Evidence-Based Practice Guideline: Increasing Physical Activity in Schools—Kindergarten Through 8th Grade

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ABSTRACT: Because of the growing obesity epidemic across all age groups in the United States, interventions to increase physical activity and reduce sedentary behaviors have become a priority. Evidence is growing that interventions to increase physical activity and reduce sedentary behaviors have positive results and are generally inexpensive to implement. National and international health organizations are calling for a comprehensive approach for reducing obesity in children that includes increasing physical activity in the school setting. Although the call to increase activity levels in schools is clear, little guidance has been given to schools on specific methods to accomplish this task. This article provides an overview of an evidence-based guideline developed by a physical education teacher and a school nurse to provide inexpensive, easy-to-implement, effective strategies to increase physical activity in students. Tools are also included in the guideline to measure the effectiveness of the intervention.

KEY WORDS: evidence-based practice, guidelines, obesity, physical activity, school-based interventions

INTRODUCTION

Because of federal legislation that places renewed emphasis on academic performance, school administrators are making difficult choices regarding the need to cut nonacademic activities in school to provide increased academic instruction time. However, recent studies consistently show that increased physical activity in students is associated with better academic performance. Even with reduced academic instruction time, students perform as well or better on perceptual skills tests, tests of developmental level, IQ tests, and academic achievement, including math and verbal skills, when physical activity levels are increased (Sallis, McKenzie, et al., 1999; Sibley & Etnier, 2003).

Regular participation in physical activity during childhood helps build healthy bones, lean muscle mass, and joints; maintains normal weight; and reduces fat (Janz, Burns, et al., 2001; Janz, Levy, et al., 2002; Kvaavik, Tell, & Klepp, 2003; U.S. Department of Health and Human Services [USDHHS], 1996). Physical activity is consistently related to higher self-esteem and self-concept and lower levels of anxiety, stress, and depression (Centers for Disease Control and Prevention [CDC], 1999; Strong et al., 2005).

Current studies have identified strong associations between increased levels of sedentary behavior and increased levels of overweight and obesity in children and adolescents (Epstein, Paluch, Gordy, & Dorn, 2000; Hancox, Milne, & Poulton, 2004; Janz, Levy, et al., 2002; Patrick et al., 2004; Robinson, 2001). These increases are associated with the rise in childhood type 2 diabetes, hypertension, elevated cholesterol, asthma, and several other childhood diseases (Center for Health and Healthcare in Schools, 2003; Saakslahti et al., 2004).

Because of the growing obesity epidemic across all age groups in the United States, interventions to increase physical activity and reduce sedentary behaviors have become a priority. Evidence is growing that

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interventions to increase physical activity and reduce sedentary behaviors have positive results and are generally inexpensive to implement (CDC, 1998; Dobbins et al., 2001). In 1998, the CDC published the *Guidelines for School and Community Programs to Promote Lifelong Physical Activity Among Young People.* These guidelines recommend a comprehensive approach that includes increasing physical activity in the school setting (CDC, 1998). In addition, *Healthy People 2010,* the World Health Organization, American Cancer Society, the National Institute of Medicine, and the surgeon general have recommended incorporating increased physical activity in the schools (Burgeson, Wechsler, Brener, Young, & Spain, 2001; Byers et al., 2002; Koplan, Liverman & Kraak, 2005; Shepard et al., 2004; USDHHS, 2000). Although the call to increase activity levels in schools is clear, little guidance has been given to schools on specific methods to accomplish this task.

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This article provides an overview of an evidence-based guideline developed by a physical education teacher and a school nurse to provide inexpensive, easy-to-implement, effective strategies to increase physical activity in students. The complete guideline, which contains additional assessment instruments, forms, and curriculum information, is available from the Research Translation and Dissemination Core (RTDC) of The University of Iowa College of Nursing at http://www.nursing.uiowa.edu/centers/gnirc/protocols.htm or by contacting research-dissemination-core@uiowa.edu. Guidelines developed by the RTDC are produced with support provided by Grant P30 NR03979 (Toni Tripp-Reimer, principal investigator, The University of Iowa College of Nursing), National Institute of Nursing Research, National Institutes of Health. The center director is Dr. Marita Titler.

