Long-Term Implementation of the CATCH Physical Education Program

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To test the effectiveness of the Child and Adolescent Trial for Cardiovascular Health (CATCH) program, a randomized trial was conducted in 96 elementary schools in four regions of the United States. Results from the original trial indicated a significant positive effect on the delivery of physical education (PE). All 56 former intervention schools (FI), 20 randomly selected former control schools (FC), and 12 newly selected unexposed control schools (UC) were assessed 5 years postintervention. Results indicate a strong secular trend of increasing moderate to vigorous physical activity (MVPA) in PE classes among both FC and UC schools. The FI schools surpassed the Healthy People 2010 goal for MVPA during PE lesson time (i.e., 50%), whereas the FC and UC schools came close to it. Barriers to implementing CATCH PE included insufficient training and lower importance of PE compared to other academic areas and indicate the need for in-service training.

Keywords: *school-based interventions; physical education; institutionalization; children; health promotion*

Regular physical activity throughout adolescence is important for maintaining a healthy body, promoting psychological well-being, and preventing premature death.[1] Regular physical activity increases muscle and bone strength,[2] increases lean muscle and helps decrease body fat, improves weight management,[3] improves insulin action or decreases peripheral insulin resistance,[4] and enhances psychological well-being by

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This research was supported by the National Heart, Lung, and Blood Institute, Grants U01 HL 39927, U01 HL 39852, U01 HL 39870, U01 HL 33906, and U01 HL 39880.

Health Education & Behavior, Vol. 30 (4): 463-475 (August 2003)
DOI: 10.1177/1090198103253538

reducing symptoms of depression and anxiety.[5] Physical activity during youth is particularly important because childhood activity habits appear to persist into adulthood.[6] Even though young children are among the most active of all segments of the population, a substantial proportion of children do not meet recommended levels of physical activity.[7]

Physical activity levels decline as children approach their teenage years and continue to decline throughout adolescence.[6] Physical education at school provides children opportunities to be physically active and to develop competency in different forms of movement (e.g., swimming, dance, or tennis). Interventions targeting physical education can substantially increase the amount of time students spend being physically active in physical education class.[8] The Centers for Disease Control and Prevention has identified guidelines for schools to develop lifelong physical activity;[9] these guidelines are linked to demonstrated effective physical activity programs and professional practice standards.[10]

But what conditions are favorable for sustaining effective school-based physical education programs? Even programs that have demonstrated feasibility and effectiveness will have little impact on public health if the program reaches only a small proportion of the population at risk.[11] Individuals and organizations choose to accept or reject innovations in a process termed *diffusion of innovation*, which includes the distinct stages of dissemination, adoption, implementation, and institutionalization.[12] *Dissemination* is the process of creating an awareness of programs among the targeted population and includes informing stakeholders about the innovation as well as persuading them to try it. *Adoption* is the decision by an entity to commit to a program, usually defined as purchase of program materials. *Implementation* is the process by which the adopter actually carries out the program, whereas *institutionalization* is the integration of the intervention into an institution's culture through continued program implementation and practice.

The Child and Adolescent Trial for Cardiovascular Health (CATCH) Institutionalization Study (CATCH-ON) was conducted to determine the level of institutionalization of the CATCH program in former intervention schools and to compare relevant metrics between adopting schools that had been in the original intervention and control groups and a new group of unexposed control schools. The present study is concerned with continued implementation and institutionalization of the CATCH physical education (PE) program 5 years postintervention.

