

**Research Report of the Month**  
**JULY 2003**

Sallis, J.F., McKenzie, T.L., Conway, T.L., Elder, J.P., Prochaska, J.J., Brown, M., Zive, M.M., Marshall, S.J., & Alcaraz, J.E. (2003).

**Environmental interventions for eating and physical activity.**

American Journal of Preventive Medicine, 24, 209-217.

This is a large, well-funded study with a powerful experimental design. Further, the primary investigators brought extensive prior experience with the variables, participant populations, and institutional contexts involved. With all of that muscle, there is a reasonable expectation that we should learn a great deal from this report. You will not be disappointed, but I do think you are going to be surprised.

Some of the hard numbers in the "results" section provide strong support for new and useful knowledge. Less explicit but more profound lessons can be read in those numbers, however, and they should serve to give all of us pause in our enthusiasm for new school programs in the areas of health, physical education, and recreation. In a sense, those lessons are all about humility. A public middle school, with its concentrated population of early adolescents, is an enormously complex social and political institution. Efforts to understand, predict, and manipulate what goes on in that bubbling stew of growth, contradiction, and swirling hormones requires more than money and research sophistication. Designing and evaluating a program intervention for middle school students takes intellectual (and personal) courage -- as well as a willingness to accept that the end result is likely to consist of more questions than answers.

### **The Study**

The objective was to evaluate the effects of a specially designed program intervention on the physical activity and fat intake of middle school students (during the school day). Although the full report attends to the impact on both outcome variables, this annotation will focus primarily on the variable of physical activity.

Impelled by the fact that most adolescents in the United States do not meet basic guideline standards for either fat consumption (too much) or physical activity (too little), the National Institutes of Health provided a substantial grant to support a comprehensive effort at school health promotion going beyond the usual classroom unit approach to involve multiple components (the gymnasium, playground, cafeteria, and the entire school building, as well as staff, faculty, and students). A cross-disciplinary and multi-departmental team was assembled from units of the California state system of higher education in the greater San Diego metropolitan area -- many of whom had prior experience with large scale tests of programs such as the Child and Adolescent Trial for Cardiovascular Health (CATCH) and Sport, Play, and Active Recreation for Kids (SPARK).

### **Participants and Context**

Forty-eight public middle schools (grades 6 to 8) were invited to participate in the study. The first 24 to indicate agreement were accepted and, after collection of baseline data, were assigned at random to intervention (n=12) or control conditions (n=12). Mean enrollment was 1109 students per school, 49% of whom were female, 44% were nonwhite, and 40% received free or reduced price school meals. Physical education was required daily at all grade levels, and generally was taught by certified specialists. Approximately 90% of all classes were coeducational in nature.

### **Design and Method**

The Middle-School Physical Activity and Nutrition (M-SPAN) study, met the conditions for a field trial

experiment in which the units used for analysis of outcome data were whole schools rather than individual classes or teachers. Data were accumulated from the spring of 1997 when baseline information was collected, through two full academic years, 1997-1998 and 1998-1999. Because of financial cost and the enormous logistical and political problems to be managed in assembling such a large group of participating schools, it is relatively rare to encounter reports involving full implementation of a field experiment design, particularly over a span of several years. It is, however, one of the most powerful tools available for evaluating complex programs with multiple outcome measures.

The physical activity component of the intervention had two targets – physical education (PE) classes, and leisure periods during the school day (before and after school, and during a recess period after lunch) when students could make volitional choices about activity. The intervention was designed to increase students' moderate to vigorous physical activity in both settings. In PE, changes in lesson context, lesson structure, and teacher behavior were supported through staff development, direct supervision activities, and incentive grants to improve PE equipment (\$1000 to each school). This component of the program closely resembled that used in the SPARK studies (for reader-friendly annotations of those studies see Locke & Lambdin [2003] on this web site). For the leisure environments, baseline observations suggested that the intervention should consist of increases in supervision, the availability of organized activities, and equipment (each school received an additional \$2000 for that purpose). The 12 schools in the control group received no element of the intervention – other than the necessary observations to assess the overall level of student physical activity during the period of the study.

A reading of the full report will confirm that this was an unusually sophisticated intervention which made use of modifications in all aspects of the school environment, beginning with plans formulated by teams of resident faculty, staff and students. An effort was made to engage the support and participation of parents through newsletters, PTA meetings, open house events, posters, and communication efforts moving throughout the surrounding community.

Outcome data for physical activity were collected by an extensively trained and regularly supervised staff of field agents (all observational measures were monitored through periodic tests of inter-observer agreement). The System for Observing Fitness Instruction Time (SOFIT), a well tested and widely used instrument was used to evaluate student physical activity in a random sample of PE classes throughout both years of the study. The System for Observing Play and Leisure Activity of Youth (SOPLAY) was developed for the present study to assess the number and activity level of students who were physically engaged during leisure periods (on randomly selected days at all activity locations throughout each school).

SOFIT and SOPLAY data were converted to estimates of caloric expenditure so that a primary outcome figure could be assigned to represent each school (calories per child, per day, per school, expended in moderate to vigorous physical activity). That may sound complicated, but it simply answers the question "How much moderate to vigorous physical activity does the average student get each day in each school?"

That is an important question because previous studies have indicated that students get between 20% and 30% of their physical activity in each 24-hour cycle from what they do while at school. Any effort that changes those figures for accrued energy expenditure (upward) could have a very large cumulative impact on their health – and lives. With data based on 72 randomly selected days of data collection in each of the 24 schools, it became possible to contrast what was going on with students in the 12 intervention schools with the same kind of student activity in the 12 control schools.

## Results

It was the old "good news and bad news" outcome! Across the two years, moderate to vigorous physical activity in the intervention schools increased at a significantly greater rate than that measured in control schools. The final difference was large and certainly of practical importance as a component in student health. If you are familiar with the procedure, calculations of Body Mass Index (BMI) strongly suggest a true physiologic consequence, probably reflecting a significant measure of weight control. That was the good news. The bad news, however, was that the overall superiority of the intervention was produced almost entirely by the impact on boys. There was little change in physical activity for girls over time and the small activity difference favoring girls in the intervention schools could be of no practical importance. The increase in physical activity for boys came about equally from what

happened in PE and engagements during various in-school leisure times. Finally, for your interest, I note that none of the efforts (including school grants and training for cafeteria staff) to alter consumption of saturated dietary fat produced any impact on the eating habits of either boys or girls.

### **Discussion**

Confronted by those results – what would you write in the discussion? I would focus a lot of my attention on the optimistic possibilities presented by confirmation of the fact that a middle school physical activity intervention could have an important impact on the youth obesity epidemic. But why boys and not girls, and why physical activity and not eating habits, would hang there on the pages like uninvited ghosts – spoiling the party and everyone's appetite.

In case your first instinct was to consider the possible problem of self-consciousness among girls when exercising in the presence of boys, what the report provides is the fact that in leisure time periods supervision was staffed primarily by female volunteers, and many activities were selected specifically because they were thought to be attractive to adolescent girls. How many of those activities were gender segregated is not reported, but it is clear that school policies differed enough to produce a mixture of arrangements.

What the authors of the report were stuck with was the truth. Put simply, all they could observe was that the enhanced physical activities opportunities in M-SPAN were a sufficient intervention for boys, but girls needed some other combination of opportunities, promotion, and education. Their first priority for future research now is to somehow improve the school physical activity intervention for girls. I suspect, however that deciding how to accomplish that will depend on developing some diagnostic hypothesis about why M-SPAN did not work for girls in the first place. I do not envy them that task.

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