PURPOSE

The purpose of this evidence-based guideline is to provide school-based strategies to increase the level of physical activity and to reduce sedentary behavior in the kindergarten through 8th-grade population. The ultimate goal is to improve the fitness level and physical and mental health of the students and to help establish lifelong patterns of healthy behavior. This guideline can be used by administrators, educators, and health care professionals in the school setting as a resource to encourage and foster a healthy level of physical activity for students.

DEFINITION OF KEY TERMS

- *Physical activity* is defined as any bodily movement produced by skeletal muscles that results in energy expenditure (CDC, 2004b).
- *Moderate to vigorous physical activity* (MVPA) is a level of activity that combines both moderate and vigorous activities. Moderate activities require an effort equivalent to a brisk walk, cause small increases in breathing or heart rate, and usually involve sustained rhythmic activity. Examples include riding a bike on level ground, playing on playground equipment, climbing, or actively moving around. Vigorous activities are those activities that engage large muscle groups and cause an increase in heart rate, breathing depth and frequency, and perspiring. Examples include activities such as running, jogging, skipping, jumping rope, playing basketball, and wrestling with peers (Byers et al., 2002; CDC, 2004b; McKenzie, Sallis, & Nader, 1991).
- *Sedentary behavior* includes nonacademic "screen time" such as watching television, watching videos, or playing video games. Studies have shown that prolonged periods of inactivity that occur during TV or video viewing result in adverse effects on metabolic activity and obesity rates. For this reason, TV and video viewing and playing video games are most commonly identified as sedentary behaviors to target in intervention studies in children (Byers et al., 2002; Gortmaker et al., 1999; Robinson, 1999).

STUDENTS WHO NEED INCREASED PHYSICAL ACTIVITY AND REDUCED SEDENTARY BEHAVIOR

Students in kindergarten through 8th grade who are likely to benefit from use of this guideline are those who

- spend less than 30 minutes per school day, or less than 1 hour per 24 hours, in moderate to vigorous physical activity (Byers et al., 2002; Koplan et al., 2005; Strong et al., 2005);
- spend more than 2 hours daily in sedentary behavior (American Academy of Pediatrics, Committee on Public Education, 2001; Koplan et al., 2005; Strong et al., 2005);
- do not participate in daily physical education classes (Koplan et al., 2005; Strong et al., 2005; USDHHS, 2000);
- spend less than 50% of physical education class

time in moderate to vigorous physical activity (Koplan et al., 2005; Strong et al., 2005; USDHHS, 2000); or
- have chronic disease risk, such as hypertension, overweight, or obesity (CDC, 1998).

ASSESSMENT TOOLS, INSTRUMENTS, AND FORMS

Several tools and forms have been included in the complete guideline to assist in the implementation of the physical activity guideline. These include the following:

1. Physical Education Lesson checklist (adapted with permission from SPARK)
2. Modified System for Observing Fitness Instruction Time (SOFIT)
3. Modified System for Observing Play and Leisure Activity in Youth (SOPLAY) and SOPLAY recording forms (adapted with permission from T. McKenzie, San Diego University)
4. The Physical Activity in Schools Knowledge Assessment Test
5. Process Evaluation Monitor
6. Physical Activity Outcomes Monitor
7. New Twists to Traditional Sports in Physical Education
8. Sample Elementary Physical Education Lesson Plan
9. For Children: Fun Alternatives to Watching TV

RATIONALE AND DESCRIPTIONS OF THREE SCHOOL-BASED METHODS

All children and adolescents should participate in 30 minutes of MVPA daily during the school day and a minimum of 1 hour total in 24 hours (Koplan et al., 2005; National Association for Sport & Physical Education, 2003; Strong et al., 2005). Current estimates are that less than 25 minutes per week during school time are spent in MVPA (National Institutes of Child Health and Human Development, 2003). Fewer than 8% of elementary schools and 6% of middle schools are currently meeting national recommendations for daily physical education classes (CDC, 2004a).

