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Implementation of a school environment intervention to increase physical activity in high school girls

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Abstract

Physical activity levels begin to decline in childhood and continue falling throughout adolescence, with girls being at greatest risk for inactivity. Schools are ideal settings for helping girls develop and maintain a physically active lifestyle. This paper describes the design and implementation of 'Lifestyle Education for Activity Program', or LEAP. LEAP used a health team approach with participatory strategies to provide training and support, instructional capacity building and opportunities to adapt school instructional program and environmental supports to local needs. The social–ecological model, based on social cognitive theory, served as the organizing framework for the LEAP intervention and elements of the coordinated school health program model as intervention channels. For the 12 intervention schools, LEAP staff documented 191 visits and interactions with 850 individuals over the 2-year period. Teachers reported successful implementation of most components of the intervention and demonstrated optimism for sustainability. These results indicate that a facilitative approach to intervention implementation can be used successfully to engage school personnel, and to change instructional programs and school environments to increase the physical activity level of high school girls.

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Introduction

A physically active lifestyle is important to health, but a majority of individuals do not maintain one. Inactivity is common and contributes to higher rates of obesity, heart disease, stroke and diabetes among sedentary individuals [1–4]. Children and adolescents worldwide are not spared the impact of sedentary living; despite traditional notions of the vitality of youth, young people are increasingly inactive and unfit [3–7]. The World Health Organization recently advocated for strategies to increase physical activity participation worldwide [8].

A decline in activity begins in late elementary school and continues throughout high school and young adulthood [4, 9, 10]. Interventions that provide opportunities and motivation for young people to be active could help address this problem. Schools, which serve 95% of American young people, may be the ideal settings for such programs [11–13] because existing health and physical education (PE) resources can be leveraged to support increased physical activity. Health educators based in schools and those in community agencies, physical educators and other school personnel can work together on programs that help boys and girls adopt and maintain physically active lifestyles.

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Guidelines for School and Community Programs to *Promote Lifelong Physical Activity among Young People*, highlight a wide range of school programs and components, not just PE, that can be implemented to increase physical activity in youth [12, 14]. Many of these recommendations can be integrated into a school-wide intervention using the eight-component coordinated school health (CSH) program model, an organizational framework designed to encourage health-promoting behaviors in students [15–18]. Researchers have found that involving several school components (e.g. PE, health education, school nurse) in a health promotion program increases the likelihood that students will adopt healthy behaviors [13, 19]. A similar approach, referred to as 'health promoting schools', has been adopted among many countries around the world, and shows much promise for the use of the school setting for health promotion [20–22].

A majority of the previously studied school-based health promotion programs has focused on training teachers to implement, with high fidelity, a curriculum developed by the research team. This approach, however, often fails to consider contextual issues (social, cultural and political) that affect program success [23, 24]. Research reveals that implementation of school programs is often influenced more by context and interaction with the local school organization than by the overall program design or intervention characteristics [23]. Therefore, it may be more important to convey the relevant theoretical orientation and focus of the intervention than to prescribe adherence to a specific model [23].

Previous research in educational reform has focused on what is needed to create and sustain change in the complex school environment, with an emphasis on building local capacity [24]. Rather than thinking of the school simply as a setting for implementing a program, this approach views the school as an ecosystem that responds and adapts to a program or intervention [24]. Further, change at the school level is as much of an outcome of the intervention as is change at the individual level.

Based on data from both population-based studies that use self-report surveys and smaller studies with objective physical activity monitoring, girls at all ages are less active than boys, and their activity levels decline at a greater rate than do boys' [25, 26]. US Title IX legislation, enacted in 1972, produced marked growth in school sports programs for girls, however, national data sources indicate that smaller percentage of girls than boys participate in interscholastic sports [27]. Also, evidence indicates that girls are less likely than boys to elect PE when it is not required [4] and report less positive attitudes toward PE than boys [28]. For some girls, school physical activity experiences are quite negative [29].

The intervention described in this paper, LEAP—Lifestyle Education for Activity Program, was designed to promote physical activity in high school girls. Although in this implementation, LEAP was employed to increase physical activity among girls, this approach could be used with male and female students. The program is designed to be inclusive and address individual needs and interests of all students. These schools were encouraged to implement the LEAP program at their individual settings, and where possible, provide specific attention to female students by addressing the barriers to physical activity identified by girls (e.g. separating females from males in PE and having female-oriented activities) [30]. The intervention was found to be successful based on a significant increase in the percentage of girls in the intervention schools who met a vigorous physical activity standard [31]. LEAP also included extensive process evaluation methods that enabled researchers to examine differences in the study outcome based on level of implementation in individual schools.

The purpose of this paper is 2-fold: (i) to describe a comprehensive school-based intervention, designed to promote physical activity in high school girls through changes in the instructional program and school environment, and (ii) to document the implementation process conducted by LEAP staff and to describe how the intervention was carried at the school level. In this paper, we report staff activities (dose-delivered), reach (schools and school teachers and staff) and teacher- and

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staff-reported levels of LEAP intervention implementation, including barriers to implementing some aspects of the intervention.

Methods

Intervention design

The LEAP intervention sought to test the effectiveness of a school-based program that targeted changes in instructional programs and school environment. Twenty-four high schools in South Carolina were recruited into the study. To insure that the schools were comparable at baseline, they were pair-matched by size and other demographics, and were randomly assigned to intervention and control groups. Twelve schools received a comprehensive intervention to increase physical activity, while 12 control schools received no treatment. The intervention was implemented >2 years, and two different groups (or waves) of ninth grade girls were exposed to the PE component of LEAP and changes in the school environment.

