

Kids on the Move: The Effects of a Short-Term Physical Activity Program in a Group of Rural Elementary School Students

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Abstract

Obesity and physical inactivity are serious problems in the United States. Through a grant awarded by the Florida Department of Health, school health providers at the Madison County Health Department undertook a study to assess measurable impact of a basic physical activity program in a convenience sample of elementary school students. Using pedometers and other student incentives, the school health staff worked with teachers and administrators to implement an exercise program for 379 students. At the conclusion of the study, 364 students had completed both baseline and follow up measurements for age, gender, height, weight, body mass index calculation, and blood pressure. A surprisingly high proportion of students were found to have a high body mass index upon initiation of the study. Body mass index declined slightly in each group over the course of the study. However, there was not a corresponding decrease in blood pressure within each group. The results demonstrated some measurable benefit of a physical activity program in this group of students.

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Introduction

Obesity and physical inactivity have become serious problems in society (Summerfield, 1998). Whereas numerous studies have demonstrated the relationship between sedentary lifestyles and overeating on chronic diseases in adults, there is a lack of evidence that increased physical activity in childhood reduces risk for adult chronic diseases (Bar-Or, 1998). In addition, there are few studies demonstrating specific immediate benefits of physical activity on children and adolescents.

In October 2003, the Madison County (Florida) Health Department received a grant to be used to implement a physical activity program in the community. This grant was awarded through the Florida Department of Health's Bureau of Chronic Disease Prevention. Staff members in the school health program used these funds to purchase pedometers and incentives to encourage third-, fourth-, and fifth-grade pupils to engage in a structured program of walking for exercise. A walking program was chosen because of its low cost, ease of implementation, and perceived acceptability to students and teachers. The program was implemented over a period of four weeks in May 2004. Students' blood pressures, weights, and body mass indices were measured prior to, and at the conclusion of, the exercise program. Measurements were compared to assess the effect of a short-term exercise program on these health indicators.

Background

Review of the Literature

More children today are overweight or obese than ever before (Summerfield, 1998). Whereas health care providers are generally in agreement that physical activity is of benefit in enhancing overall

health, little is known about the amount of physical activity required to generate a specific health benefit. Added to this uncertainty is the question of how physical activity can best be promoted among children and youth.

Healthy People 2010 cites physical activity and overweight/obesity as two of the ten leading health indicators in the nation's health objectives for the present decade (CDC, 2004). Fifteen of the *Healthy People 2010* objectives addressing these indicators are directly related to physical activity, and physical activity is mentioned in almost every priority area because of its contribution to increased risk for many health problems.

The CDC has developed guidelines for school and community programs to promote physical activity among children and youth (CDC, 1997). These guidelines provide information for school health programs to promote healthy behaviors, and to address instructional programs and psychosocial and physical environments within schools. Whereas they are written for professionals who design and deliver physical activity programs, they also recognize that childhood physical activity is affected by factors beyond the school setting. These additional elements include parental and community involvement.

Late childhood and early adolescence are times of great growth and change. This period creates special health needs and risks for young people. The United States Department of Health and Human Services has developed a document to assist in planning the health supervision of infants, children, and adolescents. This document, *Bright Futures*, includes recommendations for the encouragement of physical activity during late childhood and adolescence. Included in these guidelines are issues that should be addressed by

health professionals. Concerns about body image, height and weight are cited as areas of particular interest for this age group (Green & Palfrey, 2002).

Obesity and hypertension are major risk factors for cardiovascular disease (U.S. Department of Health and Human Services, 2003). However, most studies concerning the impact of obesity and hypertension have been conducted in the adult population. Guidelines for children's blood pressure checks are currently planned for publication by the CDC (Centers for Family and Community Health, 2004). There is currently a lack of normative data for blood pressure values in children. However, the level of blood pressure in children is considered the strongest predictor of adult blood pressure level (Koch, 2001). Risk factors for heart disease such as dyslipidemia and hypertension occur with increased frequency in overweight children (U.S. Department of Health and Human Services, 2005). By engaging in physical activity to prevent and address obesity, such risk factors may be prevented.