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This guideline focuses on three methods that have a strong research base, are easy and inexpensive to implement, and show the greatest effect on behavior changes according to current research: increasing time spent in MVPA during physical education class, increasing time spent in MVPA during recess (free play time), and teaching skills to reduce sedentary behaviors. Although measuring physical activity in children is challenging, each intervention method includes a measurement tool recommended because of its adaptability to the school setting. These tools have been tested in populations of school children, have shown good reliability and validity (Gortmaker et al., 1999; McKenzie, 2002a, 2002b; Robinson, 1999), and may be used to measure the outcomes of the interventions.

Current recommendations are for students to spend at least 50% of PE class time in MVPA.

Method 1: Increase Time Spent in MVPA in Structured Physical Education Classes

Current recommendations are for students to spend at least 50% of physical education (PE) class time in MVPA (USDHHS, 2000). Research shows that, depending on the age of the students and the quality of the instruction, often less than 10% to 40% of PE class time is spent in MVPA (Burgeson et al., 2001; Simons-Morton, Taylor, Snider, & Huang, 1993). Modifying lesson content and structure can provide an increased opportunity for helping students reach recommended physical activity levels without adding more PE classes to existing schedules.

Intervention. To increase physical activity in structured PE classes, the following are recommended:

- Increase managerial efficiency and reduce time students spend in passive learning (Luepker et al., 1996; McKenzie, Sallis, Prochaska, et al., 2004). Students need to know what the teacher expects. They should be instructed in how to respond to specific situations (e.g., how to enter and dismiss from class, warm-up) so that activities do not have to be interrupted to reinstruct students. Consider having students warm up during attendance checks or other managerial activities. Make instructions quick and not complicated, and keep talk time to a minimum to provide students with increased activity time.
- Alter existing activities to encourage participation of all students. Traditional sports can be adapted so that students who would be inactive are engaged in physical activity (e.g., alter a softball game by having the entire team run bases after each hit) (Gortmaker et al., 1999; Kahn et al., 2002; Koplan et al., 2005; Luepker et al., 1996; McKenzie, Sallis, Kolody, & Faucette, 1997).
- Avoid activities in which students are eliminated

or must wait for turns. Consider having children who are waiting for a turn engaged in alternate activities (Gortmaker et al., 1999; Kahn et al., 2002; Luepker et al., 1996).
- Add activities, such as soccer or other activities, designed to increase movement that allow for participation by more students (Gortmaker et al., 1999; Kahn et al., 2002; Koplan et al., 2005; Luepker et al., 1996; McKenzie, Sallis, Kolody, et al., 1997). Teach units that provide students with opportunities to perform a variety of physical activities, including activities that can be used outside of class time and throughout life, such as bicycling, dance, or jogging (Gortmaker et al., 1999; Kahn et al., 2002; Koplan et al., 2005; Luepker et al., 1996).
- Use predeveloped curricula specifically designed to increase levels of physical activity in students during physical education class. Examples and contact information are given in the complete guideline.

To demonstrate the effectiveness of the intervention, outcomes should be measured.

Outcome Measurement. To demonstrate the effectiveness of the intervention, outcomes should be measured. The modified SOFIT is an objective tool designed to assess the quality of physical education instruction. It is a comprehensive system that provides a measure of student activity levels, lesson context, and teacher behavior during class time. The student activity codes have been validated on both heart rate monitors and accelerometers. The three phases involved in this teacher-friendly assessment tool are the following:

- Phase 1: What is the student's activity level?
- Phase 2: How is time allocated for the class as a whole? (Lesson context)
- Phase 3: What is the teacher doing? (Interactions for physical activity)

The SOFIT tool and instructions have been modified for use in the school setting and are available in the complete guideline (McKenzie, 2002a).