The intervention used a social–ecological model drawn primarily from SCT [32, 33]. This theoretical approach is based on the proposition that social behavior, cognition and the environment are reciprocal, interactive determinants of health behaviors that include perceived self-efficacy, outcome expectations, evaluation of outcomes and behavioral and environmental factors. Accordingly, the LEAP intervention focused on changing personal, social and environmental factors hypothesized to increase physical activity. Central to the intervention was a program of physical activities set in a gender-sensitive PE program that included activities designed to be fun and age appropriate. LEAP also emphasized the enhancement of physical activity self-efficacy and the mastery of physical activity self-management skills in a school environment that promoted and supported physical activity for young women.

Table I shows that six of the eight components of the CSH program (PE, health education, school environment, school health services, faculty/staff health promotion and family/community involvement) were used as intervention channels and included a focus on changing the school's organizational infrastructure in order to sustain the intervention impact [34]. These six channels became the six key components of LEAP. The other two components of the CSH program, food service and school counseling and social services, were not addressed in this intervention.

Table I. *Six components of LEAP based on coordinated school health program*

Component	Primary goal
LEAP PE	Provide girls with the physical and behavioral skills needed to adopt a physically active lifestyle during their teenage years and to maintain that active lifestyle into adulthood.
Health education	Reinforce messages delivered in PE concerning the benefits of physical activity, provide training in behavioral skills that will enable students to initiate and maintain a physically active lifestyle.
Healthy school environment	To institute school-wide policies and practices that promote the physical activity within and outside of the school.
School health services	To increase the involvement of school health services in the creation of a school and community environment that supports and reinforces physical activity among students.
Faculty and staff health promotion	To create a supportive school environment that provides physically active adult role models.
Family and community involvement	To assist students in being physically active outside of school by enhancing parental support and by linking students to physical activity opportunities outside of school.

CSH has been used to address specific disease issues such as adolescent obesity, but prior to LEAP, no program has used CSH specifically to promote physical activity [35]. A similar approach was used in Canada to prevent obesity using seven aspects of the CSH program [13]. Although coordination and collaboration among the components

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of school health may occur at state and district levels among US schools, this rarely happens at the school level [36].

To communicate the essence of LEAP to the school personnel, LEAP project staff (in collaboration with the research investigators) developed a written communication titled 'essential elements of the LEAP intervention'. This document, which expanded the six components of LEAP into more specific guidelines, was used in written and verbal communication to the schools during training. In addition, the LEAP staff continued to reinforce LEAP characteristics through technical assistance and periodic site visits to the schools. These essential elements (Table II) were also used to develop the framework for monitoring the ongoing implementation of LEAP [37]. A description of the LEAP intervention components, along with its essential elements, follows.

Table II. *Essential elements of the LEAP intervention*

Instructional components
Gender separation opportunities exist in classes
Students are physically active in PE classes
Non-competitive activities are offered
Lifelong physical activity is emphasized
Classes are fun and enjoyable
Appropriate instructional methods are used (e.g. small group interaction)
Behavioral skills for physical activity are taught
Environmental components
Girls have opportunities to be active outside of PE class
Messages promoting physical activity are prominent in the school
Health services—school nurse participates in LEAP intervention
Faculty/staff health promotion provides adult modeling
Health education reinforces messages and skills taught in PE
Community agency involvement is included
Family involvement is included
Evidence of an active LEAP team
Administrative support for the intervention exists

Physical education

Because most high schools have some PE requirement, and the PE programs and specialists are the traditional leaders in promoting physical activity, PE played a primary role in this intervention. The PE requirement for high school students in South Carolina is one full course, or unit, which meets the equivalent of 50–60 min day^{-1}, 5 days week^{-1} for the entire year. Most students complete this requirement during their first, or freshman, year of high school. The PE component of the LEAP intervention was called LEAP PE and was implemented through this required course.

As shown in Table I, the overall goal of LEAP PE was to provide girls with the physical and behavioral skills needed to adopt a physically active lifestyle during their teenage years and to maintain that active lifestyle into and through adulthood. A principal tenet of LEAP was that PE programs often are not attuned to the specific needs of female high school students and, thus, do not provide a selection of physical activities or instructional strategies preferred by female students. Choosing activities and structuring learning experiences that appeal both to boys and girls are challenging, especially during early adolescence, when physical and emotional changes occur rapidly. Although we were not able to assess the PE curricula or instructional methods in these schools prior to the study's initiation, traditional PE programs which favor competitive sports are often unsuccessful when they attempt to integrate boys and girls into single PE activities, due in part to gender differences in behavioral and cognitive styles [38–41]. These differences may explain why traditional PE programs are often very unpopular and ineffective with girls [42].

Other school health components

As previously mentioned, five other components of the CSH model were included in the LEAP intervention (see Table I).

