Research Quarterly for Exercise and Sport

Vol. 76, No. 1, pp. 11–19

Evaluating the Sustainability of SPARK Physical Education: A Case Study of Translating Research Into Practice

Marsha Dowda, James F. Sallis, Thomas L. McKenzie, Paul Rosengard, and Harold W. Kohl, III

Dissemination and sustainability of evidence-based physical education programs (PE) has been studied rarely. The sustainability of a health-related PE program (SPARK) was independently evaluated in 111 elementary schools in 7 states. Surveys were mailed to schools that had received SPARK curriculum books, training, and follow-up (response rate = 47%). Up to 80% of schools that adopted SPARK PE reported sustained use up to 4 years later. Schools using SPARK had more frequent PE classes. Sustained use was related to support from the principal, not previously having a standard PE program, having adequate equipment, and teachers being physically active. Program sustainability was similar in advantaged and disadvantaged schools. Evidence-based PE programs can be sustained up to 4 years.

Key words: health, curricula, program dissemination, program evaluation

Physical education (PE) programs that emphasize health-related physical activity are a critical component of comprehensive strategies to promote the health of young people through regular physical activity (Centers for Disease Control and Prevention [CDC], 1997; Pate & Hohn, 1994; Sallis & McKenzie, 1991; U.S. Department of Health and Human Services [USDHHS], 2001). Based on a systematic review of evidence, the *Guide to Community Preventive Services* (Kahn et al., 2002) "strongly recommends" school-based, activity-focused PE as an effective method of improving physical activity and fitness. *Healthy People 2010* (USDHHS, 2000) identified improving PE as a national health objective. Numerous organizations recommend health-related PE (American Academy of Pediatrics, 2000, American College of Sports Medicine, 1988; American Heart Association, 1995, USDHHS, 1996).

Several reviews have documented the effectiveness of enhanced PE (Almond & Harris, 1998; Resnicow & Robinson, 1997; Stone, McKenzie, Welk, & Booth, 1998; Kahn et al., 2002). However, the research and authoritative recommendations have not produced clear improvements in policy and practice related to PE in the United States (Burgeson, Wechsler, Brener, Young, & Spain, 2001; Pate et al., 1995). Observational studies of PE classes, particularly in elementary schools, show low levels of physical activity (McKenzie et al., 1995; Simons-Morton, Taylor, Snider, Huang, & Fulton, 1994), poor quality of instruction (Faucette, McKenzie, & Patterson, 1990), and a quantity of PE class time that fails to meet state standards (McKenzie et al., 1995; McKenzie, Sallis, Kolody, & Faucette, 1997). PE appears to be an example of the failure of research to affect practice.

The public health effect of any intervention depends not only on its effectiveness but also on the extent of its implementation and sustainability (Oldenburg & Parcel, 2002). The diffusion of health promotion innovations consists of five phases (Oldenburg, Hardcastle, & Kok, 1997). The phases are: (a) "innovation development" in which the new program is developed and tested, (b) "dissemination," in which availability of the innovation is communicated widely, (c) "adoption," which refers to the

Submitted: April 22, 2003
Accepted: July 5, 2004

Marsha Dowda is with the Department of Exercise Science at the University of South Carolina. James F. Sallis is with the Department of Psychology at San Diego State University. Thomas L. McKenzie is with the Department of Exercise and Nutritional Sciences at San Diego State University. Paul Rosengard is with The SPARK Programs, San Diego, CA. Harold W. Kohl, III, is with the Centers for Disease Control and Prevention, Atlanta, GA.

uptake of the program by the target audience, (d) "implementation," in which users, in this case schools and teachers, actually put the program into practice, and (e) "maintenance," which refers to the sustained use of the innovation. In this phase, both the quantity (e.g., percentage of teachers using the program regularly) and quality of implementation (e.g., adherence to the curriculum) need to be considered. A literature review revealed that only 1% of health promotion articles could be considered diffusion research, and 6% were classified as institutionalization or policy change studies (Oldenburg, Sallis, French, & Owen, 1999). Thus, there is a need for more evaluation of the diffusion and long-term sustainability of health promotion programs.

The diffusion efforts of SPARK PE presented an opportunity for a case study evaluation of translating a research-based innovation into practice. Therefore, the purpose of the present study was to conduct an independent evaluation of sustainability of the SPARK program in schools that had adopted the program between 1 and 4 years earlier. The study was initiated by the International Life Sciences Institute (ILSI) Center for Health Promotion and Childhood Obesity Prevention Initiative. Survey mailings, data entry, and analysis took place at the University of South Carolina.