Method 2: Increase Time Spent in MVPA During Recess or Free Play Time

There are little consistent data available on time spent by elementary and middle school students in MVPA while on the playground. Estimates range from 5% to 40% depending on the age and gender of the child (McKenzie, Sallis, Kolody, et al., 1997; Sallis, Conway, et al., 2001; Zask, van Beurden, Barrett, Brooks, & Dietrich, 2001). Recess time offers an opportunity to increase levels of MVPA without altering existing schedules. Several studies have shown that the following low-cost interventions on playgrounds can increase MVPA. Although research remains somewhat limited, these interventions are easy to implement, show positive results, and are low in cost (Jago & Baronowski, 2004).

Recess time offers an opportunity to increase levels of MVPA without altering existing schedules.

Intervention. To increase physical activity during recess or free play time, the following are recommended.

- Have a physical education teacher instruct all students on proper use of playground equipment (CDC, 1998). Make sure the playground is a safe and fun area for all children. Supervisors are present to monitor any problems that may arise.
- Provide encouragement and motivation for activity (McKenzie, Sallis, Elder, et al., 1997). Examples of prompts to engage students include asking
  - How many times can you jump the rope in 1 min?
  - Can you get your name added to the wall in the gym for going across the horizontal ladder three times or more?
  - How many baskets can you make in 1 min?
- Increase the available permanent equipment on the playground, such as basketball hoops, swings, slides, climbing equipment, and volleyball nets (Sallis, Conway, et al., 2001).
- Increase the number of balls on the playground (Jago & Baranowski, 2004; Zask et al., 2001).
- Paint playground equipment with bright fluorescent colors (Stratton, 2000; Stratton & Leonard, 2002). Make sure the equipment is safe, attractive, and inviting to the students.
- Paint playground markings on hard playground surfaces (if present). Examples include letter squares, mazes, hopscotch squares, castles, pirate ships, ladders, and giant clock faces (Stratton, 2000).
- Use predeveloped templates specifically designed to increase physical activity on the playground. Examples and contact information are given in the complete guideline.

Outcome Measurement. The modified SOPLAY was designed to obtain observational data on the number of students and their physical activity level during play in a specified area. This tool may be used to quantify activity during recess. SOPLAY consists of periodic and systematic scans of a designated area. During a scan, each individual student in the area is counted

Table 1. Physical Activity Outcomes Monitor

For each school receiving the Physical Activity Guideline, please complete the following form. This form should be completed on a regular basis (for example, each school quarter). For each school receiving the intervention, please keep a record of the changes observed in records.

TO USE THE FORM: Place the appropriate criteria key next to each separate outcome for each student or class assessment. We have provided a total of four boxes, which represent the first four quarters.

These outcomes may be scored for the school as a whole, as individual grades, individual classrooms, or as individual students.

Criteria Key

Y = **Yes**/met criteria
N = **No**/criteria not met
J = **Justified Variation**, e.g., PE class not included in the monitor: note why the class is not included

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Outcome 1 Amount of time spent in MVPA during PE class is >50% as measured by SOFIT				
Outcome 2 Percentage of students engaged in MVPA during recess time >50% as measured by SOPLAY				
Outcome 3 Amount of time spent in sedentary activity is <2 hr per day as measured by self-report				

Note. PE = physical education; MVPA = moderate to vigorous physical activity; SOFIT = System for Observing Fitness Instruction Time; SOPLAY = System for Observing Play and Leisure Activity in Youth.

and coded as being sedentary (s), walking (w), or very active (v). After recording the observations, the percentage of children engaged in MVPA can be calculated. Evaluations should be done at baseline and at regular intervals to evaluate increases in MVPA. The SOPLAY tool and instructions are modified for use with this guideline (McKenzie, 2002b).

Method 3: Reduce Sedentary Activity

It is recommended that all kindergarten through 8th-grade students limit TV viewing and other sedentary behaviors to fewer than 2 hours daily (American Academy of Pediatrics, 2001; Koplan et al., 2005; Strong et al., 2005). Current estimates are that students watch 4.5 hours per day (Roberts, Foehr, Rideout, & Brodie, 1999). Although studies are still limited, teaching awareness skills and self-monitoring techniques have proven effective.