Health education. Health education is a requirement for all high school students in South Carolina, but specific schedules and formats for such instruction are determined by each school district. Because of variability in the ways the high schools fulfilled this requirement, the project staff worked with the LEAP team in each intervention school to develop

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physical activity behavioral skills modules that could be integrated into the school's health education instruction. Through teacher workshops, project staff presented information on behavioral concepts (e.g. self-assessment, goal setting, monitoring, barrier identification) that could be used to help students become more physically active. Also, LEAP staff developed 15 lessons of physical activity behavioral skills instruction for use at any of the intervention schools. These exemplars were provided to teachers in the LEAP resource manual.

School environment. The school environment component encouraged the LEAP teams to focus on instituting school-wide policies and practices that would encourage and support physical activity. Composition of the individual teams varied among the schools, depending upon the availability of interested teachers, administrators and other staff. The LEAP team formed in each school reviewed that school's existing policies and practices related to physical activity. In particular, LEAP teams looked closely at the use of school space and resources during school and non-school hours and identified ways to increase opportunities for students, faculty and staff to be more active. LEAP teams identified ways to communicate and promote physical activity within the school using bulletin boards, school newspapers and public address announcements. The LEAP teams also enlisted administrative support for the intervention.

School health services. The school health services component involved working with school nurses to create a total school environment that promoted physical activity, consistent with their role as providers of health promotion and preventive health services. The school nurses incorporated physical activity information, assessment and referral into their usual school health services. They also contributed to the 'activity friendly' environment in the school by displaying posters, 'fit facts' flyers and health and fitness magazines. In many schools, the school nurses served as guest speakers for health and PE classes and provided services, such as blood pressure screening for faculty/staff health promotion programs.

Faculty/staff health promotion. The goal of this component was to increase physical activity among school administrators, faculty and staff and to encourage them to serve as active role models for girls. Activities included assessment of faculty and staff members' physical activity interests and needs, provision of information and resources to allow them to be more active and implementation of a variety of program opportunities to be physically active, such as after-school aerobics and active teacher of the month (ATOM) awards.

Family/community linkages. This component linked girls to community physical activity programs and resources. Key to this intervention channel was the 'communities-in-motion' program, a classroom-based learning experience designed to educate students about the physical activity opportunities available in their communities. In addition to the communities-in-motion project, students were given assignments in PE, health education and family/consumer science classes that required parental involvement in completing surveys or participating in family physical activities.

Intervention implementation

Consistent with its emphasis on the organizational environment, LEAP was implemented by teachers and school staff through a combination of top–down (administrator-supported) and bottom–up (teacher-initiated) efforts. A unique aspect of the intervention design was the role played by the LEAP project staff which consisted of two health and PE professionals hired by the research team to lead the development and implementation of the intervention and to support other LEAP team members during the entire 2-year intervention period. LEAP project staff used participatory strategies in working with teachers and staff in the schools; their role was to provide information and facilitate change that would achieve the LEAP essential elements. Early in the implementation process, a 'LEAP champion' was identified in each school. The LEAP champion was either the person assigned to be the primary contact for the school or the person who evolved as the strongest supporter

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of the intervention effort. The LEAP champion, in coordination with the LEAP project staff, worked to involve school administrators, teachers and staff in the LEAP team.

Schools were expected to implement all instructional elements and three environmental elements (school administrator support, school physical activity team and media messages promoting physical activity). Schools received training and strong encouragement to implement the remaining environmental elements (school nurse counseling, adult modeling through faculty/staff health promotion, health education reinforcement of messages, family involvement and community involvement); however, some of the schools did not have adequate personnel (e.g. school nurse, health education teacher, wellness coordinator) located at the individual school level or had staff who were overburdened and unable to be involved.

Staff training consisted of formal workshops and one-on-one technical assistance for school personnel. Training was provided through in-service days before and during the school year. Training topics included a general focus on the LEAP essential elements and special topics requested by schools. Substitute pay for school personnel to attend core training was provided by LEAP. Booster trainings were held in the summer prior to the second intervention year, along with additional topical workshops as needed. LEAP staff designed a checklist based on the essential elements (called 'How Do I Know It's LEAP?') to help schools stay focused on intervention activities. These documents were shared with teachers and school staff through training and consultation. A sample checklist of items, with response options provided to school personnel, is provided in the Appendix. LEAP staff maintained a wide range of resources, including physical activity videotapes, books and equipment (hand weights, exercise bands, pedometers) for the intervention schools.

For the two instructional components (PE and health education), LEAP staff used a facilitative approach to help teachers use LEAP concepts and elements to redesign and modify their current instructional practices. This approach was used rather than offering them a curriculum designed by research staff. Exemplary PE and health education units and lesson plans were developed to help teachers understand the essential elements. LEAP staff focused on helping teachers understand and adopt the philosophy of the intervention while developing their own curricular components, and thus establishing 'ownership' of the intervention concepts implemented in their schools.

For the non-instructional components (school environment, school health services, faculty/staff health promotion and family/community linkages), LEAP staff worked with the LEAP champion and the LEAP team in each school to identify opportunities to enhance the environment or change school policy in support of physical activity. Training was provided for developing and implementing strategic plans to promote physical activity in the school. LEAP staff provided ongoing consultation and support to LEAP schools through regular visits, phone calls, e-mail and a listserv.

Process evaluation methods

Extensive outcome and process evaluation methods were used in the LEAP intervention. The intervention was successful in increasing vigorous physical activity (as measured by the 3-day physical activity recall instrument; vigorous $\geqslant$6 metabolic equivalents) for girls in the intervention compared with control school [31]. The complete methodology and results of the process evaluation (fidelity and completeness) are reported elsewhere [37]. Data reported here were obtained from LEAP records and teacher surveys.

