Promoting Physical Activity in Youth: Focus on Middle School Environments

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The sharp decline in physical activity during adolescence is a national concern. However, few studies of adherence to exercise and physical activity have been conducted with youths. This paper focuses on ecological approaches for promoting physical activity in middle schools. Baseline data collected in physical education classes, leisure time settings, and structured extracurricular programs during the four-year Middle School Physical Activity and Nutrition (M-SPAN) project are reviewed. Refocusing physical education goals, promoting gender equity in physical activity opportunities, and linking schools with community agencies are recommended as means for promoting physical activity among adolescents.

The theme of the Year 2000 American Academy of Kinesiology and Physical Education (AAKPE) annual meeting was adherence to exercise programs and physical activity. Very few investigations of adherence to exercise or physical activity have been conducted with children and adolescents (Marcus et al., 2000). This is not unexpected because standard criteria for adherence to exercise and physical activity do not exist, even for adults. Youths, the most active members of the population, rarely “exercise”—at least according to adult standards. Childhood and adolescence are characterized by rapid changes in growth, interests, and maturity, as well as in opportunities for physical activity. Youth physical activity, therefore, is variable and sporadic and rarely matches dosages typically prescribed for adult exercise (e.g., 3 bouts of 20 continuous minutes per week at 75% of maximum effort). Because “adherence” implies conforming a prescribed dosage or medical treatment, with youths, more attention should be devoted to examining phenomenon related to the maintenance and generalization of physical activity rather than to its adherence.

There is need for much concern about promoting physical activity in children and adolescents. Numerous descriptive and correlational studies of youth
physical activity have been completed, and almost all show a decline in physical activity levels as children age (Sallis, Prochaska, & Taylor, 2000). The decline is so great that Rowland (1999) referred to adolescence as a risk factor for physical activity, and Sallis (1993) has estimated that during adolescence, girls reduce their physical activity levels by 7.4% per year while boys reduced theirs by 2.7%.

Standards for physical activity for children and adolescents have just been established during the past decade. Generally, they recommend youths have at least 30-60 minutes of physical activity daily (Corbin & Pangrazi, 1998; Health Education Authority, 1998; Sallis & Patrick, 1994). Pate, Long, and Heath (1994) reported that vast majority of adolescents were physically active at moderate levels for 30 minutes per day, but only about 50% of adolescent boys and 25% of adolescent girls met standards for more vigorous exercise.

Models for motivating youths to be physically active have been proposed (e.g., Sallis et al., 2000; Weiss, 2000), and these frequently include the contributions of physical activity enjoyment, perceived competence, and social support by parents, peers, teachers, and coaches. Dishman (2001), in the AAKPE Conference keynote address, emphasized the importance of using new theories to study physical activity. The current paper is grounded in ecological theory, an approach rarely used to study physical activity promotion (Sallis, Bauman, & Pratt, 1998). Ecological approaches to modifying youth physical activity are viable methods because large numbers of children frequently congregate within particular settings (e.g., schools) and they can be affected at one time. In examining physical activity using an ecological approach, it is necessary to identify when and where physical activity occurs and to understand the conditions that facilitate or hinder it. If interventions are involved, an additional step would be to modify social and physical resources in order to reach target behaviors. The environments where children and adolescents accrue their physical activity include (a) transport, (b) work and play at home, (c) structured and unstructured activities at recreation centers, (d) youth sports, and (e) schools.

This paper focuses on middle schools, an under-studied setting for physical activity (Stone, McKenzie, Welk, & Booth, 1998). Adolescents on middle school campuses can be physically active during physical education (PE), intramurals, interscholastics, club activities, and free play settings. Of the 88,000 K-12 public schools in the United States, nearly 14,000 are middle or junior high schools (U.S. Department of Education, 1996). True middle schools contain grades six to eight, and the students attending them are typically from 11 to 14 years of age.