It is recommended that all kindergarten through 8th-grade students limit TV viewing and other sedentary behaviors to fewer than 2 hours daily. Current estimates are that students watch 4.5 hours per day.

Intervention. Suggestions to reduce sedentary behaviors in children include the following:

- Increase awareness of time spent in sedentary behaviors by teaching self-monitoring techniques to children (Epstein et al., 2000; Robinson, 1999).
- Encourage group reporting of time spent viewing TV and playing video games to motivate children to reduce this behavior (Epstein et al., 2000; Robinson, 1999).
- Challenge students to a 7-day TV turnoff, during which time children are challenged to watch no TV or videotapes and play no video games (Gortmaker et al., 1999; Robinson, 1999). Have students brainstorm a list of fun alternatives (list of alternative activities included in the complete guideline).
- Develop a program of short- and long-term incentives to comply with a 7-hour per week television, videotape, or video game budget (Epstein et al., 2000; Robinson, 1999).
- Teach students how to watch TV selectively, for example, budgeting TV time in advance for quality shows (Gortmaker et al., 1999; Robinson, 1999).
- Enlist children as advocates for reducing media use (Gortmaker et al., 1999; Robinson, 1999).
- Use available curriculum specifically designed to reduce sedentary behaviors. Examples and contact information are given in the complete guideline.

Outcome Measurement. Methods to assist students in self-evaluating their time spent in sedentary activities can be administered by the classroom teacher. Sedentary activity levels should be assessed at baseline and at regular intervals throughout the school year. Modifications to the methods can be made by the individual teacher to make them more age appropriate. Students can be assisted in evaluating and recording

their personal time spent watching TV and playing video games. One method is to have students make a classroom graph of the total number of TV shows watched or video games played for the class as a whole.

Depending on their age, the student (or teacher) can record the actual time spent in these activities. The teacher can assist by asking questions such as (Robinson, 1999, 2001; Robinson et al., 2003):

1. What TV shows did you watch yesterday?
2. Did you watch TV while eating supper? Breakfast?
3. Did you turn on the TV before school?
4. Did you turn on the TV when you came home from school?
5. Did you play any video games yesterday? How many? When did you start playing? When did you stop?

EVALUATION: PROCESS AND OUTCOMES INDICATORS

Process Indicators

Process indicators are those interpersonal and environmental factors that can facilitate the use of a guideline. Knowledge about physical activity and sedentary behavior is one process indicator that can be assessed by both educators and health care professionals. The Physical Activity in Schools Knowledge Assessment Test should be assessed before and following the education of staff regarding use of this guideline. The same sample of educators and health care professionals for whom the Knowledge Assessment Test was given should also be given the Process Evaluation Monitor approximately 1 month following implementation of the guideline. The purpose of this monitor is to determine understanding of the guideline and to assess the support for carrying out the guideline. These tools are available in the complete guideline.

Outcome Indicators

Outcome indicators are those indicators expected to change or improve from consistent use of the guideline. Outcomes expected to change with use of this guideline are

- amount of time students spend in MVPA,
- percentage of students engaged in MVPA during recess time, and
- amount of self-reported time spent in sedentary behavior.

The Physical Activity Outcomes Monitor presented in Table 1 illustrates the outcomes and the assessment criteria. It reflects the data collected throughout the school year on the three methods used to improve physical activity in the school. It is recommended that this outcome monitor be used on a regular basis, such as once each quarter during the school year. It can also be modified or outcomes added to make it more meaningful for an individual school.

CONCLUSION

The need for increasing physical activity in children is clear and is now becoming a national mandate for schools. School nurses can use the information in this guideline as a resource for research-based interventions and methods for evaluation of their effectiveness. Concerns of administrators regarding loss of education instructional time and increased cost can be allayed by providing information on low-cost strategies that do not require increased PE class time. Additional research-based information regarding studies showing academic improvement with increased physical activity can encourage administrators and educators to make physical activity a priority.

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