Dose delivered and reach

All LEAP staff activities were documented during the course of the intervention. Records documenting staff activities included orientation and training (e.g. announcements, attendance and reimbursement records), communication (e.g. correspondence, information provided to schools and congratulation letters) and field notes (e.g. visitation logs of visits and contacts, PE observation, summaries of notes from observations, visits and phone contacts). Frequencies of the primary activities were tallied,

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and LEAP staff also documented school activities and progress, creating reports that provided a qualitative view of school implementation of the LEAP essential elements.

Teacher and staff reaction to LEAP

As part of the implementation evaluation, the LEAP champion and other key teachers (n = 23) representing the 12 schools completed a survey at the end of the intervention in which they were asked to categorize their school's success in implementing the intervention components and to identify implementation barriers that they encountered. These teachers were also asked how well they thought the intervention components would be sustained in their school during the year following the end of the intervention.

Results

Dose delivered and reach

The two full-time LEAP project staff members provided 16 central workshops and 32 local training workshops and demonstrations. They also created or provided numerous resources to intervention schools, including instructional materials, LEAP programs, LEAP tools, a newsletter and media tools. The dose delivered and the reach of the training to school, including central and school-specific workshops, are provided in Table III. Consistent with the facilitation approach to implementation, LEAP staff documented 191 visits and interactions with 850 individuals in the 12 schools, and made >202 PE observations during the 2-year intervention. Evidence of the full implementation of the intervention by LEAP staff is reported in Tables III and IV. At the school level, reach could be considered to be all the girls in the school since LEAP was implemented school-wide; the outcome measurement was conducted at the school level. Individual schools varied in the degree to which they implemented the 16 essential elements (or dose delivered). Instructional components, PE and health education, were the primary focus of the LEAP intervention. However, much effort was directed toward changing the school environment as well. A brief summary of the implementation of the essential elements is provided below.

School implementation of instructional essential elements

Overall, 75% of the instructional elements were implemented across the 12 schools, mostly through changes to the PE program. All schools (100%) implemented a lifelong approach to physical activity; 83% made changes that insured that classes were fun and enjoyable and a similar number had more active PE classes and displayed prominently messages about physical activity in areas around the school.

In response to this facilitative approach to intervention implementation, the schools employed a number of strategies to fulfill the essential elements of LEAP. For example, schools incorporated many new activities into PE, including aerobics, aerobic dance, self-defense, kickboxing, walking and pedometer use, weight training and use of the sport education model. These curricular changes favored lifelong physical activity and were less competitive in nature. Additionally, nearly all schools used small groups to enhance involvement and activity and incorporated music into PE.

In the implementation of the LEAP intervention, schools were required to provide gender-separate PE; however, a number of different strategies for implementation of this component were provided. Seventy-five percent of the schools made changes in their PE organization that resulted in girl-only classes by restricting class enrollment or providing activity choices that resulted in mainly girls in these classes.

The health education component was implemented differently based on the school's method of fulfilling their health education requirement Some schools incorporated the behavioral modules into separate health education courses, while others used them in PE classes, biology classes or family and consumer science courses. Staff records also document that all schools made some effort to incorporate some behavioral skills elements in classes, with most schools emphasizing goal setting

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Table III. *LEAP training activities offered and schools attending training (mean and percentage)*

Activity	Description	Participation (school representation)	
		n	%
Central workshops (Year 1)	LEAP orientation kickoff (1 day)	12	100
	LEAP core training (4 days)	12	100
	LEAP PE: sport education model (1 day)	8	67
	LEAP team criteria and strategic planning (1 day)	12	100
	Behavioral skills and healthy school awards (1 day)	7	58
	Review of Year 1/preview of Year 2 (1 day)	12	100
	School administrators' meeting (1/2 days)	11	92
	LEAP PE resistance training in PE (1 day)	10	83
	LEAP PE aerobics instruction (1 day)	12	100
	LEAP PE United States Tennis Association tennis clinic (1 day)	8	67
Overall	School attendance	10.4	86.7
Central workshops (Year 2)	'Where we are' workshop (1 day)	8	67
	LEAPing beyond PE (1 day)	7	58
	LEAP PA self-defense (1 day)	11	92
	LEAP PE kickboxing (1 day)	7	58
	LEAPing into the community (1 day)	6	50
	Reflections over Years 1 and 2 (1 day)	12	100
Overall	School attendance	8.5	70.8
School in-service training and demonstrations	Behavioral skills training	2	17
	PE in-service	4	33
	Demonstration: aerobics	8	67
	Demonstration: communities-in-motion	2	17
	Demonstration: use of pedometers	6	50
	Demonstration: resistance training	7	58
	Demonstration: self-defense	6	50
	Demonstration: tennis	1	8
Overall	School participation	4.5	37.5

and self-monitoring. Only 50% of schools, however, employed this element consistently. Many of these schools did not have a separate health education program, but used the PE period to address required health education material. School-by-school implementation of the instructional and environmental components of LEAP (dose delivered at school) is presented in Fig. 1.

School implementation of environmental essential elements

Because each school largely determined its own direction in changing the environment, products of the intervention varied somewhat from school to school. Some schools focused on creating or enhancing their faculty/staff health promotion programs in order to model physical activity behavior for girls. Others focused on the school environment and facilities, with an emphasis on creating before- and after-school opportunities for girls to be active. In schools that had access to school nurses, nurses were activated to provide special appearances in PE class to talk about physical activity and health, and many available nurses conducted health fairs for students and faculty.