Not all studies have demonstrated a benefit from physical activity on blood pressure readings. In a meta-analysis of studies examining exercise effects on resting blood pressure in children and adolescents, Kelley, Kelley and Tran (2003) found that exercise has little effect on reducing systolic and diastolic blood pressure. However, the authors noted that the majority of subjects included in the studies were already normotensive prior to the intervention. Much work remains to be done to examine the benefits of physical activity on specific populations.

County Statistics

Madison County (population 18,718) is a rural county located in the Florida panhandle east of Tallahassee. The population is 57.5% white, 40.3% African American, and 3.2% Hispanic. Children under the age of 18 comprise 25.3% of the population. In addition, 27.9% of children live below the federally defined poverty level, whereas the state average is 21.8%. The average per capita income is \$13,683, compared to a state average of \$28,145 (U.S. Census Bureau, 2002; DOH Office of Planning, 2000).

Of Florida's 67 counties, Madison County ranked second in deaths due to diabetes in 2002. The county age-adjusted death rate was 57.4 deaths per 100,000 population. The 2004 statewide goal for the diabetes age-adjusted death rate (AADR) is 20.0 deaths per 100,000. The percentage of the adult population (age 18 and over) in Madison County that reported ever being told by a doctor that they have diabetes is 14.4%. The state rate is 8.2%.

Madison County fares somewhat better in deaths due to coronary artery disease, ranking 24th among the 67 counties. Madison County's AADR of

171.1 per 100,000 population compares favorably to the state goal of 173.6, but has not reached the *Healthy People 2010* target of 166.0 deaths per 100,000. The percent of the adults reported as obese in 2002 was 34.1%. This figure is higher than the state result of 19.4% and far removed from the *Healthy People 2010* target of 15% (Bureau of Chronic Disease Prevention, 2004).

Methods

In 2003, the Florida Department of Health initiated a health promotion campaign entitled "Just Move." The goal of the campaign was to promote 30 minutes of exercise daily by all citizens. The Madison County Health Department (MCHD) was the recipient of one of several mini-grants awarded to develop activities supportive of the campaign. The MCHD administrator and staff developed the "Kids on the Move" program to address the absence of planned physical education activities in the Madison County school district. The program was used to develop an environmental intervention with the potential to impact the health of the community. Due to the strong relationship between the health department and the school district, the grant coordinators chose to focus on increasing the physical activity of students in grades three through five at Madison Central School, where the largest proportion of children in these grades attend school.

Madison Central School is the largest school in Madison County with 1,707 students in pre-kindergarten through 8th grade. MCHD school health program staff and other MCHD staff members facilitated the implementation of the project. The third-, fourth-, and fifth-grade teachers were contacted and enlisted to assist with coordinating student enrollment and participation. A pre-existing courtyard on the school campus was used for the walking program as it was a safe and accessible environment.

The plan called for every student in the selected grades, as well as faculty and administrative staff who wished to participate, to engage in a walking program for 30 minutes a day to be conducted on-site at the school. Pedometers were purchased and issued to every student and teacher to track walking distance and challenge participants to a "10,000 steps a day" goal. This goal was selected to fulfill both state and federal recommendations for 30 minutes of daily physical activity. Tracking steps was useful in creating awareness of true activity, and was used as a talking point on the benefits of walking to the cardiovascular system.

Sun visors and sunscreen lotion were purchased for each child, to promote sun safety while

walking. Water bottles also were issued to promote the importance of being well hydrated while engaging in physical activity. This activity also was a way to encourage students to drink water rather than soda. Tee-shirts with a program logo were purchased and used to keep students motivated to maintain their walking challenge. Other incentives rewarded youth for continuing to meet the daily and weekly activity goals. Additional items included Frisbees,TM hula-hoops, mini-soccer balls, and jump ropes.