**Middle School Physical Education Classes**

PE is an important setting where middle school students can accrue physical activity and learn strategies and generalizable movement skills. In providing health objectives for the nation, Healthy People 2010 (USDHHS, 2000a) supports the offering of PE on a daily basis (Objective 22-9) and making PE classes sufficiently active (i.e., 50% of class time; Objective 22-10). Additionally, the recently published School Health Index (USDHHS, 2000b) recommended that all middle school students receive 225 minutes of structured PE per week. National data, however, do not exist to indicate how many middle school students meet PE participation goals.
Opportunities for middle schoolers to receive PE is extremely important because participation in high school PE is declining, both in terms of overall enrollment and in the number of classes students receive per week. A national survey reported only 49% of high school students were enrolled in PE at all, and only 27% had PE daily (USDHHS, 1996; USDHHS, 2000a). Additionally, because PE in elementary schools is frequently taught by classroom teachers, middle school may be the first time many students receive PE from credentialed specialists.

Only a few studies of middle school PE have investigated the amounts of physical activity that children accrue there (McKenzie, Marshall et al., 2000a). Two direct observation studies have been reported. One study, conducted in 13 middle schools in Texas, found students to engage in moderate-to-vigorous physical activity (MVPA) about 20% of lesson time (Simons-Morton, Taylor, Snider, Huang, & Fulton, 1994). The other study, using the ALT-PE observation system, found students to engage in motor tasks at an appropriate level of difficulty only 14% of lesson time (LaMaster & Lacy, 1993).

A more recent study using self-report methodology showed that participation in PE became increasingly important to activity accrual as children moved from elementary through middle school (McKenzie, Strikmiller, et al., 2000). In that study a large (N = 3168), geographically (CA, 24%; LA, 26%; MN, 27%; TX, 23%), and ethnically diverse (White, 73%; Hispanic, 14%; Black, 12%) cohort from CATCH (Child and Adolescent Trial for Cardiovascular Health) was measured each spring from fifth through eighth grades. The children reported the amount of time they spent in various physical activities (including sports, games, exercise, and chores) before, during, and after school. Their activities were grouped into intensity categories by MET values: Light (< 4.5 METS), moderate (4.5 to 6.0 METS), and vigorous (> 6.0 METS). The children had PE on 58% of the reported days, and on those days they accrued significantly more total (22%), light (7%), moderate (22%), vigorous (33%), and during school (122%) physical activity minutes than on the days they had no PE.

PE contributed 50% of the physical activity fifth graders accrued during school hours. As the cohort moved through sixth, seventh, and eighth grades, the percentage of during school physical activity contributed by PE classes increased to 67%, 76%, and 86%, respectively. Additionally, there were no significant differences between PE and non-PE days on physical activity that occurred before or after school. By eighth grade, many boys (27%) and girls (40%) had no out-of-school vigorous activities at all. On days without PE, students reported almost no moderate or vigorous activities during school hours. Although about 78% of the children's total physical activity occurred outside of PE, the study showed the important contributions PE made in providing vigorous physical activity, particularly for girls. The data also contradicted the notion that children compensate for lack of PE by modifying their activity levels before and after school. The results of the study supported the Healthy People 2010 recommendations for daily physical education and for classes that engage students in physical activity at least 50% of lesson time (USDHHS, 2000a). By having daily PE, middle school children would receive at least a minimum amount of physical activity as well as some instruction on movement skills and behavioral strategies that might be continued into adulthood.
Middle-School Physical Activity and Nutrition Project (M-SPAN)

The investigation of physical activity in middle schools began more thoroughly in the on-going, NHLBI-supported project, M-SPAN (Middle-School Physical Activity and Nutrition). M-SPAN extends earlier intervention work with the CATCH (McKenzie et al., 1996; Nader et al., 1999) and SPARK projects (McKenzie et al., 1997; Sallis et al., 1997), which were conducted in elementary school settings. Compared to elementary schools, middle schools provide some different opportunities for physical activity—they have more physical activity facilities, offer more intramural and interscholastic programs, and employ more PE specialists who conduct longer PE classes than the teachers in elementary schools do. There are, however, fewer free play and unstructured physical activity opportunities at middle schools, mainly because recess periods are not provided. The overall goal of M-SPAN was to investigate whether environmental changes can lead to improved physical activity and dietary habits of students during the school day. Following a semester of collecting baseline data, 12 intervention schools were assigned to receive staff development, materials, and services over a 2-year period in an effort to increase student activity and reduce the consumption of dietary fat. During this time, 12 control schools continued with their usual physical activity and nutrition programs.