Staff records documented that schools actively linked girls to physical activity opportunities outside of PE and the school, and used other mechanisms (such as forming LEAP teams) to create a more supportive school environment for physical

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Table IV. *Examples of training materials*

Type	Specific materials	Target received
Training support materials	LEAP notebook components:	
	(i) LEAP essential elements (ii) LEAP PE (iii) Behavioral skills (iv) LEAP team and strategic planning (v) Resources	• 27 PE specialists • 12 team members • 12 administrators
	LEAP behavioral skills notebook	• 16 health and related-area teachers
LEAP Programs	• Communities-in-motion: to create awareness of and involvement in community physical activity • ATOM: to recognize active teachers and staff and promote physically active adult role models • Developing a departmental walking/physical activity challenge	• 12 schools
Instructional handouts and materials	• 'LEAP across SC-A cooperative cardiovascular fitness challenge'	• PE specialists
	• 'Female role models—women who inspire us'	
	• 'How parent-school organizations can support LEAP'	• Parent organizations
	• 'How parents can encourage girls to be physically active'	
	• 'Promoting physical activity in the media center: women and physical activity media observances'	• Media specialists • Family/consumer • General teachers
	• 'Promoting PA outside of the gym'	• Wellness coordinators
	• 'PA prescription pads'	• School nurses
	• 'PA and blood pressure screening'	
	• 'How to organize a successful employee health promotion program'	• Wellness coordinators
	• 'Fitness calendars for logging PA'	
LEAP tools	• How do I know its LEAP? • LEAP strategic plan • LEAP linkages	LEAP champion, LEAP team
LEAP linkages and media tools	• LEAP lookout newsletters (9) provided to all teachers in the 12 schools • Set of 'stall talkers' • School librarian resource kit	LEAP champion, LEAP team

activity. In PE, linkage activities included announcing school and community opportunities, going on field trips and inviting guest instructors into PE. Six schools (50%) implemented 'communities-in-motion' to create girls' awareness of and involvement in community activities. Many schools also collaborated with community agencies to promote and provide physical activity for girls; some schools participated in community physical activity events and allowed community members to use school

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facilities when those facilities were not being used for school activities.

Schools also sent information home to families, but family involvement was one of the least implemented components (only in three schools). Communication strategies used by individual schools varied but mainly occurred through newsletters or flyers sent home with students or through e-mail. This modest parent participation may be explained by the absence of evidence-based strategies for working with parents of high school youth.

Staff records also indicated that 100% of the schools used some kind of media messages to promote physical activity in the school setting. This included installing bulletin boards in the PE area or in school halls, providing information on physical activity in school announcements and school newsletters and featuring female role models. Eight schools (67%) implemented the ATOM program, and half of the schools reported some health promotion programming activity for faculty and staff. A few schools created even greater changes, including adding sections of elective PE courses, creating dance teams for girls and making improvements in the girls' locker rooms. Overall, ~40% of the environmental components from the essential elements were implemented at the school level (see Fig. 1).

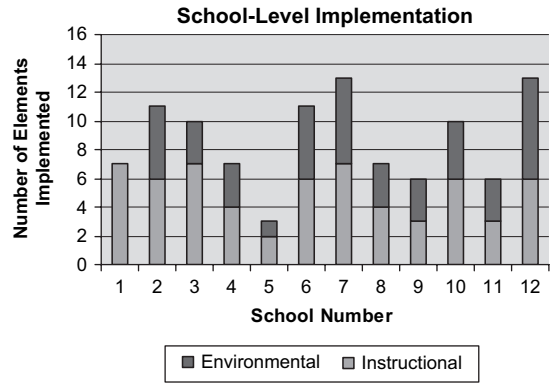

Fig. 1. School-level LEAP implementation.

Teacher perceptions of LEAP

Teacher responses on the survey at the end of the second year were consistent with staff documentation regarding implementation. As shown in Table V, teachers believed that their schools had effectively implemented the PE and health education components, with 96 and 87% of respondents, respectively, rating these components as highly or moderately effective. Similarly, a majority of teachers (78%) believed that the development of a LEAP team in their school had been effective. The teachers also reported success in moving the school environment toward reaching the LEAP goals. Teachers reported lower implementation for the LEAP components school health services, family and community involvement and faculty/staff health promotion; however, these components were recommended but not required in LEAP. The teacher-identified barriers to implementation pertained largely to these areas and included lack of personnel (e.g. school nurses), lack of time for teachers and staff to participate in wellness activities (even if offered) and lack of time to do the communication and coordination needed for community and family involvement. They also indicated that scheduling and time challenges made it difficult for the LEAP team to work together. As shown in Table VI, teachers appeared optimistic that elements of the LEAP intervention would be sustained in the year after the formal end of the intervention. They felt that PE, health education, the LEAP team and the school environment would be maintained at a high level or improved in the next school year, following the end of the formal intervention.