Method

SPARK Physical Education

SPARK PE was developed by a multidisciplinary team at San Diego State University through a grant (1989–96) from the National Heart, Lung, and Blood Institute of the National Institutes of Health to create, implement, and evaluate an elementary school health-related physical education program. Main program components were an active PE curriculum, staff development, and on-site support. The PE curriculum was designed as a practical resource for both classroom teachers and PE specialists, and it provided developmentally appropriate yearly unit and lesson plans.

SPARK PE was designed to encourage health-related PE by maximizing physical activity participation during class to improve students' fitness, skills, and enjoyment. These changes may help to prevent obesity and introduce children to a lifelong physical activity lifestyle. The curriculum included only activities that could be implemented realistically in various school settings. Inactive games and drills were excluded or modified. Each lesson included two types of class activities: (a) health-related fitness activities targeted the development of muscular strength and endurance, cardiovascular endurance, flexibility, and locomotor and nonlocomotor skills; and (b) skill-related fitness activities targeted the development of generalizable manipulative and sport-related skills (McKenzie, Alcaraz, Sallis, & Faucette, 1998).

The SPARK Physical Education Curriculum for Grades 3–6 contained over 350 pages of 24 core activity units, suggestions for managing children in PE classes, and instructions for inclement weather activities, strength and conditioning, warm-up, and a fitness self-testing program. The program was originally tested in the upper grades, but due to demand from schools during the diffusion phase, a complementary curriculum was developed for kindergarten through second grade. Visit www.sparkpe.org for more information on the curriculum.

A related classroom curriculum taught behavioral self-management skills that would assist students in developing regular physical activity skills outside of school. Although the level of participation in self-management activities was related to increases in physical activity and fitness (Marcoux et al., 1999), there was no overall program effect on out-of-school activity (Sallis et al., 1997).

The staff development program was designed to: (a) enhance teachers' commitment to health-related PE, (b) help them understand SPARK curricular units and activities, (c) develop management and instructional skills needed for effective program implementation, and (d) assist them in overcoming barriers to full implementation. The program further developed the skills of PE specialists and provided basic PE skills training for classroom teachers. Regular on-site mentoring and assistance by trainers was considered essential.

The process and outcomes of the program have been published. SPARK PE had positive effects on quality and quantity of teacher instruction of PE (McKenzie, Sallis, Faucette, Roby, & Kolody, 1993), physical activity in class and components of physical fitness (Sallis et al., 1997), sports-related skills (McKenzie et al., 1998), and academic achievement (Sallis et al., 1999). Classroom teachers who received the curriculum, staff development, and support during the study maintained high quantity and quality PE classes 18 months following the intervention (McKenzie et al., 1997). SPARK PE classes were well received by students (McKenzie, Alcaraz, & Sallis, 1994), and staff development and follow-up were well received by teachers (Faucette, Nugent, Sallis, & McKenzie, 2002). Because of these favorable findings, efforts to diffuse the program were undertaken.

Diffusion Methods

The SPARK PE diffusion was designed to implement the tested intervention as closely as possible and included curricula and materials, staff development, and follow-up services. The program was made available to schools throughout the United States on a contractual basis, beginning in summer 1994. Contracts were

made for three different levels of training, ranging from 6 to 12 hr of staff development instruction.

Certified trainers, most of whom had master's degrees, provided services. To become a certified trainer, teachers participated in the SPARK staff development program, implemented SPARK PE with their own students, and completed an 80-hr training program under the guidance of the SPARK executive director. At the time of the present evaluation, there were 16 certified trainers.

The staff development workshops were "hands–on," with participants actively engaging in the lessons, physical skills, and activities they would eventually teach. In schools without PE specialists, on-site facilitators were trained and supported for the Grade K–2 and 3–6 programs. The on-site facilitator helped the program succeed by overcoming implementation barriers, such as scheduling of facilities and managing equipment. Follow-up assistance was provided via telephone and e-mail on request. Additionally, SPARK staff initiated interactions with on-site facilitators via e-mail annually.

Schools and Participants

There were 277 schools that had adopted SPARK and received staff development more than a year prior to the survey, and 233 of these names and addresses were available (the database was incomplete for the remainder). The schools were located in California (57.5%), Hawaii (23.6%), Maryland (6.9%), Tennessee (5.6%), Utah (1.3%), Washington (0.4%), Arizona (0.4%), and Saipan, Northern Mariana Islands (4.3%).