Initially, teachers expressed concerns about the study, citing a lack of time to participate, scheduling difficulties, and a preference for other locations to implement the activity. In addition, a few pedometers were found to be defective, creating frustration for students. Over time, however, teachers became active participants and supporters of the program and were very effective at encouraging continued participation by students.

Guidelines created for the project called for students to walk for 30 minutes a day, five days a week, for four weeks. Only steps taken during the 30 minute walking program were tracked with the pedometers. At the conclusion of the study, some teachers reported that they personally decided what the length of the activity would be at times, so the actual walking time varied slightly on some days. The few exceptions such as this were stated to be due to inclement weather or special student meetings that reduced the activity by 5-10 minutes on fewer than 10 occasions.

The population of children in the aforementioned grades included 405 students. Of that group, 379 students participated in baseline screening. Data collected for each student included age, gender, weight, height, body mass index (BMI) and blood pressure. The initial group included 221 males and 160 females. There were 364 students available for re-screening at the end of the project, including 209 boys and 156 girls. The same data elements were collected at the conclusion of the activity program and comparisons were made to the baseline data.

Results

After completing the four-week walking activity, student measurements including weight, BMI, and blood pressure were taken and recorded for comparison to the baseline data. All of the data were analyzed using a Microsoft Access database created for this purpose.

There were 364 students who completed the study, with boys outnumbering girls 208 to 156. Age and gender distributions are provided in Table 1. Reasons given for attrition were students moving and

school transfers. There were no reported health-related reasons for attrition.

Table 1: Age and Gender Distribution of Participants

Age (years)	N of Boys	N of Girls
8	8	5
9	41	37
10	54	47
11	62	42
12	38	19
13	5	6
Total	208	156

As an illustration of the scope of the pediatric obesity problem in this population of children, body mass index (BMI) measured at the initiation of the study was compared to national data for BMI in the same age groups. This comparison is displayed by age and gender in Table 2.

Table 2: Percent of Boys and Girls at Risk for Overweight (BMI greater than 85th percentile for age) or Overweight (BMI greater than 95th percentile for age) Prior to Walking Program

Girls	Percent >85 th Percentile for Age	Percent >95 th Percentile for Age
8 years	80.0%	40.0%
9 years	48.6%	29.7%
10 years	57.4%	29.8%
11 years	47.5%	33.3%
12 years	57.9%	26.3%
13 years	33.3%	33.3%
Boys		
8 years	50.0%	37.5%
9 years	34.2%	19.5%
10 years	38.9%	25.9%
11 years	43.6%	27.4%
12 years	42.1%	23.7%
13 years	40.0%	40.0%

At the conclusion of the activity program, a decline in average body mass index was noted in each group studied. These data are displayed in Table 3.

Student blood pressure measurements also were compared prior to, and following, the four-week intervention. Whereas individual results are mixed, there was no overall decline in blood pressure for the

group taken as a whole. Table 4 summarizes these findings.

Discussion

In this small convenience sample there was a surprisingly high proportion of students noted having a body mass index exceeding the 95th percentile based on the BMI charts. The short-term physical activity program implemented did produce a slight decline in the mean body mass index in each group measured. Whereas there was not a corresponding decrease in systolic or diastolic blood pressure overall, the results do demonstrate some measurable benefit of a physical activity program for these students. Additional benefits noted by the school principal and teachers were improved behaviors, attitudes and academics based on teacher observations.