Discussion

The LEAP was developed to increase the physical activity of high school girls using an intervention model that facilitated, rather than directed, changes in the participating schools. The LEAP intervention was guided by six components of the CSH program model. Unique aspects of the intervention included using essential elements (rather than pre-developed curricula) from which individual schools developed their own version of LEAP, using teams to implement the intervention and employing initial teacher training plus ongoing technical assistance

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Table V. *Teachers' perceptions of their school's success in meeting LEAP objectives*

Component	Number of respondents (%)			
	Highly effective or very successful	Moderately or fairly effective	Slightly effective or ineffective	No response
PE	13 (56.5)	9 (39.1)	0	1 (4.3)
Health education	7 (30.4)	13 (56.5)	3 (13.0)	0
School health services	0	13 (56.5)	9 (39.1)	1 (4.3)
Family/community	3 (13.0)	11 (47.8)	8 (34.8)	1 (4.3)
School environment	3 (13.0)	15 (65.2)	4 (17.4)	1 (4.3)
Faculty/staff health promotion	4 (17.4)	8 (34.8)	10 (43.5)	1 (4.3)
LEAP team	7 (30.4)	11 (47.8)	4 (17.4)	1 (4.3)

n = 23 total teachers responding from the 12 schools.

Table VI. *Teachers' perceptions of the likelihood that LEAP components will be maintained in the upcoming school year*

Component	Number of respondents (%)				
	Solid or fairly solid; will sustain or extend	Making headway or intend to continue	Weak now; will be stronger next year	Weak; is not going to happen	No response
PE	17 (73.9)	1 (4.3)	0	2 (8.7)	3 (13.0)
Health education	12 (52.2)	5 (21.7)	2 (8.7)	1 (4.3)	3 (13.0)
School health services	7 (30.4)	4 (17.4)	5 (21.7)	3 (13.0)	4 (17.4)
Family/community	5 (21.7)	8 (34.8)	5 (21.7)	2 (8.7)	3 (13.0)
School environment	7 (30.4)	10 (43.5)	2 (8.7)	1 (4.3)	3 (13.0)
Faculty/staff health promotion	8 (34.8)	6 (26.1)	4 (17.4)	3 (13.0)	2 (8.7)
LEAP team	11 (47.8)	5 (21.7)	1 (4.3)	2 (8.7)	4 (17.4)

n = 23 total teachers from the 12 schools.

from LEAP project staff over the life of the intervention.

LEAP staff used these participatory strategies to develop relationships with the schools and worked as partners over time. They were responsive and flexible in their approach to school personnel, and they were required to maintain extensive documentation of their activities and of developments in the schools. The essential elements framework proved to be an effective structure to guide staff activities and to set up a structure to document those activities.

Through a very intensive training program, teachers and administrators learned the LEAP concept as described by the essential elements and implemented their version of the LEAP program at their schools. Although the elements were not implemented equally in the 12 schools, a significant number of girls in the intervention schools met the vigorous physical activity standard compared with the control schools [31]. These results, including a comparison of the low implementers to the high implementers, are analyzed in a separate publication [37].

Few physical activity interventions have targeted high school girls, and none has used this innovative approach which includes many elements of the CSH and teacher-centered intervention development. Educational experts stress the importance of training teachers properly to avoid program implementation failure [43]. For example, evidence from the smoking literature underscores the role of teacher engagement and motivation in subsequent implementation efforts. In the LEAP implementation, interest and commitment of the intervention schools were sustained over the 2-year implementation

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period. Similar participatory approaches have been effective in changing nutrition policy and environment at the worksites [44].

Some aspects of the LEAP approach, such as using small group and cooperative teaching methods in PE, were implemented through teacher training, with a focus on the individual teacher. Other approaches, such as the emphasis on gender separation, were broader issues that required discussions at the policy level, beyond the purview of the individual teacher. Such discussions demonstrate that creating an environment that broadly supports physical activity for girls requires system-level approaches. LEAP focused on system-level change in the school by working with teachers, staff and administrators, both individually and in teams.

The LEAP intervention focused on providing fun, gender-specific activities for girls that encouraged active participation in and outside of school. Allowing PE teachers to start with a concept model and from that develop units, lessons and classroom activities that supported and extended those concepts, seemed to leverage teachers' desire to create solid teaching environments with support and resources from project staff. The development of mutual respect and trust and clear expectations by project staff created a partnership which resulted in a cohesive, integrative approach to promoting physical activity at school. LEAP demonstrated that such integration is possible with support and guidance from an outside source when the two work as partners. Internationally, the health promoting schools concept has shown much promise, although evaluation designs have not been fully established [20, 22]. Barriers to implementation related to lack of staff (e.g. school nurses) and general lack of time for team meetings or participation in staff wellness activities. Schools or school districts interested in curriculum development, especially where new approaches are required should provide sufficient time for such activities to occur.

Advantages of a facilitative approach included increased acceptance from teachers and staff, increased ownership of the changes made in these areas, greater implementation of the changes proposed by the LEAP champion and LEAP team and increased likelihood that the changes would be sustained beyond the intervention period. Disadvantages of this approach included the loss of valuable time waiting for schools to coalesce into functioning teams and accepting the schools' decisions about how they wanted to proceed. Other challenges included teacher readiness to change, difficulties (for the PE teachers) to understand and implement behavioral skills concepts and challenges of reaching/motivating parents of high school girls. These issues are not unique to the facilitative intervention approach, however, and would not be solved by the use of pre-designed curriculum materials.