Procedures

ILSI compiled, pretested, and printed questionnaires and sent them to the University of South Carolina. SPARK provided a computer file of school names, addresses, and contact people. Letters addressed to the principal or SPARK contact person, a survey, and a prepaid addressed envelope were mailed from South Carolina. The letter explained that the enclosed questionnaire was designed to evaluate the sustainability of the SPARK program and should be completed by the person most familiar with the program. Further, the letter stated that most teachers complete the questionnaire in 10 min or less, the group sending the survey was working with the SPARK team, and provided assurance that responses would be confidential. A week later a reminder postcard was sent to each school. Return envelopes had been coded by school and were separated from the survey on receipt to maintain confidentiality. A second survey was mailed approximately 2 weeks later to schools that had not returned a survey. The University of South Carolina institutional review board approved the study.

Measures

The survey was designed to evaluate current use of the SPARK program and materials and assess factors that might affect continued use. Four items addressed the personal characteristics of the responder and included sex, level of certification, years of teaching, and whether he or she engaged in at least 30 min of moderate to vigorous physical activity all or most days of the week. Eight items addressed the general environment of the school, district, and community. Ten items were related to PE classes within the school. Four items asked about the "school community," and four were related to the use of SPARK.

Only schools using the program completed additional questions pertaining to SPARK PE. These included questions about who initiated SPARK at the school, the manner in which SPARK was used, the number of teachers using the program, and whether they received ongoing support and training. Most items were rated on a 5-point Likert-type scale (strongly disagree to strongly agree) or were in a yes-no format.

Data Analysis

Chi-square analyses (or Fisher's exact test when the cell size was less than 5) were conducted to determine differences between dichotomized responses and whether the respondent was a SPARK user. Items significant at $p < .05$ were entered into a logistic regression analysis. SPARK user (1 = yes, 0 = no) served as the dependent variable. Nonsignificant items were eliminated, and only significant ($p < .05$) items were reported. A second set of chi-square analyses were performed using the same questions to determine differences in dichotomized items by whether the respondent was a physical education teacher. Last, frequency distributions for items completed only by SPARK users were reported.

Results

A total of 111 (47.2%) surveys were returned. Of the returned surveys, 62.2% were from California, 23.4% from Hawaii, 0.9 % from Maryland, 8.1% from Tennessee, 2.7% from Utah, and 2.7% from Saipan, Northern Mariana Islands. Demographic data were complete for 104 (94%) of the respondents. Seventy percent were women, 55% had been teaching for more than 10 years, and 81% said they were currently using the SPARK program in their schools. Table 1 shows that demographic characteristics of users and nonusers of SPARK PE were similar.

The relationship of the study variables with continued use of SPARK PE is presented in Table 2. For general environment variables, a higher proportion of sustained

Table 1. Demographic characteristics of survey responders, by SPARK user category

Characteristics	SPARK user *N*	% of users	SPARK nonuser *N*	% of nonusers	*p*
Women	84	70.2	20	70.0	.98
PE certified	84	25.0	20	30.0	.65
Taught >10 years	83	55.4	20	55.0	.97
Trained by SPARK PE trainer	82	91.5	19	89.5	.78

Note. PE = physical education.

SPARK PE users (SPARK users) than nonsustained SPARK PE users (nonusers) reported that their principals supported PE programs and endorsed projects and campaigns promoted by the PE teachers. A higher proportion of SPARK users than nonusers also reported 3 days or more of PE per week and adequate equipment. Higher proportions of nonusers used standardized (i.e., published) PE curricula or programs prior to SPARK training. Teacher profiles differed between the two groups. A greater proportion of SPARK users reported participating in 30 min or more of physical activity per day, while more nonusers reported recently obtaining one or more PE-related academic credits.

Results of backward-elimination logistic regression are presented in Table 3. SPARK users were 4.4 times