METHOD

Background of the CATCH Program

CATCH was a multisite randomized controlled field trial (1991-1994) designed to assess the effects of a school- and family-based intervention to reduce cardiovascular disease risk factors among third- to fifth-grade elementary school students. CATCH intervention components included classroom curricula and school environmental modifications related to food consumption, physical activity, and tobacco use, as well as family and home-based programs to complement the school-based activities. To evaluate the effects of the intervention, 96 schools in four sites (San Diego, California; Austin, Texas; Minneapolis, Minnesota; and New Orleans, Louisiana) were randomized into treatment and control conditions, with 14 intervention and 10 control schools per site.[13] The original CATCH study demonstrated that a multicomponent intervention had a favorable impact on child diet and physical activity patterns and on the school environment.[13] Some of the

effects on individuals persisted to eighth grade with no additional intervention after the fifth grade.[14]

CATCH PE

CATCH PE has been previously described in detail elsewhere, including in this special issue by McKenzie et al.[15] Briefly, the goal of CATCH PE was to involve students in moderate to vigorous physical activity (MVPA) at least 40% of class time during a minimum of three PE classes per week, for 30 to 40 minutes per class.[16] Students were provided with the opportunity to experience and practice physical activities that could be carried over into other times of the day and maintained later in life. Teachers were trained in methods to increase the amount of available class time devoted to MVPA, regardless of the specific physical activities taught. The CATCH PE activity box included a variety of activities including warm-ups, main activities (walk/run/jog and other aerobic recreation games), and cooldowns.

In the former intervention (FI) schools, all teachers responsible for implementing CATCH PE had received a full day of training in each of 3 successive grades (third, fourth, and fifth grades). Teachers of fourth and fifth graders also received a one-half-day training near midyear and on-site consultations by CATCH PE staff about every 3 weeks. At the completion of the original study in 1994, former control (FC) schools were provided with all CATCH PE curricula and materials, and a full-day training was made available.

CATCH-ON Study Design

The CATCH-ON study took place 5 years after the completion of the original CATCH trial. All 56 FI schools and 20 randomly selected FC schools also participated. To provide a comparison of the CATCH PE component with non-CATCH cardiovascular health promotion programs and other secular trends and policies, 12 new unexposed control (UC) schools that had no prior exposure to CATCH were recruited. Measures were taken in the 1998-1999 school year by systematically observing PE lessons, interviewing individuals responsible for PE, and administering questionnaires to PE specialists and classroom teachers.

Measures

SOFIT Instrument

We used the System for Observing Fitness Instruction Time (SOFIT) to obtain a simultaneous measure of students' physical activity levels and lesson contexts during PE classes. Development and validation of SOFIT have been extensively described previously.[17] Observers coded activity levels of four randomly selected children using four codes to describe the body position of students (lying down, sitting, standing, walking) and a fifth code to indicate when students were very active (regardless of body position). For each observation interval, lesson time spent in each of the following contexts was recorded: management, knowledge, physical fitness knowledge, physical fitness activity, skill drill, game play, and free play. The following SOFIT summary measures were included in the present analyses: (a) proportion of lesson time students were very active (vigorous physical activity [VPA] %) and proportion of time students were walking or very active (moderate to vigorous physical activity [MVPA] %), (b) estimated class

energy expenditure (CEE), and (c) proportion of lesson minutes allocated to each of the seven lesson contexts. Trained observers have used the instrument reliably, with reliability coefficients between .95 and .99 for virtually every measure of activity, lesson context, and energy expenditure.[18]

School Staff Questionnaires for Classroom Teachers and PE Specialists

During the fall of 1998, third-, fourth-, and fifth-grade classroom teachers and PE specialists in the FI and FC groups completed school staff questionnaires regarding level of training and current implementation of the CATCH program. PE specialists and classroom teachers in all three conditions (FI, FC, UC) were asked to rate the level of support for PE by school administrators, classroom teachers, parents, school food service personnel, school nurses, and district administrators. Perceived obstacles to PE were measured by 15 items, including the following: poor facilities; large class size; low priority; lack of interest among students, parents, and teachers; lack of teacher training, PE specialists, and principal and district-level support; and difficulty with financial resources, time, equipment, and materials. Scores for support and obstacles were created by averaging Likert-type scale ratings for the respective items.

Also collected in this questionnaire were data regarding use and incorporation of CATCH materials and characteristics of the schools and the teachers. In schools without a PE specialist, the school principal selected a classroom teacher responsible for administering PE to answer the PE specialist questionnaire. Questionnaires were completed by 903 classroom teachers and 90 PE specialists, with response rates of 94% and 100%, respectively.

