

Using Pedometers

to Promote Physical Activity at School



Worldwide, at least 155 million school-age children are overweight or obese, according to estimates by the International Obesity Task Force (IOTF) of the World Health Organization (WHO).¹ Twenty-two million younger children are also affected, according to International Obesity Task Force global estimates based on WHO data for children less than 5 years of age.² In recent years, obesity levels have risen sharply around the globe.

The WHO defines “overweight” in adults as a Body Mass Index (BMI) equal to or more than 25, and “obesity” as a BMI equal to or more than 30.³ Body Mass Index is a simple ratio of weight to height, defined as the weight in kilograms divided by the square of the height in meters.⁴ In children, measuring overweight and obesity is more difficult because there is no worldwide standard definition of childhood obesity. In the United States, the Centers for Disease Control and Prevention have established standards for age- and sex-specific percentiles for

BMI, based on the 2000 CDC Growth Charts and expert input.⁵ (See Figure 1 on page 19.)

Overweight and obesity can lead to serious health issues, including chronic conditions such as cardiovascular disease, diabetes, musculoskeletal disorders, and some cancers,⁶ with the risk increasing as the BMI increases. Because overweight and obesity, as well as their related diseases, are largely preventable, childhood obesity issues should receive greater priority in schools.

BY ROBERT C. BENGGE

Figure 1
Children's Body Mass Index (BMI)

Percentiles	Classifications
95th and above	Overweight
85th to 94th	At risk for overweight
6th to 84th	Normal
5th and below	Underweight

Well-researched data suggests that a lifestyle of regular daily physical activity and exercise may lessen and in some cases reverse obesity-related disease processes.⁷ Likewise, research suggests that physical inactivity in childhood can lead to a lifetime of health problems.

Because parents hear more warnings about the risks of their children's involvement in illegal behaviors, including ingestion of drugs and alcohol, they may not fully grasp the serious implications of overeating and a sedentary lifestyle. In the United States, obesity now rivals smoking as the nation's most expensive and deadly healthstyle-related problem. Each year, nearly 400,000 deaths are attributable to obesity, and the death toll is expected to rise.⁸ Virtually unknown in children and adolescents 10 years ago, Type 2 diabetes, an obesity-related illness, now accounts for almost 50 percent of new cases of the disease in some communities.⁹ Throughout the United States, physicians are noticing higher blood pressure levels for children and teenagers, and adolescents are increasingly suffering from health problems that were virtually nonexistent for that age level two decades ago.¹⁰

People are becoming fatter because of two factors—increased calorie intake and decreased physical activity.¹¹ Globally, people are consuming foods high in fat and sugar but low in vitamins, minerals, and other nutrients. Concurrently, there is a trend toward

decreased physical activity due to the sedentary nature of many types of work, changing modes of transportation, and increasing urbanization.¹² In the United States and other developed countries, many children gain weight because they're spending too much time in front of the TV, computer, and video games and not enough time playing outdoors or being involved in physical education and sports. They are often surrounded by unhealthy eating choices at home, in the fast-food

restaurants in their communities, and even in school lunch programs.

Of the numerous studies of physical activity, almost all show a decline in activity levels as children progress to adulthood.¹³ The decline is so great that Rowland¹⁴ labeled adolescence as a risk factor for physical activity, and Sallis¹⁵ has estimated that during adolescence, girls' physical activity levels decline by 7.4 percent per year, while boys' decline by 2.7 percent.

Unfortunately, many school-aged children are not meeting the recommended physical-activity guidelines of at least 60 minutes or more per day engaged in appropriate activities, most of which should be spent in moderate- or vigorous-intensity aerobic physical activity.¹⁶ Thus, the U.S. government has been urging more physical activity promotion programs for youth.¹⁷

The continued increase in overweight among children demands our attention and action. Because children