Table 2. Relation of variables to sustained use of SPARK physical education

	SPARK user[a] %	SPARK nonuser[b] %	*p*
General environment			
PA programming decisions are made at the school level (strongly agree)	54.2	33.3	.09
Principal offers support for PE programs (strongly agree)[c]	43.9	19.1	.04
Principal endorses projects/campaigns promoted by PE teachers (strongly agree)[c]	41.8	15.8	.03
There is integration of PA curriculum into academic lessons (strongly agree)	14.3	5.0	.45[d]
PE facilities not reallocated for meeting etc. (strongly agree)	23.1	9.5	.23[d]
There is correspondence between school/district and state curriculum objectives for PE (strongly agree)	39.0	38.1	.94
Availability of indoor facilities for PE (strongly agree)	14.3	14.3	1.00[d]
Availability of outdoor facilities for PE (strongly agree)	67.9	47.6	.08
PE within the school			
PE program was standardized before SPARK (strongly agree)	3.7	21.1	.02[d]
When > 30 students, there is additional help (strongly agree)	10.3	5.3	.68[d]
< 30 students per PE class	75.0	88.9	.12[d]
3 days or more of PE per week	50.6	21.1	.02
30 min or more of PA during PE class	19.1	40.0	.07[d]
Minimal time spent in management activities (strongly agree)	34.5	21.1	.26
Minimal time lost changing activities (strongly agree)	32.1	20.0	.29
Time for set-up and take down between classes is adequate (strongly agree)	17.1	15.3	.29[d]
Alternative site is available for PE on rainy days (strongly agree)	12.1	21.1	.29[d]
There is adequate equipment (strongly agree and agree)	79.8	50.0	.01
School community			
Parents actively support PE program (strongly agree)	17.9	15.0	1.00[d]
Community offers many organized physical activities (strongly agree)	35.7	30.0	.63
41% of students live in single-parent homes	41.4	42.9	.92
> 41 % of students receive free or reduced lunch	56.2	44.4	.37
Teacher profile			
SPARK is first attempt to standardize PE program (strongly agree)	26.2	5.0	.07[d]
Obtained one or more PE-related academic credits in past 5 years	53.1	80.0	.03
Responder participates in PA 30 min per day (strongly agree)	41.0	15.0	.03

Note. Percentages are based on response option(s) in parentheses; PA = physical activity; PE = physical education.
[a]Sample size ranged from 70 to 84.
[b]Sample size ranged from 14 to 21.
[c]Two principals were deleted from this analysis.
[d]Fisher's exact test.

Table 3. Comparison of SPARK PE users (n = 76) and nonusers (n = 18); results of backward logistic regression analysis

Variable	Odds ratio	95% CI
PE program was standardized before SPARK	0.08	0.01, 0.54
There is adequate equipment	4.43	1.16, 16.85
During past 5 years obtained ≥ 1 PE credit	0.15	0.03, 0.64
Participates in 30 min/day of PA	4.68	0.96, 22.85

Note. PE = physical education; PA = physical activity.

more likely to be in schools with adequate equipment for PE and 4.7 times more likely to participate in 30 min of physical activity per day than nonusers. SPARK users were less likely to have had a standardized PE program before SPARK training and to have obtained PE credits during the previous 5 years.

Comparisons of PE specialists with other teachers on study questions are shown in Table 4. Compared to "others" teaching PE, a higher proportion of PE specialists reported having: (a) a principal who endorsed PE projects and campaigns, (b) 30 min or more of physical activity during PE class, (c) adequate equipment for PE, (d) parents who actively supported PE programs, and (e) obtained

Table 4. Comparisons of physical education specialists and other teachers

	Physical education[a] (%)	Other[b] (%)	p
Characteristics			
Female	55.6	75.3	.05
Taught > 10 years	55.6	53.4	.85
General environment			
PA programming decisions are made at the school level (strongly agree)	44.4	51.3	.54
Principal offers support for PE programs (strongly agree)[c]	44.4	37.3	.52
Principal endorses projects/campaigns promoted by PE teachers (strongly agree)[c]	55.6	30.0	.02
There is integration of PA curriculum into academic lessons (strongly agree)	7.4	13.2	.73[d]
PE facilities not reallocated for meeting etc. (strongly agree)	15.4	22.2	.46
There is correspondence between school/district and state curriculum objectives for PE (strongly agree)	48.2	36.0	.27
Availability of indoor facilities for PE (strongly agree)	18.5	13.0	.53[d]
Availability of outdoor facilities for PE (strongly agree)	59.3	64.9	.60
PE within the school			
PE program was standardized before SPARK (strongly agree)	15.4	4.0	.07[d]
When > 30 students, there is additional help (strongly agree)	11.1	8.6	.71[d]
< 30 students per PE class	85.2	74.7	.26
3 days or more of PE per week	26.9	51.3	.03
30 min or more of PA during PE class	40.7	16.9	.01
Minimal time spent in management activities (strongly agree)	44.4	27.6	.11
Minimal time lost changing activities (strongly agree)	40.7	26.3	.16
Time for set-up and take down between classes is adequate (strongly agree)	59.3	82.4	.02
Alternative site is available for PE on rainy days (strongly agree)	59.3	38.7	.06
There is adequate equipment (strongly agree and agree)	88.9	68.8	.04
School community			
Parents actively support PE program (strongly agree)	33.3	11.7	.02[d]
Community offers many organized physical activities (strongly agree)	48.2	29.9	.09
> 41 % of students receive free or reduced lunch	50.0	54.9	.70
41% of students live in single-parent homes	35.0	43.8	.49
Teacher profile			
SPARK is first attempt to standardize PE program (strongly agree)	7.4	27.3	.03
Obtained 1 or more PE related academic credits in past 5 years	81.5	50.0	.01
Responder participates in PA 30 min per day (strongly agrees)	48.2	31.6	.12