In-Depth Interviews

In-depth interviews were designed to collect qualitative information regarding the extent to which former CATCH schools continued implementing the program. Open-ended conversational interviews were conducted with two to four individuals in each former CATCH school ($N = 76$). One person was selected for each of the CATCH program components (food service, physical education, and classroom and family health curricula). A total of 199 interviews were completed; information regarding PE was provided by 100 individuals. Interviews were transcribed verbatim, and transcripts were coded and subsequently abstracted.

Statistical Analysis

Data for these analyses were obtained from the SOFIT Lesson Observation Form and the classroom teacher and physical education school staff questionnaires. Two-way comparisons were made using Student's *t* test for continuous data and Pearson's chi-square test for discrete-level variables. Continuous outcomes were analyzed using mixed-effects analysis of covariance and dichotomous outcomes with mixed-effects logistic regression. SOFIT outcomes (student activity levels, lesson contexts, and teacher management of students) were modeled with the following fixed effects: CATCH site (California, Louisiana, Minnesota, Texas: 3 *df*), treatment condition (FI, FC, UC: 2 *df*), grade (3, 4, 5: 2 *df*) location of PE lesson (indoor, outdoor, both: 2 *df*), gender of the instructor (1 *df*), teacher

type (PE specialist, classroom teacher: 1 *df*), and lesson length (1 *df*). Outcomes from the staff questionnaires also included these fixed effects, with the exception of grade, location of PE lesson, and lesson length. School nested within site and treatment condition was included in both models as a random effect to account for variability in schools within and across sites. Interaction terms to investigate treatment differences by grade (for SOFIT outcomes) or by teacher type (for staff questionnaire outcomes) were found not to be predictive and were subsequently dropped. Dunnett's test was used to control the Type I error rate associated with multiple comparisons. Pairwise comparisons were made only if the omnibus *F* test associated with the interaction term was significant. A total of 645 classes were observed and 958 school staff questionnaires completed at 88 schools during CATCH-ON. Fewer than 24 (3.7%) of lessons were automatically dropped by the Statistical Analysis System (SAS) mixed-modeling procedure due to missing values for PE lesson location. Similarly, 3% or less of all staff questionnaires were dropped as a result of missing data in the teacher gender variable or the outcome. The effect of missing data on the results is considered negligible.

Continuous outcomes were analyzed making iteratively updated calls to Proc Mixed from SAS/STAT software (Version 8.1 of the SAS System for Windows, SAS Institute, Inc., Cary, North Carolina). Binary outcomes were analyzed with Glimmix, a macro supported by SAS that fits generalized linear mixed models using Proc Mixed.

In-depth interviews were coded by CATCH project staff from each of the four sites. Coders determined the structure of categories of responses that were based on reading of the verbatim transcripts. Each coder's structure was cross-checked by another member of the team. Responses were then placed on a matrix of categories by treatment and field site that could be visually examined for frequency. Responses were also cross-referenced to transcripts so that example quotes could easily be examined by response category.

RESULTS

Table 1 presents the number of lessons observed using SOFIT and school staff questionnaires that were analyzed across the three conditions (FI, FC, UC). A total of 645 classes across Grades 3,4, and 5 were observed during spring of 1999. Twenty-two PE specialist questionnaires and 13 classroom teacher questionnaires were completed incorrectly and were dropped from the analyses, resulting in a total of 958 completed staff questionnaires. The proportion of lessons observed and school staff questionnaires completed were similar across grades and teacher specialty (Pearson χ^2: $p = .79$ and $p = .80$, respectively).