Things to Consider When Purchasing and Using a Pedometer¹⁸

1. Purchase a good-quality pedometer with a safety strap or leash so that if it becomes dislodged, it will not fall to the ground. Consult online evaluations to determine the best models.
2. Wear the pedometer in a horizontal position on the waistband or belt, directly above the center of your leg.
3. Treat the pedometer with care, as it is a sensitive instrument. It should not be shaken, thrown, dropped, or allowed to get wet.
4. Not all pedometers count steps accurately. If you suspect the pedometer is not measuring each footstep, reset it to "0," walk 100 steps, then check to see how close to that number of steps the pedometer displays.
5. A helpful feature is a reset button with a delay feature to prevent data from being inadvertently erased.¹⁹
6. More-expensive pedometers have added features like distance walked and calories burned, but studies have shown that pedometers are most accurate for counting steps, less accurate for measuring distance, and even less accurate for calculating calories burned.²⁰

spend most of their waking hours in school, if we want them to eat better and exercise more, that's the logical place to initiate change. The intervention described below reports on one physical educator's attempt to collaborate with classroom teachers in promoting physical activity.

Pedometer Monitoring

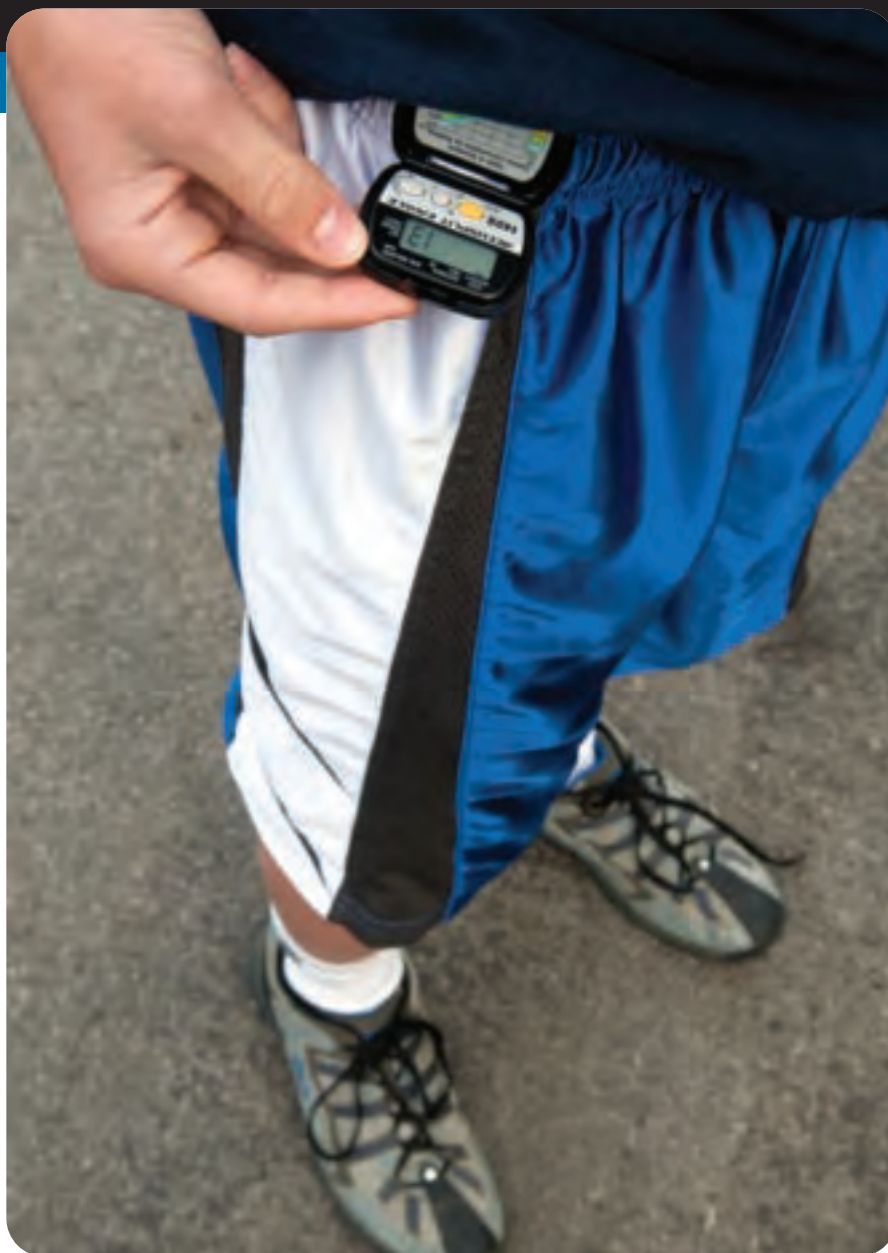
Recently, pedometers have become popular in promoting physical activity through daily step count monitoring.²¹ When the pedometer is attached to clothing near the hip, its internal mechanism moves up and down as the person walks, recording each step and calculating the distance walked.