Note. Percentages are based on response option(s) in parentheses; PA = physical activity; PE = physical education.
[a]Sample size ranged from 20 to 27.
[b]Sample size ranged from 64 to 77.
[c]Two principals were deleted from this analysis.
[d]Fisher's exact test.

PE-related academic credits during the previous 5 years. Higher proportions of other teachers reported 3 days or more of PE per week and that SPARK was their first attempt to use a standardized PE program.

Responses of users of SPARK PE are shown in Table 5. Ninety percent or more of the users agreed that a SPARK PE book was available to them, creative enhancement of the SPARK lessons were possible with minor adaptations, and they used SPARK concepts, methods, and lesson plans for 50% or more of their lessons. Approximately 80% of users reported they: (a) had implemented SPARK for more than 2 years, (b) were trained to teach SPARK in Grades K–6, (c) used SPARK lesson plans for 50% or more of PE lessons, (d) had a regular schedule for using PE equipment and facilities, and (e) had PE equipment that was organized and distributed for each instructional unit. About 60 % of users reported the principal or a veteran teacher initiated the SPARK program and that equipment was available for at least 50% of the students. About 50% of users reported that more than 50% of all teachers (including classroom teachers) in the school were using SPARK, a PE plan was distributed each year, and teachers of PE received ongoing support and training.

Discussion

Health-related school physical education programs based on evidence of effectiveness (Kahn et al., 2002; USDHHS, 2000) are a recommended public health strategy, and it is important to increase the use of these programs in schools across the United States and internationally. The well documented increases of obesity and diabetes (James, Leach, Kalamara, & Shayeghi, 2001; Mokdad et al., 2001) bring added urgency to recommendations for improved PE. The present study documents that a research-based PE program can be disseminated to schools in a range of geographic locations, adopted, and sustained successfully by a high proportion of schools.

The primary finding was that a high proportion of respondents reported using the SPARK PE program from 1 to 4 years after initial training. Schools are unlikely to invest in PE materials and training very often (Sallis, McKenzie, Kolody, & Curtis, 1996), so evidence that a 1-year investment in PE can create a program that is sustained for at least 4 years may encourage more schools to adopt research-based PE programs. SPARK users taught PE classes more frequently than nonusers. Previous studies showed classroom teachers without PE staff development conducted fewer PE classes than those with training (McKenzie et al., 1993; 1997), and increasing the frequency of classes translated directly into enhancing students' physical activity and opportunities for skill practice.

Several characteristics of the schools were related to program sustainability. SPARK users reported more principal support for PE than nonusers, confirming claims about the necessity for administrative support (Sallis et al., 1996). Another aspect of administrative support was availability of PE equipment, which SPARK PE users more frequently reported as adequate. School adoption of SPARK PE was contingent on a school agreement to provide sufficient equipment to implement the program, and on-site facilitators received assistance in maintaining that equipment. An interesting finding was that schools with no previous standard PE program in place were more likely to continue using SPARK than schools with a PE curriculum. This pattern suggests that a specific program such as SPARK may be most useful to the many elementary schools building a PE program from a low baseline.

Two characteristics of teachers were related to SPARK PE sustainability. Physically active teachers were more likely to continue the program, suggesting it is useful to include personal physical activity programming into the staff development workshops. Second, teachers who had not received PE-related academic credits in recent years were more likely to continue using SPARK PE. This suggests that the SPARK program was particularly successful with teachers who had no recent staff development in PE.

