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School-Based Physical Activity and Fitness Promotion

Susan B. Racette, W. Todd Cade, Laura R. Beckmann

<LEAP> highlights the findings and application of Cochrane reviews and other evidence pertinent to the practice of physical therapy. The Cochrane Library is a respected source of reliable evidence related to health care. Cochrane systematic reviews explore the evidence for and against the effectiveness and appropriateness of interventions—medications, surgery, education, nutrition, exercise—and the evidence for and against the use of diagnostic tests for specific conditions. Cochrane reviews are designed to facilitate the decisions of clinicians, patients, and others in health care by providing a careful review and interpretation of research studies published in the scientific literature.¹ Each article in this PTJ series summarizes a Cochrane review or other scientific evidence on a single topic and presents clinical scenarios based on real patients or programs to illustrate how the results of the review can be used to directly inform clinical decisions. This article focuses on a physical activity program for school children. [How can a physical therapist use evidence to design a school-based physical activity program to improve student health and fitness?](#)

Find the <LEAP> case archive at
<http://ptjournal.apta.org/cgi/collection/leap>.

Physical inactivity is responsible for approximately 191,000 deaths in the United States² and 1.9 million deaths worldwide³ each year. More than 60% of the population worldwide fails to meet the physical activity recommendations that are required to achieve health benefits.³ Data from the Youth Risk Behavior Survey reveal a striking reduction in the proportion of high school students in the United States who attend physical education (PE) classes, from 41.6% in 1991 to 25.4% in 1995, with no significant change since 1995.⁴ In addition to causing almost 1 in every 10 US deaths,² physical inactivity is estimated to cause 22% of coronary heart disease and more than 10% of type 2 diabetes and cancers of the breast, colon, and rectum worldwide.³ Physical inactivity also contributes to the obesity epidemic. Data from the 2007–2008 National Health and Nutrition Examination Survey indicate that 68.0% of US adults are overweight or obese,⁵ 31.7% of youth aged 2 to 19 years are overweight,⁵ and an additional 16.9% of youth are obese.⁶ Obesity in childhood increases the risk for obesity in adulthood and predisposes children to cardiovascular disease and diabetes at a young age.^{7,8}

The benefits of physical activity are striking and indisputable for individuals of all ages. In addition to improving cardiorespiratory fitness, physical activity reduces the risks for obesity, type 2 diabetes, hypertension, cardiovascular disease, cancer, and premature death.⁹ Physical activity also helps to ameliorate the metabolic and cardiovascular consequences of obesity and may enhance self-esteem and

reduce depression. The breadth and significance of these health benefits form the basis of the *2008 Physical Activity Guidelines for Americans*.¹⁰ As stated in these guidelines, children and adolescents aged 6 to 17 years should engage in at least 1 hour of physical activity every day, predominantly in the form of moderate- or vigorous-intensity aerobic activity, but with inclusion of muscle-strengthening and bone-strengthening activities. The World Health Organization is currently developing “Global Recommendations on Physical Activity for Health.”

The importance of promoting a physically active lifestyle among children and adolescents has prompted the development of numerous strategies to improve the health of school children, some of which are highlighted in the report brief titled *Progress in Preventing Childhood Obesity: Focus on Schools*.¹¹ Anecdotal reports from school principals and teachers suggest that students who are physically fit have greater focus in the classroom, perform better on standardized tests, and exhibit fewer behavioral problems.¹¹ An important advantage of school-based physical activity programs is that they ensure exposure of all school children to the interventions.

Dobbins et al¹² conducted a Cochrane review of randomized controlled trials and quasi-experimental studies of school-based physical activity interventions designed to promote physical activity and fitness in children and adolescents. In this review, the physical activity interventions had to include, at a minimum, changes to the school curriculum and printed educational

Table.

School-Based Physical Activity Programs to Promote Physical Activity and Fitness in Children and Adolescents: Cochrane Review Results¹²