Five teachers from four schools in the Gulf States Conference (which encompasses the states of Alabama and Mississippi as well as several counties in Florida) volunteered their classrooms to participate in a research study to determine the feasibility of classroom teachers using pedometers to promote student physical activity. The teachers were recruited to participate because they worked at schools that did not employ a physical-education specialist.

Forty-seven pupils in grades 4 to 9 at participating schools wore the Yamax Digi-Walker 140S pedometer²² for six weeks.

Because pedometers do not measure intensity of activity, students participating in the study were told to wear them during discretionary time (i.e., recess, free time, activity time, and physical education). The pedometers were collected and put away during the times when the children were doing seat work or were unlikely to be at least moderately active.

For the first week, to determine a baseline value for the daily average student step count, the children wore the pedometers without any teacher guidance regarding physical activity. The students were each given a one-page



form titled "School Step Count Log," on which they were asked to record their personal data each day.²³

For weeks two thru six, the students were encouraged to use strategies that the researchers had provided to the teachers to increase their physical activity above the baseline and then to calculate the daily average step count for the week. Finally, the pupils were asked to fill out a paper-and-pencil survey appraising their physical-activity habits.

Findings

The average step count during the baseline week was 3,993 ($sd = 1996$).

During subsequent weeks, the students' step count averages ranged between 3,859 ($sd = 2103.66$) and 5,171 ($sd = 2681.01$) steps. There was a significant increase in step counts for weeks four²⁴ and six²⁵ when compared with the baseline week. The data was also compared to the criterion value of 3,000 steps, which was chosen because it was possible for the 4th to 9th graders to complete this number of steps while at school. (Three thousand steps are equivalent to walking about 1.5 miles [2.41 km] and require about 20-25 minutes to accumulate.)²⁶

Table 1
Favorite Spare Time Activities for Boys in Grades 7-9

Percentage of Responses	Activity
22%	Computer/TV/video
22%	Team sport activities (i.e., basketball, football, baseball)
22%	Individual sports (i.e., bicycling, swimming, running)
18%	Extreme sports (i.e., skateboarding)
16%	Miscellaneous sedentary

Table 2
Girls' Favorite Spare Time Activities (Grades 7-9)

Percentage of Responses	Activity
56%	Miscellaneous sedentary activities (i.e., talking on the phone to friends, listening to music, practicing music, reading)
19%	TV/computer/video/movies
13%	Team sport activities (i.e., basketball, volleyball, softball)
7%	Individual sport activities
5%	Extreme sports

Table 3
Students' Perceptions of Time Spent in Physical Activity

Time Increment	Percentage Reported by Boys	Girls
More than 60 minutes	67%	10%
45-60 minutes	17%	30%
30-44 minutes	17%	40%
20-29 minutes	0%	10%
10-19 minutes	0%	10%
0-9 minutes	0%	0%

The results indicated a significant increase ($p < .01$) in the students' step counts for the baseline week and with each week of teacher intervention, when compared with the goal of 3,000 steps.

The researcher concluded that pedometers offer a unique, affordable, and practical way to teach, assess, and promote youth physical activity, and to help combat adolescent obesity.

Assessing Physical Activity

In addition to the pedometer study, students were asked to complete a survey pertaining to physical activity. Several of the responses were noteworthy. The survey revealed a huge difference between the genders in the types of favored free-time activities: For the boys in grades 7 to 9, 62 percent of the preferred activities involved physical activity (Table 1), in contrast with only 25 percent of the activities listed by the girls (Table 2).

Students were asked to indicate how much time they spent in strenuous physical pursuits (activities that made them breathe hard, get tired, or sweat) on most days of the week. Sixty-seven percent of the boys and 10 percent of the girls responded that they spent more than 60 minutes a day in physical activity (Table 3).

Students were also asked to indicate the things in their life that kept them from being physically active. The top three barriers to being physically active reported by these students were school-work (71 percent), lack of time (53 percent), and weather (40 percent).