It is useful to highlight some variables that were *not* associated with program sustainability. It was encourag-

Table 5. Reports of SPARK users on PE characteristics

99% agree that the SPARK PE book is available to them
99% agree that creative enhancement of the SPARK lessons is possible through minor adaptations
90% reported using SPARK concepts and methods for > 50% of PE lessons
83% reported using SPARK lesson plans for > 50% of PE lessons
82% were trained to teach SPARK in grade levels K–6
82% agree that PE equipment is organized and distributed for each instruction unit
80% reported using SPARK for more than 2 years
79% agree that there is a regular schedule for use of PE equipment and facilities
63% strongly agreed that equipment is available for at least 50% of the students
58% reported that the principal or veteran teacher initiated the SPARK program
54% agree that PE teachers in school receive on going support and training
54% agree that a PE plan is distributed each year
53% reported that > 50% of teachers in school were using SPARK

Note. PE = physical education.

ing that demographic variables, such as the percentage of students with free or reduced lunches (an indicator of socioeconomic status), percentage of students in single-parent families, and availability of physical activity programs in the community were not related to SPARK PE sustainability. These findings indicate that SPARK PE can be sustained equally well in advantaged and disadvantaged schools. Thus, adopting research-based PE programs can contribute to reducing health disparities, which is the overriding national health objective (USDHHS, 2000).

Surprisingly, the nature and quality of PE facilities, the nature of state PE objectives, time for equipment set up and take down, and the size of PE classes were not related to program sustainability. These findings may indicate that the on-site facilitator and SPARK follow-up services were effective in overcoming common barriers related to facilities, unrealistic objectives, and inadequate time for class set up and take down.

Classroom teachers provide a substantial amount of the physical education delivered to elementary school children (National Association for Sport and Physical Education, 2002). The comparison of PE specialists and "other" (i.e., classroom) teachers revealed few significant differences on survey variables. PE specialists reported more principal support for PE programs and more PE equipment, which could reflect a higher level of administrative commitment to PE at schools with PE specialists. Compared to other teachers, PE specialists reported that students received fewer PE classes; however, they reported students engaged in more physical activity per class. We previously observed a common pattern in elementary schools where one PE specialist has time to provide only one or two classes per week per student. Those classes are often 45 min or longer, compared to more typical 25–30-min classes taught by non-PE specialists (McKenzie et al, 2001). The hiring of a single PE specialist is not the full answer to improving PE, because the frequency of PE classes they can provide is too low. In the SPARK diffusion program, it is common for PE specialists not only to receive staff development on the SPARK curriculum but also on how to be an on-site facilitator for nonspecialists who are trained to deliver SPARK. Thus, the special skills of the PE specialist are used fully, and students are able to receive more PE weekly.

Reports from the SPARK users shed additional light on program implementation. About 80–90% of SPARK users had been implementing SPARK for more than 2 years, and most of the time they continued to rely on both actual lesson plans and the program's concepts and methods. Virtually all users reported they could easily adapt SPARK lessons to fit their needs and teaching styles. About 80% agreed that class scheduling and equipment distribution at that their schools were satisfactory. This is a favorable finding, because training and follow up are designed to develop specific plans for these logistical issues that could be major barriers to program sustainability. Other findings were not as favorable. Only about 50% of SPARK users reported that more than 50% of other teachers in the school used SPARK. This could be due to situations in which only some teachers participated in staff development (for example, only teachers in Grades 3–6). Because the program is voluntary, some teachers elected not to attend training or implement the program. Turnover of trained teachers creates the necessity to periodically provide staff development to new teachers. The finding that only about half of SPARK PE users received ongoing support suggests the need for SPARK staff to initiate contact with school facilitators more often rather than relying on teachers to initiate contact.

Strengths and Limitations

It is important for independent agencies to evaluate the diffusion of programs; in this case, the evaluation of SPARK PE was initiated at the ILSI and conducted by the University of South Carolina. Because schools had received the program as much as 4 years prior to the survey, there was a chance to assess long-term sustainability. The evaluation results have been used in-house to further improve the diffusion methods, and they add to the limited literature on diffusion of health promotion programs.

Problems with response bias and inaccurate reporting that apply to all self-report studies limit the conclusions that can be drawn from this survey. Another limitation was the adoption of a single item to define sustainability of the SPARK PE program. The response rate of approximately 50% is limiting, and the true sustainability of SPARK is likely to be less than the 80% reported by respondents. Although the modest response rate may imply that the continued use of SPARK PE is much lower than reported here, there are some additional considerations. Turnover of teachers and principals is high, and the U.S. Department of Education reports about 14% teacher turnover per year (National Center for Education Statistics, 1996). Thus, over a 4-year period, approximately half of the teacher contacts at schools can be expected to move, perhaps implementing the program in another school. Lack of incentives for returning surveys could have contributed to the modest response rate. It is likely there was a bias for SPARK users to return surveys more than nonusers, but it is not possible to estimate the extent of bias.