Tables 2 summarizes data from SOFIT, displaying information on observed student activity and observed lesson context by grade and treatment condition and shows differences between FI and the two other conditions. No significant differences were observed on study activity and lesson context. Overall, students in FI schools spent a slightly larger proportion of lesson time engaged in MVPA and VPA, and they had higher energy expenditure than students in FC or UC schools; however, these differences were not statistically significant. The FI schools met the Healthy People 2010 goal for MVPA during lesson time (i.e., 50%), and the FC and UC schools came close to it. The FI schools had levels of MVPA and VPA near that observed at the completion of the original CATCH trial (see McKenzie et al.[15] in this issue). The majority of PE lesson time was spent in fitness activities, skill drills and scrimmage, and game play, with approximately 20% devoted to management of students. Relative to how lesson time was allocated, FI and FC schools were

Table 1. Number of Lessons Observed and School Staff Questionnaires Completed in Former Intervention, Former Control, and Unexposed Control Schools During CATCH-ON (spring 1999)

	Former Intervention		Former Control		Unexposed Control		Total	
	n	%	*n*	%	*n*	%	*n*	%
Schools	56	63.6	20	22.7	12	13.6	88	100.0
Lessons observed								
Grade 3	153	64.8	54	22.9	29	12.3	236	36.6
Grade 4	129	59.5	54	24.9	34	15.7	217	33.6
Grade 5	119	62.0	45	23.4	28	14.6	192	29.8
Total	401	62.2	153	23.7	91	14.1	645	100.0
School staff questionnaires								
Physical education specialist	41	60.3	16	23.5	11	16.2	68	7.1
Classroom teacher	572	64.3	191	21.5	127	14.3	890	92.9
Total	613	64.0	207	21.6	138	14.4	958	100.0

NOTE: CATCH: Child and Adolescent Trial for Cardiovascular Health; CATCH-ON: CATCH Institutionalization Study.

more similar than FI and UC schools. The FI and FC schools tended to spend more time on general knowledge and skill drills and scrimmage, whereas UC schools tended to spend more time on game play and free play. No significant differences in the allocation of time between FI and UC schools were found, however.

Large differences were observed between the FI and UC schools on five of the seven lesson characteristics—teachers using encouragement (effect size = .843), praise (effect size = .702), providing clear instructions (effect size = .528), presence of an adequate student-to-equipment ratio (effect size = .935), and appropriate group size (effect size = .895). There were no significant differences in lesson characteristics between the FI and FC schools, although the trend generally favored the FI condition. FI teachers were also observed to include more warm-up and cooldown segments in classes than did FC and UC teachers: 64% of FI teachers allowed time for warm-up compared with 54% of FC and 55% of UC teachers. Similarly, 16% of FI teachers included a cooldown period compared with 5% of FC and 4% of UC teachers ($p = .75$ after adjustment for site, grade, location, teacher gender, and type and lesson length).

Table 3 presents the prevalence of availability and training in the use of CATCH materials as reported in the classroom teacher and PE specialist surveys. A larger proportion of teachers in FI schools (31.2%) than those in FC schools (8.3%) received CATCH PE training ($p < .001$) and had CATCH materials available (32.3% vs. 6.0%, $p < .001$), and they used the materials more frequently (27.2% vs. 9.2%, $p = .001$). Of teachers who received CATCH training ($n = 230$), those in FI schools had an average of 9.3 hours compared with 3.1 in FC schools ($p = .006$, data not shown). Five years after the completion of the original CATCH trial, only 35% of the FI schools reported having the PE materials. Further examination of these data by teacher type revealed differences in availability of PE materials between treatment groups: in FI schools, 98% of PE specialists still had CATCH PE materials compared with 56.3% of PE specialists in FC schools ($p \leq .05$). In addition, 88% of PE specialists in FI schools reported having used the CATCH PE materi-

Table 2. Adjusted Mean (*SE*) for Student Activity Observed during CATCH-ON Physical Education by Treatment Condition[a]