Baseline observations of 430 PE lessons, taught by 126 teachers in 24 schools, showed students obtained 16.5 MVPA minutes and 5.0 vigorous activity minutes per lesson. Actual lesson length was 34.3 minutes for lessons scheduled for an average of 50 minutes (McKenzie, Marshall et al., 2000b). PE, which was offered daily, provided students a weekly total of 25 vigorous activity minutes and 83 MVPA minutes. These figures are short of physical activity recommended for health and indicate that even adolescents receiving daily PE need additional physical activity outside of class time. During PE, there were gender inequities in activity accrual, with boys being significantly more active than girls, overall and specifically during skill drills, game play, and free play. Physical activity levels also varied by lesson context, with fitness activities producing the most activity and time for knowledge producing the least. Student engagement in physical activity was negatively associated with class size, with students in larger classes receiving significantly more opportunities for physical activity.

These baseline data indicated numerous opportunities existed for increasing physical activity during PE and we designed an intervention program to make improvements. While control schools continued with their usual programs, the 12 intervention schools received five 3-hr PE staff development sessions, 1.5 on-site visits per month, and sample PE curricula over a 2-year period. The effects of this strategy were assessed using direct observation. Intervention schools significantly increased their minutes of MVPA and surpassed the Healthy People 2010 objective of engaging students in MVPA 50% of class time (McKenzie, Sallis et al., 2000). The program had cumulative effects, and by the second year, intervention schools had increased MVPA and vigorous physical activity (VPA) by 18% and 6%, respectively. The intervention effects were stronger for MVPA than for VPA and for boys than girls. The study indicated that changes from a school intervention
may not be immediate and that special attention is needed to motivate middle school girls to participate fully during large coeducational classes.

In middle schools, PE is typically required and it provides a structured environment for physical activity. Physical activity also occurs on campus in settings where participation is more voluntary. Tools were not available for objectively assessing physical activity during leisure time periods, so SOPLAY (System for Observing Play and Leisure Activity in Youth) was designed (McKenzie, Marshall, Sallis, & Conway, 2000a). SOPLAY involves direct observation using momentary time sampling. In a baseline study, trained assessors traveled to each of the 24 M-SPAN schools on three separate days and used SOPLAY to assess the physical activity of students in all possible activity areas \( (N = 151) \) before and after school and during lunch breaks. The characteristics of the activity areas were coded (i.e., usable, accessible, supervised, equipped), and each student in an activity area was scored as being sedentary, walking, or very active. Results indicated that the activity areas were usable nearly all the time and made accessible to students about 50% of the time. Activity areas, however, were rarely supervised or equipped for physical activity. With the largest proportion of students to visit activity areas doing so at lunch time (19.5%), followed by before (4.1%) and after school (2.1%), the facilities on these middle school campuses were an underutilized resource. More boys than girls were in activity areas before school (33.4 vs. 7.7) and at lunch time (148.8 vs. 36.7). Meanwhile, the boys that were in the activity areas engaged in more MVPA than girls that were there before school (59.6 vs. 40%) and at lunch time (67.7 vs. 51.7%). The activity levels of boys and girls participating in programs after school, which consisted primarily of structured interscholastic practices, were not significantly different.