Conclusion

Based on an independent evaluation of the diffusion of SPARK PE, up to 80% of schools that adopted SPARK PE reported sustaining the program up to 4 years

later. Rates of reported sustainability were similar in advantaged and disadvantaged schools. The SPARK program was most likely to be sustained when teachers had not been using a specific PE program and had no recent PE training. It appears SPARK PE was most useful in schools that most needed improvements in their PE programs. Principal support for PE was related to sustainability, and this finding suggests that school boards and parents need to monitor and encourage principals to support high-quality PE. The present report is an unusual documentation of an apparently successful diffusion of an evidence-based health promotion program. The diffusion of SPARK and other evidence-based physical education programs needs to be greatly expanded so that students in the more than 80,000 elementary schools in the United States have access to effective health-related physical education.

References

Almond, L., & Harris, J. (1998). Interventions to promote health-related physical education. In S. Biddle, J. Sallis, & N. Cavill (Eds.), *Young and Active? Young people and health-enhancing physical activity—Evidence and implications* (pp. 133–149). London: Health Education Authority.

American Academy of Pediatrics. (2000). Physical fitness and activity in schools. *Pediatrics, 105,* 1056–1057.

American College of Sports Medicine. (1988). Physical fitness in children and youth. *Medicine & Science in Sports & Exercise, 20, 422–423.*

American Heart Association. (1995). *Strategic plan for promoting physical activity.* Dallas, TX: Author.

Burgeson, C. R., Wechsler, H., Brener, N. D., Young, J. C., & Spain, C. G. (2001). Physical education and activity: Results from the School Health Policies and Programs Study 2000. *Journal of School Health, 71,* 279–293.

Centers for Disease Control and Prevention. (1997). Guidelines for school and community programs to promote lifelong physical activity among young people. *Mortality and Morbidity Weekly Report, 46* (No. RR-6), 1–36.

Faucette, N., McKenzie, T. L., & Patterson, P. (1990). Descriptive analysis of nonspecialist elementary physical education teachers' curricular choices and class organization. *Journal of Teaching in Physical Education, 9,* 284–293.

Faucette, N., Nugent, P., Sallis, J. F., & McKenzie, T. L. (2002). "I'd rather chew on aluminum foil." Overcoming classroom teacher's resistance to teaching physical education. *Journal of Teaching in Physical Education, 21,* 287–308.

James, P. T., Leach, R., Kalamara, E., & Shayeghi, M. (2001). The worldwide obesity epidemic. *Obesity Research, 9*(Suppl. 4), 228S–233S.

Kahn, E. B., Ramsey, L. T., Brownson, R. C., Heath, G. W., Howze, E. H., Powell, K. E., et al. (2002). The effectiveness of interventions to increase physical activity: A systematic review. *American Journal of Preventive Medicine, 22*(4S), 73–107.

Marcoux, M. F., Sallis, J. F., McKenzie, T. L., Marshall, S., Armstrong, C. A., & Goggin, K. J. (1999). Process evaluation of a physical activity self-management program for children: SPARK. *Psychology and Health, 14,* 659–677.

McKenzie, T. L., Alcaraz, J., & Sallis, J. F. (1994). Assessing children's liking for activity units in an elementary school physical education curriculum. *Journal of Teaching in Physical Education, 13,* 206–215.

McKenzie, T. L., Alcaraz, J. E., Sallis, J. F., & Faucette, F. N. (1998). Effects of a physical education program on children's manipulative skills. *Journal of Teaching in Physical Education, 17,* 327–341.

McKenzie, T. L., Feldman, H., Woods, S. E., Romero, K. A., Dahlstrom, V., Stone, E. J., et al. (1995). Children's activity levels and lesson context during third-grade physical education. *Research Quarterly for Exercise and Sport, 66,* 184–193.

McKenzie, T. L., Sallis, J. F., Faucette, N., Roby, J. J., & Kolody, B. (1993). Effects of a curriculum and inservice program on the quantity and quality of elementary physical education classes. *Research Quarterly for Exercise and Sport, 64,* 178–187.

McKenzie, T. L., Sallis, J. F., Kolody, B., & Faucette, F. N. (1997). Long-term effects of a physical education curriculum and staff development program: SPARK. *Research Quarterly for Exercise and Sport, 68,* 280–291.

McKenzie, T. L., Stone, E. J., Feldman, H. A., Epping, J. N., Yang, M., Strikmiller, P. K., et al. (2001). Effects of the CATCH physical education intervention: Teacher type and lesson location. *American Journal of Preventive Medicine, 21,* 101–109.

