportions of class time standing (50.2% vs 35.4%) and

walking (26.6% vs 21.4%), but their energy expenditure rates were similar to those in classes of PE specialists. Specialists allocated a greater proportion of lesson time to management (21.7% vs 13.4%), knowledge (14.6% vs 5.1%), and skill practice (16.1% vs 7.7%) and less time to game play (30.9% vs 56.1%).

LESSON LOCATION

Most of the observed lessons (75.2%) were taught indoors. Indoor lessons were longer (33.6 vs 29.1 minutes), permitting more total energy expenditure (2.5 vs 2.3 kcal/kg). However, children's expenditure rate (0.072 vs 0.077 kcal/kg per minute) and proportion of MVPA (35.4% vs 42.0%) were greater during outdoor lessons. More time was allocated for class management, knowledge, and skill practice during indoor lessons. Almost half of the time (46.4%) during outdoor lessons was allocated for game play.

CLASS SIZE

Class sizes ranged from 10 to 60 students, with most (79.0%) having between 16 and 30 students (4 classes with <10 students, 13 classes with >60 students, and 2 classes with missing class size were excluded from this analysis). In examining the correlation between class size and proportion of class time spent in different student activities and lesson contexts, we found small but significant relationships. As class size increased, there was proportionately less MVPA ($r = -0.07$, $P < .05$), more sitting ($r = 0.11$, $P < .01$), and more time spent in class management ($r = 0.10$, $P < .01$).

Table 3. Minutes of MVPA per Week and Proportion of Lesson Time Spent in MVPA by Data Collection Site*

	Minutes of MVPA	Proportion of Lesson Time, %
Little Rock, Ark (n = 63)	9.12 (4.19)	32.40 (15.83)
Irvine, Calif (n = 100)	10.99 (6.37)	40.64 (17.51)
Lawrence, Kan (n = 66)	11.75 (5.13)	38.68 (15.40)
Boston, Mass (n = 77)	13.96 (4.96)	37.01 (12.86)
Pittsburgh, Pa (n = 76)	9.25 (3.90)	29.92 (13.44)
Philadelphia, Pa (n = 99)	13.29 (5.19)	36.80 (13.57)
Charlottesville, VA (n = 79)	12.23 (5.17)	38.23 (13.57)
Seattle, Wash (n = 98)	13.22 (5.30)	42.37 (15.13)
Morgantown, NC (n = 67)	11.05 (5.59)	32.34 (17.27)
Madison, Wis (n = 89)	12.37 (5.20)	37.85 (12.45)

Abbreviation: MVPA, moderate to vigorous physical activity.
 *Data are presented as mean (SD). F statistics provide tests of whether site differences are noted in minutes of MVPA or proportion of lesson time spent in MVPA. For minutes of MVPA, $F_{9,814} = 7.69, P < .001$; for proportion of lesson time, $F_{9,814} = 5.67, P < .001$.

DATA COLLECTION SITE

We noted a significant variation among data collection sites in lesson length, minutes of PE per week, student activity levels and energy expenditure, and proportion of lesson time allocated to different contexts. For example, minutes of MVPA per week ranged from 9.12 (SD, 4.19) to 13.96 (SD, 4.96) across the 10 sites. **Table 3** shows the mean percentage (SD) of time per week in MVPA by site.

When data collection site was controlled in the multiple analysis of variance, multivariate results did not change. However, some previously significant univariate differences dropped out. Specifically, teacher type differences for number of minutes and percentage of time spent lying down and very active, teacher type differences for minutes in game play, and lesson location differences in proportion of time in management activities were no longer significant when site was controlled.

COMMENT

The results of this study using direct observation of children in 684 different schools from 10 data collection sites around the United States show that third-grade children received an average of 2 approximately 33-minute sessions of PE per week. The children averaged about 5 minutes of vigorous activity (15.0% of lesson time) and about 12 minutes of MVPA (37.0% of lesson time) per class, accumulating only about 25 minutes of MVPA per week in school PE classes.

The relatively large SDs and the significant site differences indicate that there is substantial variation in how PE is conducted across the country. Nine percent of those children excluded from the analyses could not be measured because they had no PE class scheduled.

The results of our study show that PE in schools is falling short in meeting Healthy People 2010 goals for PE in both frequency (ie, daily) and activity intensity (ie, 50% of the lesson in MVPA).¹² The wide differences in activity noted among the 10 sites may be due to state and

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local district requirements. Many of the characteristics of PE that we examined, such as teacher type and lesson location, also seemed to vary by geographic location. However, both teacher type and lesson location are modifiable by a given school or district. At the elementary level, state-mandated requirements for PE time, when suggested, range from 30 min/wk to 150 min/wk.¹⁸ In addition, district support for PE programs varies greatly. This finding calls for much more standardized requirements and for more staff development and curriculum time devoted to increasing the frequency and quality (more MVPA) of PE. Even large increases in the frequency and vigor of PE classes have had no detrimental effects on achievement,²⁵ so fears of deleterious effects on literacy and numeric skills by improving PE are unfounded. Evidence exists documenting that improvement in PE is possible by using interventions that include staff development and follow-up.^{21,26}

Interestingly, student MVPA levels in the present study (ie, 37.0% of lesson time) were similar to the 1992 baseline levels identified in the Child and Adolescent Trial for Cardiovascular Health (CATCH) study.²¹ CATCH, which was conducted in 4 states, improved student activity levels in 56 intervention schools and surpassed the Healthy People 2010 objective of 50% of the lesson spent in MVPA. The results of that study also support continued advocacy to improve the curriculum of PE, so that girls are encouraged to engage in appealing activities in which they will obtain more MVPA.

What This Study Adds

With today's concerns regarding increasing trends of obesity, lack of fitness, and inactivity among youth, existing institutional opportunities to increase physical activity among youth must be examined. School PE is one such opportunity. Recommendations are for daily school PE, with students engaging in MVPA for at least half of the PE time. This study provides results of direct observation of a large sample of US children in 10 dispersed sites and documents significant gaps between recommended levels and reality. The results support advocacy to improve both the quantity and quality of school PE at the local level.

With children accruing only about 25 minutes of moderate activity during PE classes of the recommended 420 min/wk (7 days \times 60 minutes), further study is indicated to document other sources for physical activity for children at home, after school, and in organized activities. In addition, better descriptive studies of the extent and nature of physical activity engaged in by this age children are called for to estimate the gaps that exist between the recommendations for total activity and the current reality.

Although not a randomly selected national sample of third-grade PE classes, our study documents through observation the frequency of PE and the intensity of activity of a large sample of children in PE classes in 684 schools across 10 US locations. The data also imply variability across sites and serve as adequate rationale for pediatrician advocacy to improve both the quantity and quality of school PE programs.

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