The contributions organized extracurricular programs at middle schools make to student physical activity is relatively unknown. To assess this event, the Structured Physical Activity Survey (SPAS) was designed to be completed by school physical activity program directors. The SPAS was administered at each school during three randomly selected weeks in one semester to collect baseline information on all activities offered (Powers, Marshall, Conway, McKenzie, & Sallis, 1999). The physical activity programs were grouped into four mutually exclusive categories: (a) Interscholastic activities—programs that provide competition for students at that school with those from other schools; (b) Intramural activities—programs that provide competition for students within the same school; (c) Club activities—competitive and noncompetitive physical activity groups that met regularly (e.g., aerobics club); and (d) Other activities—sporadic or miscellaneous physical activity programs (e.g., judo workshop). The grade level of participants, sponsorship (i.e., whether or not a program was offered exclusively by an outside organization, versus offered by the school), number of days per week, duration, and the number of male and female participants in each activity were reported. Total weekly hours for each activity and total student-hours per activity were then calculated for all programs—overall and separately by gender. Most (69.6%) extracurricular programs were offered after school, with 15.6% offered during lunch, 7.6% during school periods, and 7.1% before school. Outside agencies sponsored 13% of the programs. Interscholastic sports were the most frequently offered program (42.4%), followed by intramurals (30.8%), other activities (15.2%), and clubs (11.6%). Basketball (31.7%), track & field (10.3%), soccer (9.4%), tennis (6.7%), and football (5.4%) were the most commonly offered activities. Taking into account student
participation and the duration of activities, the average school offered a total of 546 student hours (284 male hours and 262 female hours) of extracurricular physical activities per week. While this seems like a lot, the schools were quite large (mean = 1,081 students) and, overall, the extracurricular programs attracted only 5.5% of a school’s daily attendance (3.0% of the males and 2.5% of the females).

The results of these two M-SPAN baseline studies of physical activity outside of PE classes indicated that the middle schools did not provide many structured opportunities for physical activity during leisure time periods and that students did not take advantage of facilities unless activities were programmed in them. The data suggested the possibility that modifications to school policies (e.g., increased accessibility to activity areas) and the environment (e.g., increased provision of supervision, equipment, and structured programs) might attract more students, especially girls, to activity programs and areas. Some of these environmental changes were attempted during the two-year M-SPAN intervention, and the results are currently being analyzed.

Recommendations for Improving Physical Activity at Middle Schools

The M-SPAN baseline studies indicate that there are numerous possibilities for improving opportunities that students have for accruing physical activity at middle schools. They are summarized into three categories.

Refocus Physical Education Goals

Middle school PE currently has numerous objectives (e.g., cognitive, social, emotional, motor skill, and physical fitness) and all of these cannot be reached in the short time allocated for PE in schools. Pate and Hohn (1994) have referred PE’s diversity of goals as having a “muddled mission.” Given the limited amount of time available for PE, a reorientation of its content and conduct is necessary in order to promote physical activity. The notion of health-related physical education (HRPE) has been advanced (Pate & Hohn, 1994; Sallis & McKenzie, 1991), with its main goal being to prepare children and adolescents for a lifetime of physical activity. Reaching this goal would require the implementation of curricular and instructional strategies that are substantially different from those provided in traditional fitness and sport-oriented programs.

Promote Gender Equity in Opportunities for Physical Activity

Comparisons of boys and girls in the M-SPAN baseline studies showed middle school girls were (a) less active during PE, especially during skill drills, gameplay, and free play episodes (McKenzie, Marshall et al., 2000b) and (b) less likely to visit activity areas and be physically active before school and at lunch time (McKenzie, Marshall et al., 2000a). These results show current PE and leisure-time programs in schools do not provide girls with equitable opportunities for physical activity. Gender differences in physical activity are less apparent in elementary schools, but it is important that the content and delivery of physical activity programs in middle schools be closely examined. There is little evidence to show that mandatory coeducational classes provide equitable opportunities for
physical activity engagement. Programs and practices to increase the amount of physical activity that both boys and girls receive are needed, but particular attention should be given to females.