<p>> Twenty-six prospective controlled trials were included in the review, with a total of 31,939 participants from hundreds of schools located in the United States (16 studies), European countries (8 studies), and Australia (2 studies).</p>	
<p>> Participants were school-attending children and adolescents aged 6 to 18 years.</p>	
<p>> Interventions included, at a minimum, school curriculum changes and printed educational materials. Additional strategies included schedule changes to increase time spent in physical activity, physical education enhancements to increase time spent in vigorous physical activity, provision of exercise equipment, teacher training in how to incorporate physical activity into the curriculum, parental engagement, community involvement, mass media, and policy development. Intervention duration ranged from 5 weeks to 6 years; program frequency, specific intervention components, and assessment methods varied across studies.</p>	
<p>> Studies compared schools or classes that received the intervention with schools or classes that either did not receive the intervention or did not receive the same intervention.</p>	
<p>> Four of 9 outcomes favored the physical activity interventions in the majority of the studies.</p>	
Duration of physical activity	Five of the 7 studies that assessed physical activity duration showed an increase in the intervention groups relative to the control groups based upon self-report, accelerometers, or parental report. The physical activity increase across the 5 studies ranged from 6 to 50 minutes per week.
Time spent watching television	Three of the 4 studies that assessed television viewing showed a decrease in the intervention groups relative to the control groups based upon self-report. The magnitude of change ranged from 5- to 48-minute decreases in the intervention groups compared with the control groups in 2 studies; the third study showed a 51% difference between intervention and control groups in the proportion of students who watched >3 hours of television daily.
Aerobic capacity	Three of the 5 studies that assessed either maximal aerobic capacity or heart rate recovery showed an improvement in fitness in the intervention groups relative to the control groups. The magnitude of increase in the intervention groups ranged from 2.8% to 15.2%.
Blood cholesterol	Four of the 7 studies that assessed total blood cholesterol level showed a decrease in the intervention groups relative to the control groups, based on either fasting or nonfasting blood samples. The magnitude of difference between intervention and control groups for the change in cholesterol ranged from 2 to 28 mg/dL.
<p>> Five of 9 outcomes did not favor the physical activity interventions in the majority of studies in which they were assessed: percentage of children who are physically active during leisure time (3 of 6 studies showed improvement), systolic blood pressure (3 of 10 studies showed improvement), diastolic blood pressure (4 of 9 studies showed improvement), body mass index (4 of 14 studies showed improvement), and resting pulse rate (1 of 5 studies showed improvement).</p>	
<p>> No adverse events were reported.</p>	
<p>> Limitations to applying the findings: Differences in study design, intervention components, and outcome measures precluded the authors from combining data across studies. Therefore, it is difficult to predict the magnitude of change that would be expected for each outcome.</p>	

materials. The major outcome measures included 3 lifestyle behaviors (ie, physical activity rates, duration of physical activity, and time spent watching television) and 6 physical health measures (ie, systolic blood pressure, diastolic blood pressure, total cholesterol level, body mass index, aerobic capacity, and pulse rate). The results of the review are outlined in the Table.

Take-Home Message

This Cochrane review indicates that school-based physical activity programs are effective for increasing duration of physical activity, reducing time spent watching television, increasing aerobic capacity, and improving blood cholesterol levels. Importantly, there was no evidence of adverse effects. The review results indicated that longer-term in-

terventions generally produce more favorable outcomes. According to the review, relatively few studies show improvements in body mass index (BMI); however, the likelihood of observing favorable outcomes may depend on the baseline BMI of the study population.

<LEAP> Case #3: Applying Evidence to School-Based Physical Activity Programs

How can a physical therapist use evidence to design a school-based physical activity program to improve student health and fitness?

S. Jones, PT, DPT, was a part-time practitioner in a suburban public school district. Her primary responsibilities were to examine and evaluate physical limitations, identify disabilities, and provide physical therapy interventions to in-need school children. In addition, she identified and modified any potential physical barriers to learning. Because the school board was concerned about childhood obesity and physical inactivity, they asked Dr Jones to increase her hours to full-time status to assist in designing and implementing a novel school-based physical activity and nutrition program to help improve the students' physical activity levels and fitness. The program would be implemented first in one middle school with 660 children in grades 6 through 8, and, if successful, would be implemented in all schools across the district. As a physical therapist, Dr Jones has ex-

pertise in movement and a clear understanding of physiologic development; these credentials, combined with her experience in the educational system, make her uniquely qualified to advise the school board on appropriate physical activity programs for school children.

How did the results of the Cochrane systematic review apply to the development of this program?

Dr Jones used the Cochrane review results to help inform the school board about the potential benefits of a school-based program. First, she explained that the benefits would likely become more evident as the duration of the program increases. Dobbins et al¹² reported that studies showed that programs should be implemented for a minimum of 18 weeks. Based on evidence from the Cochrane review, benefits may include improvements in students' physical activity levels, cardiorespiratory fitness, and cholesterol levels as well as a reduction in time spent watching television. Dr Jones noted that the improvement in fitness is particularly important due to the strong inverse association between cardiorespiratory fitness and mortality in adults.¹³ She also explained

that, although her primary goal is to enhance student health, additional benefits *may* include improvement in academic achievement.