	FI[b]		FC[b]		UC[b]		FI-FC		FI-UC	
	M	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*
Student activity										
(% of lesson, except where noted otherwise)										
Lying down	0.5	0.1	1.0	0.2	0.1	0.3	–0.5	0.3	0.4	0.3
Sitting	14.6	1.3	18.2	2.1	14.0	2.8	–3.7	2.5	0.6	3.1
Standing	34.5	1.4	33.4	2.4	38.7	3.2	1.1	2.8	–4.1	3.5
Walking	33.7	1.1	32.4	1.9	34.1	2.5	1.3	2.2	–0.4	2.8
Vigorous physical activity	16.3	0.8	15.2	1.3	13.9	1.7	1.4	1.6	3.2	2.0
Moderate to vigorous physical activity	50.4	1.4	47.5	2.4	47.5	3.1	2.8	2.8	2.9	3.4
Mean lesson class energy expenditure (kcal/kg)	2.5	.03	2.4	0.1	2.4	0.1	0.1	0.1	0.1	0.1
Lesson context (% of lesson)										
Management	19.7	1.0	20.4	1.6	21.3	2.1	–0.8	1.9	–1.7	2.3
General knowledge	11.2	0.9	10.2	1.4	7.1	1.9	0.9	1.7	4.1	2.1
Physical fitness knowledge	0.4	0.2	0.7	0.3	0.3	0.4	–0.3	0.3	0.1	0.4
Physical fitness activity	21.1	2.1	19.6	3.5	23.7	4.6	1.5	4.1	–2.6	5.1
Skill drills and scrimmage	17.4	2.1	22.6	3.5	6.1	4.7	–5.2	4.1	11.3	5.1
Game play	25.6	2.5	23.4	4.1	31.0	5.4	2.2	4.8	–5.4	6.0
Free play	4.6	1.4	2.7	2.3	10.2	3.1	1.9	2.7	–5.6	3.4

(continued)

Table 2. (Continued)

	FI[b]		FC[b]		UC[b]		FI-FC		FI-UC	
	M	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*
Lesson characteristic[c]										
Teacher encouragement	2.8	0.1	2.7	0.1	2.3	0.2	0.1	0.1	0.6	0.2**
Teacher praise	2.7	0.1	2.5	0.1	2.2	0.2	0.2	0.2	0.5	0.2*
Students enjoying physical education	3.2	0.1	3.1	0.1	3.0	0.1	0.1	0.1	0.2	0.1
Teacher providing clear instructions	3.3	0.1	3.3	0.1	2.9	0.1	–0.05	0.1	0.3	0.1*
Adequate student-to-equipment ratio	3.3	0.1	3.3	0.1	2.6	0.2	–0.01	0.2	0.7	0.2***
Appropriate group size	3.2	0.1	3.2	0.1	2.5	0.2	–0.01	0.2	0.7	0.2**
Teacher rewards outside of class physical activity	1.3	0.1	1.3	0.1	1.1	0.1	–0.05	0.1	0.1	0.2

NOTE: CATCH: Child and Adolescent Trial for Cardiovascular Health; CATCH-ON: CATCH Institutionalization Study.

a. Mean (*SE*) from mixed-effects analysis of covariance, adjusted for site, gender, and specialty of physical education teacher, and location and length of lesson.

b. FI = former intervention (n = 56 schools); FC = former control (n = 20 schools); UC = unexposed control (n = 10 schools)

c. Outcomes were measured on the following ordered scale and averaged across lessons within each school: 1 = *observed none of the time*, 2 = *observed some of the time*, 3 = *observed most of the time*, 4 = *observed all of the time*.

*p < .05. **p < .01. ***p < .001.

Table 3. Prevalence of CATCH PE Materials and Training in Former Intervention (n = 56) and Former Control (n = 20) Schools During CATCH-ON by Treatment Condition

	FI[a] (n = 600)		FC[a] (n = 203)		Adjusted Percentages[b]		
Material or Training	n	%	n	%	FI	FC	p value[b]
Have CATCH PE materials	211	35.2	38	18.7	32.3	6.0	< .001
Have used CATCH PE materials	194	32.3	45	22.2	27.2	9.2	.001
Received CATCH PE training	202	33.7	28	13.8	31.2	8.3	< .001

NOTE: CATCH: Child and Adolescent Trial for Cardiovascular Health; CATCH PE = CATCH Physical Education; CATCH-ON: CATCH Institutionalization Study.

a. FI = former intervention (n = 56 schools with 600 completed staff questionnaires); FC = former control (n = 20 schools with 203 completed staff questionnaires).

b. From a mixed-effects logistic regression model, adjusted for site, gender, and specialty of the PE teacher.

als, compared with 50% of PE specialists in FC schools (adjusted percentages not significant).