**Link Schools With the Community**

Physical education, even when offered daily, does not provide middle school students with recommended amounts of physical activity. To further influence the promotion of physical activity, middle school physical educators need to redesign their curricula and instructional behaviors to promote out-of-class activity, modify the school environment so students have opportunities to be active on campus outside of PE, and work to develop physical activity linkages in the community. Many teachers do not currently act in a way to directly promote out-of-class physical activity (e.g., through prompts and reinforcement). Only 2–4% of M-SPAN students used on-campus physical activity areas before and after school, indicating expensive facilities and equipment available at schools are an underutilized resource (McKenzie, Marshall et al., 2000a).

Having physical educators work toward linking schools and the community is especially important because it is estimated that over 80% of children’s physical activity occurs outside of PE (Heath, Pratt, Warren, & Kann, 1994). The *Guidelines for School and Community Programs to Promote Lifelong Physical Activity Among Young People* (Centers for Disease Control and Prevention, 1997) provide ten categories of recommendations for school and community programs to promote physical activity. These guidelines include recommendations for policy, environment, physical education classes, health education curricula, extracurricular activities, parental involvement, personnel training, health services, community programs, and evaluation. Implementation of these guidelines should produce substantial increases in youth participation in both current and lifelong physical activity.

A fourth, but relatively untested strategy for improving physical activity in adolescents would be to teach them to self-manage their own physical activity. This would involve them learning the skills necessary to modify their own activity environments, an important strategy in the maintenance and generalization of physical activity. PE currently typically focuses on events that occur in the gymnasium, and little attention is given to teaching the behavioral skills needed to promote long-term physical activity. Teaching self-management skills showed some potential with elementary school students in the CATCH (Nader et al., 1999) and SPARK (Marcoux et al., 1999) projects. Self-management strategies are likely to be more successful in middle schools because adolescents are less dependent upon their parents and have more control over their own environments than younger children.

**Physical Activity Participation Index (PAPI)**

To consider the different environments where physical activity occurs on middle school campuses, the use of the PAPI index is proposed. It enables schools to assess how much physical activity they provide the average student during a week. The PAPI summary score (i.e., physical activity minutes per student per week) is calculated by summing the total number of minutes of physical activity made available from all activity sources in the school and dividing it by the total student population (i.e., average daily attendance during an observed week). Sources
of physical activity include (a) structured physical education classes, (b) intramural programs, (c) interscholastic programs, (d) organized nonsport clubs (e.g., dance, aerobics, weight training programs), and (e) nonstructured leisure time activities (e.g., fitness trails, games, shooting baskets) made available before and after school and during lunch time.

Table 1 compares two mythical schools on the amount of physical activity they provide to students. Movers Middle School, which has required daily physical education for all students, an extensive intramural program that runs daily, an interscholastic program, noncompetitive dance and martial arts clubs, and ample free-play opportunities, provides the average student with 305 minutes of physical activity per week. On the other hand, Sloth Secondary School schedules PE classes three times per week for seventh graders only, has a large interscholastic program, offers no intramural or club programs, and provides only limited space and equipment for free play. Sloth Secondary provides the average student with only 67.5 minutes of physical activity opportunities per week, 237 minutes fewer than those at Movers Middle.

### Table 1 Comparison of Activity Time at Two Middle Schools Using the Physical Activity Participation Index

<table>
<thead>
<tr>
<th>Source</th>
<th>Students</th>
<th>Days/week</th>
<th>Min/day</th>
<th>Min/week</th>
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</thead>
<tbody>
<tr>
<td><strong>Movers Middle School</strong></td>
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<td></td>
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<tr>
<td>(1000 students)</td>
<td></td>
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</tr>
<tr>
<td>Physical education</td>
<td>1000</td>
<td>5</td>
<td>50</td>
<td>250,000</td>
</tr>
<tr>
<td>Intramurals</td>
<td>100</td>
<td>5</td>
<td>30</td>
<td>15,000</td>
</tr>
<tr>
<td>Interscholastics</td>
<td>70</td>
<td>5</td>
<td>60</td>
<td>21,000</td>
</tr>
<tr>
<td>Activity clubs</td>
<td>40</td>
<td>5</td>
<td>60</td>
<td>12,000</td>
</tr>
<tr>
<td>Leisure activity</td>
<td>50</td>
<td>5</td>
<td>30</td>
<td>7,500</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>305</td>
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<td>305,000</td>
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</tbody>
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Participation Index Score = 305 min per student per week (305,000 min/1000 students)