As documented in this paper, the LEAP intervention was successfully implemented to the teachers by LEAP staff and by the teachers to the students at the individual schools. Since very few studies report assessment of implementation, it is difficult to compare how well the facilitative approach compares to more directed (i.e. pre-designed curricula) interventions [45]. Also, only the instructional components of LEAP could be compared with other studies since virtually no one has reported on organizational and environmental change in schools. Even when implementation efforts are reported, no consistent definitions or consistent methods are employed [45], and fidelity for curriculum implementation is lower than expected (e.g. 60–75%). The LEAP intervention appears to compare favorably with this level of implementation. Although the LEAP approach was more difficult to 'sell' initially, after an initial period, the teachers made LEAP their own and implementation was high. The implementation barriers that teachers reported were primarily in the environmental component of LEAP and related to resource issues in the school (e.g. lack of time and personnel, scheduling challenges for team meetings). Future research should focus on strategies, including school and district policies, to overcome barriers to and enhance school environments for increased physical activity for adolescents.

Efforts are currently underway to provide access to the intervention materials and implementation methods used in LEAP. Although a cost-benefit analysis for the intervention was beyond the scope

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of this paper, the primary costs of LEAP were the two LEAP staff members who were employed >2 years to provide training and support for the 12 schools and the teachers engaged in the LEAP initiative. The success of LEAP was due, in part, to the facilitative approach to its implementation. This method provided capacity building and encouraged adaptation to address unique characteristics of individual schools. When planning school-based interventions, researchers should consider using a facilitated approach to intervention implementation, and when physical activity of high school girls is of interest, program planners should consider adoption of the LEAP intervention.

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Conflict of interest statement

None declared.

References

1. Centers for Disease Control and Prevention. *2000 Behavioral Risk Factor Surveillance System Summary Prevalence Report*. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, 2001, 110.
2. Brownson RC, Jones DA, Pratt M *et al*. Measuring physical activity with the behavioral risk factor surveillance system. *Med Sci Sports Exerc* 2000; **32**: 1913–8.
3. U.S. Department of Health and Human Services. *Physical Activity and Health: A Report of the Surgeon General*. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, 1996.
4. Grunbaum JA, Kann L, Kinchen S *et al*. Youth risk behavior surveillance—United States, 2003. *MMWR Surveill Summ* 2004; **53**: 1–96.
5. Janssen I, Katzmarzyk PT, Boyce WF *et al*. Overweight and obesity in Canadian adolescents and their associations with dietary habits and physical activity patterns. *J Adolesc Health* 2004; **35**: 360–7.
6. Veugelers PJ, Fitzgerald AL. Prevalence of and risk factors for childhood overweight and obesity. *Can Med Assoc J* 2005; **173**: 607–13.
7. Carnethon MR, Gulati M, Greenland P. Prevalence and cardiovascular disease correlates of low cardiorespiratory fitness in adolescents and adults. *J Am Med Assoc* 2005; **294**: 2981–8.
8. Bauman A, Craig CL. The place of physical activity in the WHO global strategy on diet and physical activity. *Int J Behav Nutr Phys Act* 2005; **2**: 10.
9. Kann L. The Youth Risk Behavior Surveillance System: measuring health-risk behaviors. *Am J Health Behav* 2001; **25**: 272–7.
10. Gordon-Larsen P, Nelson MC, Popkin BM. Longitudinal physical activity and sedentary behavior trends: adolescence to adulthood. *Am J Prev Med* 2004; **27**: 277–83.
11. Story M. School-based approaches for preventing and treating obesity. *Int J Obes Relat Metab Disord* 1999; **23**(Suppl. 2): S43–51.
12. Koplan JP, Liverman CT, Kraak VA (eds). *Preventing Childhood Obesity: Health in the Balance*. Washington, DC: Institute of Medicine of the National Academies, 2005, 1–461.
13. Veugelers PJ, Fitzgerald AL. Effectiveness of school programs in preventing childhood obesity: a multilevel comparison. *Am J Public Health* 2005; **95**: 432–5.
14. Centers for Disease Control and Prevention. Guidelines for school and community programs to promote lifelong physical activity among young people. *Morb Mortal Wkly Rep* 1997; **46**: 1–36.
15. Allensworth DD, Kolbe LJ. The comprehensive school health program: exploring an expanded concept. *J Sch Health* 1987; **57**: 409–12.
16. Kolbe L. Indicators for planning and monitoring school health programs. In: *Symposium on Indicators of Health Promotion Behaviors*. Los Angeles, CA: UCLA Press, 1986.
17. Davis TM, Allensworth DD. Program management: a necessary component for the comprehensive school health program. *J Sch Health* 1994; **64**: 400–4.
18. Deschesnes M, Martin C, Hill AJ. Comprehensive approaches to school health promotion: how to achieve broader implementation? *Health Promot Int* 2003; **18**: 387–96.
19. Parcel GS, Simons-Morton BG, Kolbe LJ. Health promotion: integrating organizational change and student learning strategies. *Health Educ Q* 1988; **15**: 436–50.
20. Mukoma W, Flisher AJ. Evaluations of health promoting schools: a review of nine studies. *Health Promot Int* 2004; **19**: 357–68.
21. St Leger L. What's the place of schools in promoting health? Are we too optimistic? *Health Promot Int* 2004; **19**: 405–8.
22. Lee A, Cheng FF, St Leger L. Evaluating health-promoting schools in Hong Kong: development of a framework. *Health Promot Int* 2005; **20**: 177–86.
23. MacDonald MA, Green LW. Reconciling concept and context: the dilemma of implementation in school-based health promotion. *Health Educ Behav* 2001; **28**: 749–68.