Significance of the Study

The classroom teacher is in a key position to educate students on health issues and to encourage healthy behavior. This is especially true in many Adventist elementary schools, since few of them employ a physical education specialist. Unless classroom teachers take the initiative and schedule some type of organized activity, pupils will be left on their

own to plan activities and develop attitudes about physical activity. Working with resource people such as physical educators or allied-health professionals, classroom teachers can find ways to get their pupils involved in more physical activity during the school day.

Every school should deliver comprehensive health programs that provide and promote physical activity. The curricula should provide youngsters with enjoyable experiences that build exercise self-efficacy, provide significant amounts of physical activity, and promote the value of lifelong participation in active pursuits. The following items should be given careful attention by all those who come into contact with children in Adventist schools:

Classroom teachers in the Seventh-day Adventist school system need to get their pupils moving to prepare them for a lifetime of physical activity.

Females especially need to be encouraged to be physically active. Girls enjoy the social aspect of physical activity, so they are more likely to participate in group activities if their friends do so also. Because they are less attracted to competitive activities than their male peers, they can be encouraged to participate in group fitness activities such as aerobics, indoor cycling or spinning, pilates mat training, stability ball training, and group strength training. Both boys and girls will enjoy outdoor adventure activities such as walking, hiking and backpacking, rock climbing, canoeing, and kayaking.

The Body Mass Index (BMI) for Age should be calculated for each pupil at the beginning of each school year.²⁷ This ensures that positive and negative trends in children's body weight are measured and monitored.

Physical education specialists need to partner with the church's elementary schools to serve as physical activity coordinators, intervention organizers, and resource persons.²⁸



InStep for Life Program

Schools should consider adapting a walking program such as the "InStep for Life" physical-activity initiative of the North American Division of Seventh-day Adventists. The program promotes regular physical activity through walking and monitoring progress with a pedometer. Its updated Website, <http://www.adventistsinstepforlife.org>, offers free logging and tracking of step counts.

Teachers need to embed instruction relating topics of physical activity, nutrition, and weight control topics in the curriculum. They will find it helpful to invite experts like nutritionists and exercise coaches to make presentations to their classes.

Strategies for Promoting Physical Activity

Physical education specialists can partner with classroom teachers to encourage adoption of the following strategies to increase physical activity among pupils:

- *Integrate walking into the school day.* Ellen White states, "When the weather will permit all who can possibly do so ought to walk in the open air every day, summer and winter. . . . A walk, even in winter, would be more beneficial to the health than all the medicine the doctors may prescribe."²⁹
- *Organize extracurricular activities that engage pupils in sustained exercise.*
- *Use the school's closed-circuit television system or DVD players to broadcast exercise videos.*
- *Develop partnerships with media, businesses, and civic organizations to conduct ongoing activities.*
- *Create new or develop existing physical activity spaces at school.*
- *Develop a coordinated school health model that emphasizes increased physical activity for students and staff.*

Conclusion

The rationale for promoting physical activity in children and youth is well established. During childhood and adolescence, young people develop attitudes and habits relating to health-related behaviors, including physical activity, that can carry over into adulthood. Teaching and modeling an active lifestyle is a vital role for classroom teachers to play in enhancing the long-term health and well being of their students. ☞



Robert C. Bengé, Ph.D., is a Professor in the School of Physical Education, Health, and Wellness at Southern Adventist University in Collegedale, Tennessee,

where he teaches classes in the Physical Education Teacher Education program.