<table>
<thead>
<tr>
<th>Source</th>
<th>Students</th>
<th>Days/week</th>
<th>Min/day</th>
<th>Min/week</th>
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</thead>
<tbody>
<tr>
<td><strong>Sloth Secondary School</strong></td>
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<tr>
<td>(1000 students)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical education</td>
<td>300</td>
<td>3</td>
<td>50</td>
<td>45,000</td>
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<tr>
<td>Intramurals</td>
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<tr>
<td>Interscholastics</td>
<td>70</td>
<td>5</td>
<td>60</td>
<td>21,000</td>
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<tr>
<td>Activity clubs</td>
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<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Leisure activity</td>
<td>10</td>
<td>5</td>
<td>30</td>
<td>1,500</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>67,500</td>
<td></td>
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<td>67,500</td>
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</tbody>
</table>

Participation Index Score = 67.5 min per student per week (67,500 min/1000 students)

*Note. Index summary data refer to minutes of opportunities for students to participate in physical activity per week. Observations suggest actual activity minutes will be less than half the Index score.*
PAPI could be used to compare physical activity among programs and schools and even within the same school over time. In the example, students at Movers Middle had more than four times the opportunity for physical activity than those at Sloth Secondary. It is important to realize that PAPI minutes refer to the time students have the opportunity to be physically active, rather than actual minutes of activity engagement. Students rarely spend entire periods moving continuously, even when they are appropriately engaged in activity settings. Based on direct observations of activity levels in the five program types, the actual minutes of physical activity typically range from 37–56% of the PAPI minutes.

**Trial of Activity for Adolescent Girls (TAAG)**

National concern over the sharp decline in physical activity that occurs during adolescence, particularly among females, has resulted in the National Heart, Lung, and Blood Institute initiating the Trial of Activity for Adolescent Girls (TAAG). TAAG is a 6-year collaborative project to develop and test the effectiveness of a multicomponent school-based and community-linked intervention aimed at preventing the decline in physical activity and fitness of middle school girls. The study, funded for approximately $30 million in October 2000, is being conducted in six study centers across the USA (Baltimore; Columbia, SC; Minneapolis; New Orleans; San Diego; and Tucson).

TAAG will consist of three stages: program development and testing, intervention, and follow-up. A 2-year intervention is proposed. Although not yet finalized, intervention components will be diverse and likely include school policy and environmental changes, physical education classes, extracurricular activities, health education, home-based activities, student peer/advocacy clubs, school staff development, and community/agency programs that promote physical activity. The primary outcome measures are cardiorespiratory fitness and physical activity. Academic achievement, discipline problems, sedentary behaviors, absence from school, smoking, and parent physical activity patterns are also likely to be studied.

Approximately 36 middle schools (six at each study center) will be randomized to intervention or control conditions. Selected schools will serve a diverse population of youth and have a nearby community agency. Approximately 5,000 girls will be included in the baseline measurements (Fall 2002), and they will be assessed annually during the next three years.

A study of the magnitude of TAAG has never previously been conducted to examine the promotion of physical activity and fitness with adolescents. The materials developed should be a tremendous resource to practitioners and results should provide physical activity scientists with an increased knowledge about promoting and maintaining the physical activity of adolescents.

*A common reference list is being provided following the last article.*

**Acknowledgments**

The important contributions to this paper made by researchers on the M-SPAN Project (HL54564), particularly James F. Sallis, Principal Investigator, are acknowledged.