This study was limited by the time available to intervene and it is recommended that a longer

activity program be considered for future research. The investigators found it surprising that such a limited program of activity resulted in a measurable change in BMI. This activity was considered to be a fairly minimal one for children in this age group. This project focused on a narrow age range of students in a single county and could be expanded to other ages in both rural and urban counties. The role of nutrition in influencing body mass and blood pressure in this age group also remains to be studied. As children do not grow linearly, a larger study would be useful to more strongly demonstrate that these results were not due to normal growth and development. A further limitation of this study was the occasional shortening of the walking period by teachers due to special events. An additional study using a control group of children also would contribute to the internal validity of the intervention (McDermott & Sarvela, 1999).

Table 3: Average BMI Change by Age Group and Gender

Girls				
Age (years)	Beginning BMI	Ending BMI	Change	P-value
8	22.04	21.90	-0.14	0.9709
9	20.89	20.50	-0.38	0.7452
10	22.04	21.59	-0.45	0.6836
11	23.32	22.82	-0.50	0.7348
12	24.00	23.30	-0.69	0.8038
13	22.80	22.03	-0.76	0.8549
Boys				
8	19.28	18.91	-0.37	0.8032
9	19.98	19.80	-0.18	0.8664
10	20.93	20.46	-0.47	0.5223
11	22.31	21.85	-0.45	0.6489
12	22.06	21.44	-0.62	0.5452
13	25.00	24.26	-0.74	0.8895

Table 4: Average Blood Pressure Change by Age Group and Gender

Girls' Mean Systolic Blood Pressure				
Age (years)	Beginning	Ending	Change	P-value
8	111.2	97.6	-13.6	0.1214
9	102.1	98.0	-4.1	0.2530
10	97.8	97.7	-0.1	0.9474
11	101.5	101.7	0.2	0.9420
12	105.2	106.0	0.8	0.8139
13	105.0	105.3	0.3	0.9576
Girls' Mean Diastolic Blood Pressure				
8	65.6	70.0	4.4	0.6286
9	63.6	63.3	-0.3	0.8844
10	62.4	63.9	1.5	0.2811
11	65.1	65.2	0.1	0.9794
12	67.2	66.4	-0.8	0.7901
13	61.7	67.7	6.0	0.3797
Boys' Mean Systolic Blood Pressure				
8	98.3	97.3	-1.0	0.8801
9	102.8	100.0	-2.8	0.1919
10	100.2	101.0	0.8	0.7012
11	103.9	101.6	-2.3	0.2432
12	103.3	105.0	1.7	0.5518
13	105.6	108.8	3.2	0.6511
Boys' Mean Diastolic Blood Pressure				
8	62.5	59.3	-3.2	0.4191
9	66.9	64.9	-2.0	0.2177
10	64.6	66.1	1.5	0.3248
11	67.7	65.7	-2.0	0.2125
12	66.2	67.9	1.7	0.3775
13	67.6	71.6	4.0	0.4964

The challenge of promoting physical activity among children and youth lies in the hands of the adults who work with young people. These adults include parents, school personnel, and health care workers. The local school district could consider a physical education policy providing every child with 30 minutes of physical activity during every school day. The corresponding curriculum should be consistent with the Sunshine State Standards and the National Physical Education Standards. The school district or community also may consider forming a Wellness Council to coordinate school health issues and develop long-range goals and outcomes. This

end could be accomplished through a Wellness Team consisting of parents, teachers, nutritionists, food service workers, and school nurses. The team's focus would be the promotion of healthy lifestyles in students. A needs assessment should be conducted to identify available resources and funding within existing physical education departments. The students should be involved and queried as to the physical activities that are appealing for each age and gender group.

Physical activity is listed as one of the leading health indicators in *Healthy People 2010*. Objective 22-7 addresses specific performance as

follows: "Increase the proportion of adolescents who engage in vigorous physical activity that promotes cardiorespiratory fitness to three or more days per week for twenty or more minutes per occasion." This objective can be used to measure progress toward the achievement of this indicator. Regular physical activity throughout life is important for maintaining a healthy body, enhancing psychological well-being, and preventing premature death. Pedometer programs such as this one are a significant source of incentive and reinforcement to participate in physical activity.

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