NOTES AND REFERENCES

1. T. Lobstein, L. Baur, and R. Uauy, "International Obesity Task Force: Obesity in Children and Young People: A Crisis in Public Health," *Obesity Reviews* 5 (2004):4-104.
2. Ibid.
3. World Health Organization, "Obesity and Overweight: Factsheet No. 311" (2006): <http://www.who.int/mediacentre/factsheets/fs311/en/print.html>. Retrieved March 2, 2010.
4. "It is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m²)," *ibid.*, par. 2.
5. Centers for Disease Control and Prevention (2011a): <http://www.cdc.gov/obesity/childhood/basics.html>. Retrieved August 9, 2011.
6. *Ibid.*; World Health Organization (2006).
7. American College of Sports Medicine, *ACSM's Resource Manual for Guidelines for Exercise Testing and Prescription, Fifth Edition* (Philadelphia: Lippincott Williams & Wilkins, 2006); Sheri R. Colberg, "Enhancing Insulin Action With Physical Activity to Prevent and Control Diabetes," *American College of Sports Medicine Health & Fitness Journal* 12:2 (March/April 2008):16-22.
8. Ali H. Mokdad, James S. Marks, Donna F. Stroup, and Julie L. Gerberding, "Actual Causes of Death in the United States," *Journal of the American Medical Association* 291:10 (2004): 1238-1245.
9. R. Sinha, et al., "Prevalence of Glucose Tolerance Among Children and Adolescents With Marked Obesity," *New England Journal of Medicine* 346:11 (2002):802-810.
10. Paul Muntner, Jiange He, Jeffrey A. Cutler, Rachel P. Wildman, and Paul K. Whelton, "Trends in Blood Pressure Among Children and Adolescents," *Journal of the American Medical Association* 291:17 (2004):2107-2113.
11. Marie P. St.-Onge, Kathleen L. Keller, and Steven B. Heymsfield, "Changes in Childhood Food Consumption Patterns: A Cause for Concern in Light of Increasing Body Weights," *American Journal of Clinical Nutrition* 78 (December 2003):1068-1073.
12. *Ibid.*; World Health Organization (2006).
13. James F. Sallis, Judith J. Prochaska, and Wendell C. Taylor, "A Review of Correlates of Physical Activity of Children and Adolescents," *Medicine and Science in Sports and Exercise* 32:5 (May 2000):963-975.
14. Thomas W. Rowland, *Adolescence: A "Risk Factor" for Physical Activity. The President's Council on Physical Fitness and Sports Research Digest* (Series 3, No. 6) (Washington, D.C.: President's Council on Physical Fitness and Sports, 1999).
15. James F. Sallis, "Epidemiology of Physical Activity and Fitness in Children and Adolescents," *Critical Reviews in Food Science and Nutrition* 33 (1993):403-408.
16. Centers for Disease Control and Prevention (2011b), "How Much Physical Activity Do Children Need?" <http://www.cdc.gov/physicalactivity/everyone/guidelines/children.html>. Retrieved August 9, 2011.
17. U.S. Department of Health and Human Services, *Healthy People 2010, Volume 2* (Washington, D.C.: U.S. Government Printing Office, 2010).
18. *Creative Walking* (2010). Retrieved March 2, 2010, from <http://www.creativewalking.com>.
19. Walk 4 Life Inc., "Technology and Physical Education: Motivating, Measuring and Rewarding Students for Physical Activity" (n.d.). Retrieved March 2, 2010, from http://www.walk4life.com/education/education_whitepaper.aspx.
20. Scott E. Crouter, P. L. Schneider, M. Karabulut, and D. R. Bassett, Jr., "Validity of 10 Electronic Pedometers for Measuring Steps, Distance, and Energy Cost," *Medicine & Science in Sports and Exercise* 35:8 (2003):1455-1460.
21. Don H. Hall, "InStep for Life: Physical Activity Comes Alive in the Adventist Church," *Adventist World-NAD* (April 2008):25-28.
22. The author in a separate (unpublished) study validated the reliability of the Yamax Digi-walker 140S pedometer. Its reliability was determined to be .95 ($p < .01$), and the validity was determined to be .89 ($p < .01$).
23. C. F. Morgan, R. P. Pangrazi, and A. Beighle, "Using Pedometers to Promote Physical Activity in Physical Education," *Journal of Physical Education, Recreation, and Dance* 74:7 (2003): 33-38.
24. ($p < .05$, $M = 4466$, $sd = 2259$).
25. ($p < .001$, $M = 5171$, $sd = 2681$).
26. Robert Sweetgall, *Pedometer Walking: A New Look at Walking, Longevity, Weight Management, and Active Living* (Clayton, Mo.: Creative Walking, 2001).
27. *Ibid.*; Centers for Disease Control and Prevention (2011a).
28. Julienne K. Maeda and Nathan M. Murata, "Collaborating With Classroom Teachers to Increase Daily Physical Activity," *Journal of Physical Education, Recreation, and Dance* 75:5 (2004): 42-46.
29. Ellen G. White, *Counsels on Health* (Mountain View, Calif.: Pacific Press Publ. Assn. 1957). p. 52.