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24. Bond L, Glover S, Godfrey C *et al*. Building capacity for system-level change in schools: lessons from the Gatehouse Project. *Health Educ Behav* 2001; **28**: 368–83.
25. Centers for Disease Control and Prevention. Surgeon General's report on physical activity and health. From the Centers for Disease Control and Prevention. *J Am Med Assoc* 1996; **276**: 522.
26. Trost SG, Ward DS. Factors related to girls participation in physical activity. In: Randell L, Petlichokoff L (eds). *Ensuring the Health of Active Girls and Women*. Reston, VA: AAHPERD, 2005, 3–28.
27. National Federation of State High School Associations. *2004–05 NFHS High School Athletics Participation Survey*. Available at: http://www.nfhs.org/core/contentmanager/uploads/2005_06NFHSparticipationsurvey.pdf. Accessed September, 2006.
28. Koca C, Demirhan G. An examination of high school students' attitudes toward physical education with regard to sex and sport participation. *Percept Mot Skills* 2004; **98**(3 Pt): 754–8.
29. van Daalen C. Girls' experiences in physical education: competition, evaluation, & degradation. *J Sch Nurs* 2005; **21**: 115–21.
30. O'Dea JA. Why do kids eat healthful food? Perceived benefits of and barriers to healthful eating and physical activity among children and adolescents. *J Am Diet Assoc* 2003; **103**: 497–501.
31. Pate RR, Ward DS, Saunders RP *et al*. Promotion of physical activity among high-school girls: a randomized controlled trial. *Am J Public Health* 2005; **95**: 1582–7.
32. Stokols D. Translating social ecological theory into guidelines for community health promotion. *Am J Health Promot* 1996; **10**: 282–98.
33. Bandura A. *Social Foundations of Thought and Action. A Social Cognitive Theory*. Englewood Cliffs, NJ: Prentice-Hall, 1986, 617.
34. Committee on Comprehensive School Health Programs in Grades K-12, Division of Health Sciences Policy, Institute of Medicine. Building the infrastructure for comprehensive school health programs. In: Allensworth D *et al*. (eds). *Schools and Health: Our Nation's Investment*. Washington, DC: National Academy Press, 1997, 237–70.
35. Illuzzi S, Cinelli B. A coordinated school health program approach to adolescent obesity. *J Sch Nurs* 2000; **16**: 12–9.
36. Kolbe LJ, Kann L, Collins JL *et al*. The School Health Policies and Programs Study (SHPPS): context, methods, general findings, and future efforts. *J Sch Health* 1995; **65**: 339–43.
37. Saunders R, Ward DS, Felton GM *et al*. Examining the link between program implementation and behavior outcomes in the Lifestyle Education for Activity Program (LEAP). *Program Eval Plann* 2006, in press.
38. Faucette N *et al*. Comparison of fourth grade students' out-of-school physical activity levels and choices by gender: project SPARK. *J Health Educ* 1995; **26**: S82–90.
39. Garcia C. Gender differences in young children's interactions when learning fundamental motor skills. *Res Q Exerc Sport* 1994; **65**: 213–25.
40. Branta C, Painer M, Kiger J. Gender differences in play patterns and sport participation in North American youth. In: Gould D, Weiss M (eds). *Advances in Pediatricr Sport Sciences*. Champaign, IL: Human Kinetics, 1987, 25–42.
41. Garcia AW, Broda MA, Frenn M *et al*. Gender and developmental differences in exercise beliefs among youth and prediction of their exercise behavior *J Sch Health* 1995; **65**: 213–9. [erratum appears in *J Sch Health* 1995; **65**: 311].
42. Sallis JF, Zakarian JM, Hovell MF *et al*. Ethnic, socioeconomic, and sex differences in physical activity among adolescents. *J Clin Epidemiol* 1996; **49**: 125–34.
43. Kealey KA, Peterson AV Jr, Gaul MA *et al*. Teacher training as a behavior change process: principles and results from a longitudinal study. *Health Educ Behav* 2000; **27**: 64–81.
44. Biener L, Glanz K, McLerran D *et al*. Impact of the Working Well Trial on the worksite smoking and nutrition environment. *Health Educ Behav* 1999; **26**: 478–94.
45. Dusenbury L, Brannigan R, Falco M *et al*. A review of research on fidelity of implementation: implications for drug abuse prevention in school settings. *Health Educ Res* 2003; **18**: 237–56.

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Appendix

The checklist illustrated below was provided to the school staffs and they were to answer 'yes', 'partial' or 'no' to each question.

Is physical education gender separate and provide a safe and supportive environment for girls?

- Does the program provide girls with fun, enjoyable, and successful experiences?
- Overall, are students physically active for at least 50% of class time?
- Does health education teach decision-making skills to enhance physical activity participation?
- Does health education teach students how to identify and overcome barriers to physical activity?

Appendix

Does health education emphasize the personal relevance and application of physical activity behavioral skills outside of class?
Does your school have a team that regularly plans, implements, and evaluates student and faculty physical activity programs?

- Does your school promote physical activity through school media?
- Does the school nurse counsel students about physical activity?
- Does the school have an active wellness program?

Are families provided information about physical activity?

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