Mokdad, A. H., Bowman, B. A., Ford, E. S., Vinicor, F., Marks, J. S., & Koplan, J. P. (2001). The continuing epidemics of obesity and diabetes in the United States. *Journal of the American Medical Association, 286,* 1195–1200.

National Association for Sport and Physical Education. (2002). *Shape of the nation report, 2001: Status of physical education in the USA.* Reston, VA: American Alliance for Health, Physical Education, Recreation and Dance.

National Center for Education Statistics. (1996). *Predictors of retention, transfer, and attrition of special and general education teachers: data from the 1989 Teacher Follow-up Survey. Working Paper No. 96-12.* Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement.

Oldenburg, B. F., Hardcastle, D., & Kok, G. (1997). Diffusion of health education and health promotion innovations. In K. Glanz, B. F. Lewis, & B. Rimer (Eds.), *Health behavior and health education: Theory, research and practice* (2nd ed., pp. 270–286). San Francisco: Jossey-Bass.

Oldenburg, B., & Parcel, G. S. (2002). Diffusion of innovations. In K. Glanz, B. K. Rimer, & F. M. Lewis (Eds.), *Health behavior and health education: Theory, research and practice* (3rd ed., pp. 312–334). San Francisco: Jossey-Bass.

Oldenburg, B. F., Sallis, J. F., French, M. L., & Owen, N. (1999). Health promotion research and the diffusion and institutionalization of interventions. *Health Education Research: Theory and Practice, 14,* 121–130.

Pate, R. R., & Hohn, R. C. (Eds.). (1994). *Health and fitness through physical education.* Champaign, IL: Human Kinetics.

Pate, R. R., Pratt, M., Blair, S. N., Haskel, W. L., Macera, C. A., Bouchard, C., et al. (1995). Physical activity and public health: A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *Journal of the American Medical Association, 273*, 402–407.

Resnicow K., & Robinson, T. N. (1997). School-based cardiovascular disease prevention studies: Review and synthesis. *Annals of Epidemiology, 7*, S14–S31.

Sallis, J. F., & McKenzie, T. L. (1991). Physical education's role in public health. *Research Quarterly for Exercise and Sport, 62*, 124–137.

Sallis, J. F., McKenzie, T. L., Alcaraz, J. E., Kolody, B., Faucette, N., & Hovell, M. F. (1997). The effects of a 2-year physical education program (SPARK) on physical activity and fitness in elementary school students. *American Journal of Public Health, 87*, 1328–1334.

Sallis, J. F., McKenzie, T. L., Kolody, B., & Curtis, P. (1996). Assessing district administrators' perceptions of elementary school physical education. *Journal of Physical Education, Recreation, and Dance, 67*(8), 25–29.

Sallis, J. F., McKenzie, T. L., Kolody, B., Lewis, M., Marshall, S., & Rosengard, P. (1999). Effects of health-related physical education on academic achievement: Project SPARK. *Research Quarterly for Exercise and Sport, 70*, 127–134.

Simons-Morton, B. G., Taylor, W. C., Snider, S. A., Huang, I. W., & Fulton, J. E. (1994). Observed levels of elementary and middle school children's physical activity during physical education classes. *Preventive Medicine, 23*, 437–441.

Stone, E. J., McKenzie, T. L., Welk, G. J., & Booth, M. L. (1998). Effects of physical activity interventions in youth: Review and synthesis. *American Journal of Preventive Medicine, 15*, 298–315.

U.S. Department of Health and Human Services. (1996). *Physical activity and health: A report of the Surgeon General.* Atlanta, GA: Centers for Disease Control and Prevention.

U.S. Department of Health and Human Services. (2000). *Healthy People 2010* (conference edition, in two volumes). Washington, DC: U.S. Government Printing Office. Retrieved January 5, 2005, from http://web.health.gov/healthypeople/Document/tableofcontents.htm.

U.S. Department of Health and Human Services. (2001) *The Surgeon General's call to action to prevent and decrease overweight and obesity.* Washington, DC: U.S. Government Printing Office.

Authors' Notes

At the time of this study, SPARK was a program of the San Diego State University Foundation. After completion of the study, SPARK became a program of Sportime, LLC. The second and third authors are consultants for Sportime, LLC. Please address all correspondence concerning this article to Marsha Dowda, Department of Exercise Science, 730 Devine Street, University of South Carolina, Columbia, SC 29208.

E-mail: mdowda@gwm.sc.edu