Table 4 presents scores on perceived school barriers and support for PE by treatment condition. Overall, there was general support for PE, and it did not differ significantly by treatment condition. The highest level of perceived support was found among PE teachers (3.7), school administrators (3.4), and parents (3.2); lowest support was from school food service workers (2.7) (data not shown). There was overall agreement that obstacles exist for implementation of quality PE. The highest rated obstacles were lack of time in school day (3.1), low priority relative to academic subjects (2.9), lack of indoor facilities (2.8), low financial resources (2.7), and lack of state requirements for mandated educational standards (2.7) (data not shown). Use of the CATCH PE curriculum was significantly associated with the school having a higher index of support (r = .35, p = .003) and a lower index of barriers for PE (r = –.25, p = .036).

Information from the in-depth interviews corroborated the teacher and PE specialist surveys. Participants were asked to describe any barriers to the implementation of CATCH PE and to select the most important. The most frequently cited barriers to continuing the use of CATCH PE were also rated the most important: (1) lack of time for preparing for, and implementing, the lessons; (2) higher priority given to academic standards and testing; (3) lack of training and teacher interest; and (4) insufficient equipment or stolen equipment.

Among classroom teachers, feeling inadequately prepared to implement PE was frequently reported; and in many cases, teachers had little interest in gaining the skill. This appears to be a salient barrier for continued implementation of the program, and this has been confirmed under quantitative testing.[15,19] Classroom teachers also reported not being held accountable for PE or health and not being sufficiently trained. School personnel also reported on conditions that enhanced the continued use of CATCH and commented on the most important of these "enhancers." The most frequently cited positive features of CATCH were (a) students and teachers enjoyed teaching the program; (b) the format, organization, and ease of use of the curriculum materials and activity box; (c) provision of training and equipment; and (d) agreement with the underlying philosophy of CATCH.

Table 4. School Barriers and Support for Physical Education in 56 Former Intervention Schools, 20 Former Control Schools, and 12 Unexposed Schools During CATCH-ON by Treatment Condition

	FI[a]		FC[a]		UC[a]		FI-FC		FI-UC	
Characteristic	*M*	*SE*[b]	*M*	*SE*[b]	*M*	*SE*[b]	*M*	*SE*[b]	*M*	*SE*[b]
School support for physical education[c]	3.15	0.04	3.17	0.07	3.0	0.09	–0.02	0.09	0.15	0.10
School barriers to physical education[d]	2.45	0.03	2.42	0.05	2.48	0.06	0.03	0.05	–0.03	0.07

NOTE: CATCH: Child and Adolescent Trial for Cardiovascular Health; CATCH-ON: CATCH Institutionalization Study.

a. FI = former intervention (n = 56 schools with 613 completed staff questionnaires); FC = former control (n = 20 schools with 207 completed staff questionnaires); UC = unexposed schools (n = 12 schools with 138 completed staff questionnaires).

b. Mean, standard error, and p value from a mixed-effects analysis of variance model, adjusted for site, gender, and specialty of the physical education teacher. Neither treatment effect nor treatment-by-teacher type interaction were significant for either outcome ($p > .05$).

c. 1 = *not at all supportive*, 3 = *somewhat supportive*, 5 = *extremely supportive*.

d. 1 = *strongly disagree*, 2 = *disagree*, 3 = *agree*, 4 = *strongly agree*.