In addition to using the Cochrane systematic review, Dr Jones consulted with colleagues to identify an existing novel, multifaceted physical activity program that could serve as a model for her school program. The identified program (Figure) has been implemented across 23 schools in a Midwestern school district, in which 64% of the 12,000 students qualify for free or reduced lunch and 80% of students are minority. The program includes a nutrition component designed by a dietitian.

Multifaceted interventions include the use of WittFitt training and exercise balls* in the classrooms instead of chairs, a "walking school bus" (a group of children walking to school with one or more adults), hip-hop dance, a "Footsteps to Fitness" cross-curricular program in which elementary school students wear pedometers and are challenged to walk to a particular destination on a world map by charting their daily pedometer steps, creative changes in the instructional and assessment process of the PE curriculum (eg, use of Polar heart rate monitors† to assess and record the students' exercise intensity and to track their progress throughout the semester), and educational strategies in the classroom that incorporate the Health Belief Model and the Transtheoretical Model of Behavior Change. These models hold that effective interventions that improve physical activity behavior do so because of changes "in intermediate variables, such as cognition, self-efficacy, knowledge, skills, current behavior, social support, balance between 'pros' and 'cons' in decision making, perceived barriers and benefits, and enjoyment."¹⁴



Figure. Middle school physical education class.

* WittFitt LLC, PO Box 821, Hudson, WI 54016.

† HRM USA Inc, 1039 Pulinski Rd, Warminster, PA 18974.

A novel "Fit-For-Life Portfolio" is maintained for each student and includes:

- Physical activity, fitness, and nutrition goals
- Heart rate monitor data downloaded during PE class
- Pedometer data
- Physical activity logs
- Physical fitness assessment results
- Self-efficacy survey responses

Each student's portfolio is shared with parents and is used longitudinally across grades. Additional components include an after-school program for elementary school students conducted at the YMCA and an after-school YMCA program held at the middle school consisting of Zumba, Step, and other dance exercise classes taught by specialty instructors.

Based on preliminary data (LRB, unpublished data, 2010), this model program has demonstrated favorable outcomes in several domains, including some that were not reported in the studies covered by the Cochrane review. During a 3-year intervention-and-assessment period, changes were observed in 4 physical fitness standards: endurance, upper-body strength, abdominal strength, and flexibility. The percentage of students in grades K through 12 who met all 4 physical fitness standards increased from 15.5% to 21.2%. Physical activity among the elementary school students increased 13%. Changes also were observed for BMI: the percentage of K–12 students with healthy BMI scores increased from 61.5% to 63.3% at the end of year 3. Physical fitness was associated positively with both attendance and academic performance. Both aerobic capacity

and abdominal strength were highly associated with academic performance on standardized state tests.

In order to create a more healthful school environment and promote physical fitness, Dr. Jones plans to provide novel fitness opportunities that engage the interest of all students, especially those who are not athletically gifted or who have special needs. She believes that involving parents and the community will strengthen the social and environmental correlates of physical activity.

Some of the studies in the Cochrane review reported the use of teacher training to integrate physical activity into the curriculum. Dr. Jones has determined that it will be important to provide professional development opportunities for teachers to ensure that they are adequately trained not only to implement the program but to model the healthy behaviors that are being taught. Lesson plans must be consistent with national and state physical education standards, and assessments should be conducted routinely to track longitudinal changes in physical fitness, other health parameters, and academic performance to determine whether the program is successful. However, because of the differences in research design, interventions applied, and outcome measurements used across studies, the Cochrane review does not allow conclusions regarding prediction of the magnitude of change that would be expected.

What can be advised based on the results of the systematic review?

Many children and adolescents are likely to benefit from a school-based physical activity intervention. School-based programs reach all enrolled students and may help youth who are at risk to achieve the goal of 1 hour of physical ac-

tivity daily. Additional benefits may include improvements in aerobic capacity and cholesterol level and a reduction in television viewing. As previously noted, based on the variability in intervention components, duration, frequency, intensity, assessment methods, and student populations among the different studies included in the Cochrane review, it is difficult to predict whether improvements will occur in blood pressure, BMI, pulse rate, or the proportion of students who are physically active. Nevertheless, the evidence suggests that the potential health benefits of school-based physical activity programs are substantial and should be encouraged.

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