DISCUSSION

The results reported here indicate that most schools in all three conditions have achieved, or nearly achieved, an important Healthy People 2010 objective that calls for 50% of physical education class time to be spent in MVPA.[20] The importance of this finding lies not in the fact that FI schools have continued the implementation of CATCH PE and have maintained this goal over 5 years but that MVPA levels in the FC and UC schools have nearly achieved it as well. In almost every respect, student activity, lesson context, and lesson characteristics were the same in FC and FI schools. This was also true for the UC schools, with the exception of lesson characteristics where they scored poorer on several elements of quality PE (e.g., structured activity time, skill development, student interaction, group size, and equipment ratio) compared with FI schools. CATCH was an innovative program and may have changed the state of practice in the areas where the main trial was implemented. At the completion of the main trial, FC schools were provided a complete set of CATCH materials and were offered training in the program's use. Even though UC schools were selected because they reported having never been trained in CATCH, because of the proximity to the study schools and the availability of staff development sessions during the 5-year postintervention period, the guiding principles of CATCH PE may have become part of PE practice among neighboring school districts. Unfortunately, we did not ask questions regarding school or district policies on PE (e.g., required staff development or specific PE curriculum standards) and are limited in offering any support for this speculation.

The results reported here also identify significant barriers for the continued implementation of the CATCH PE program. CATCH PE was designed to be implemented by both PE specialists and classroom teachers, and the former group felt more prepared and were more likely to implement CATCH PE than the latter (also see McKenzie et al. in this issue[15]). Among the PE specialists, the biggest barrier for implementation was lack of

specific training related to CATCH PE. Schools constantly receive new staff members who are not likely to implement a program they are unfamiliar with. The result was that teachers not specifically trained in CATCH would conduct PE based on their prior experiences. This, coupled with lost curriculum and worn-out or broken equipment, resulted in a lower level of implementation than might be expected given the level of support provided by the study team in the main CATCH trial. Availability of equipment was also problematic; and, in the majority of schools, the annual PE equipment budget was less that $1,000. Although CATCH PE includes many activities where little or no equipment is required, having enough equipment for each child to have a ball or jump rope, for example, allows students to be more active and teachers to be more effective in implementing the program.

Training was an important contributing factor to continued use, especially among classroom teachers who were less familiar with the subject matter and managing groups of physically active children in movement settings. It was almost universally agreed by classroom teachers and PE specialists in both FI and FC schools that CATCH PE materials were easy to use and helped them to quickly create lesson plans, and that the layout of the materials and activities facilitated continued use. After overcoming their initial resistance to teaching structured PE, classroom teachers found teaching CATCH was a positive experience, and several reported that the box and cards made it easier for them to leave instructions for substitute teachers. This observation may explain the positive differences observed on lesson characteristics between FI and UC schools (Table 2), which indicate the long-term influence of CATCH training sessions. During PE, teachers at schools in the FI condition, compared to UC schools, were significantly more likely to encourage and praise students, to provide clear instructions, to provide an adequate student-to-equipment ratio, and group instruction with the appropriate number of students.

Implications for Practitioners

Physical education is important for the development of lifelong physical activity habits that can have positive healthy impacts across the life span.[1] The CATCH-ON study offers guidance to those who believe high-quality PE should be widely available in elementary schools. A common obstacle to implementation of PE is access to professional development. The results presented here indicate the need for in-service training for existing staff and newly hired teachers. Optimally, training should include time for teachers to observe experts conduct PE activities and to practice new instructional skills themselves. This is particularly relevant among classroom teachers who may not feel prepared to implement structured PE.[21] PE specialists are more thoroughly prepared and when exposed to CATCH PE are more likely to implement it than classroom teachers. Yet in many school districts, PE specialists are not at all available or not in sufficient numbers. Thus, in order for children to receive an adequate dose of PE, classroom teachers may be required to augment the efforts of PE specialists.

A second barrier for implementation of PE is the relative importance of health and PE compared with other academic areas. Increased emphasis on academic achievement may crowd out available school time for PE and reduce classroom teacher motivation to provide it. This finding is corroborated by a study of California school administrators where the biggest barriers for implementing physical education were inadequate teacher training (37%) and lack of time or scheduling problems (44%).[22] The implications of these observations bode poorly for the development of healthy children. Policy solutions at the

local or state levels that mandate staff development and the implementation of proven effective PE programs are advised/needed.

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