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The Effects of an ActiPed Pedometer Intervention Program on Body Composition and Aerobic Capacity of Youth in a School System in East Tennessee.

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by

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ABSTRACT

The Effects of an ActiPed Pedometer Intervention Program on Body Composition and Aerobic Capacity of Youth in a School System in East Tennessee

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The purpose of this study is to determine if the ActiPed Pedometer Intervention Program would sustain or improve aerobic capacity or body composition scores over a 12-week period for students ages 8-12 in a school system in East Tennessee. Obesity is an epidemic in Tennessee and in the United States. In fact, Tennessee has the 5^{th} highest obesity rates for youth in the United States. National and State Legislations with physical activity and wellness mandates are being passed at an alarming rate as the need to combat the obesity epidemic is astonishing. The responsibility to decrease the obesity rates in children is falling on schools systems, administrators, school nutrition personnel, and teachers. Therefore, the search for effective programs to fight the “battle of the bulge” in a school setting is becoming increasingly popular. This study focused on the ActiPed Pedometer Program and its effort to increase activity levels of students in a school setting.

The local Young Men’s Christian Association (YMCA) composed and received a grant from Wellmont Health System to help Activate Bristol and get students moving. The YMCA partnered with the Bristol Tennessee City School System in the fight against

inactivity and childhood diabetes implementing the ActiPed Pedometer Intervention Program in January of 2008.

Secondary data were collected by the investigator which included pretest and posttest Fitness Tests measures for body composition and aerobic capacity scores for both a treatment and a control group to determine success of the program. There were 310 students in the treatment group and 295 students in the control group for the body composition analysis for students at a healthy weight. The body composition analysis for overweight students included 83 students in the treatment group and 82 students in the control group. The aerobic capacity analysis for students at a healthy weight included 371 students in the treatment group and 323 students in the control group. The aerobic capacity analysis for overweight students included 78 students in the treatment group and 79 students in the control group. Population numbers differed because of missing or incomplete data on students.

Base level findings revealed mixed results. Because a successful score is dependent on age and gender, students' scores were analyzed accordingly using Chi Square and Independent *t* tests. Statistically, the ActiPed Intervention Program did not appear to have a great impact on aerobic capacity scores or body mass index scores for students for the 12-week period. However, all groups had positive mean gains. A significant difference was found for 9-year-old girls in aerobic capacity gains between the control and treatment group. Eight-year-olds, 9-year-olds, and 10-year-olds tended to have more positive results and higher gains than 11 and 12-year-olds.

DEDICATION

The completion of this dissertation is dedicated to the following members of my family:

To my husband Eugene for his patience, understanding, and unconditional love throughout the endeavor. Thanks for keeping me focused on the light at the end of the tunnel.

To my son Dayton for making my breaks from the computer fun and exciting. You light up my life like fireworks on the fourth of July. I love how you spread joy and laughter to all around you. The sky is the limit!

To my parents Jerry and Janice Russell for their love and support. You gave me the courage to attempt, the strength to endure, and guidance when I became discouraged and lost sight of my goals.

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CHAPTER 1

INTRODUCTION

Obesity is an epidemic in the state of Tennessee and in our nation as nearly 50% of adults are overweight or obese in the United States (U.S. Department of Health and Human Services, 2009). Obesity is not only a problem for adults, as nearly 15% of the country's youth are overweight, with 12 million children and adolescents classified as obese (National Conference for State Legislator [NCSL], 2008). Tennessee is ranked number 4 for the highest obesity rates for adults and number 5 (36.5% for ages 10-17) for the largest percentage of overweight youth. Over 30 states have 30% of their youth who are overweight or obese (Trust for America's Health, 2009). In the past 20 years, physical activity has declined and obesity levels have increased as "the rates of overweight children have doubled, and even tripled in adolescents" (National Conference of State Legislators, 2006, ¶ 1).

Trends in adolescent behavior over the past 20 years may explain a few factors that have increased obesity in children. Technological advancements such as handheld video games, video game consoles, iPods, and the increased availability of computers compete for time of school age children after school hours replacing free play. Thirty-five percent of students indicated they spent 3 or more hours watching television and 25% of students played video games or computer games not related to homework on an average school day. Advancements in technological toys have put students on the couch playing games instead or searching the internet instead of participating in physical activity opportunities. The advancements may be one reason that 65% of students do not meet the daily recommended levels of physical activity (CDC, 2008).

The passage of the No Child Left Behind Act (NCLB) of 2001 enforced stronger accountability for schools to achieve using proven scientifically based methods. The methods and programs targeted teaching methods to improve learning and academic achievement. This accountability forced local education agencies and administrators to focus on standardized testing, placing less emphasis on the arts and developing healthy bodies (Weshler, 2004). In 2007 the Center for Disease Control and Prevention (CDC) conducted the National Youth Risk Survey for high school students that articulated school factors contributing to the increase in obesity rates. These factors include: (a) the lack of physical education requirements; (b) the lack of opportunities for physical activity during and after the school day; (c) the need to teach better dietary behaviors and offer health courses; (d) the lack of healthier food choices in the school cafeteria and limiting unhealthy choices in snack machines.

Because 95% of children attend school, the obesity epidemic is unlikely to be halted without strong school based policies and programs. Recognizing the benefits of a strong mind and a strong body as well as the correlation existing between the two can help local education agencies and state legislators realize the need to realign resources to improve both academics and physical fitness.

Administrators must acknowledge research indicating the benefits of exercise on brain functions. Castelli and Hillman (2007) indicated that exercise plays an important part in the production of new brain cells. Exercise can increase attention span and time on task (Mahar 2009; Richardson 2009). Exercise increases memory and learning while reducing stress (Richardson, 2009). Seigel (2006) demonstrated the link between physical fitness and academic achievement in a study correlating fitness test scores of

884,715 Californian students with the (SAT) Stanford Achievement Test's reading and math scores increased as the number of fitness test passed increased. Studies portraying the academic and physical benefits associated with physical activity are essential in advocating the need for schools to increase student activity levels in the fight against obesity.

The Center for Disease Control and Prevention estimates that "if the current obesity trends continue, one third of all children and one half of African-American and Hispanic children born in 2000 will develop diabetes" (NCSL, 2006, ¶ 3). Therefore, we must take appropriate actions to combat obesity and inactivity by reaching out to America's youth. This can motivate them to become more active and teach them how to live a healthy active lifestyle.

A well-known fitness organization and school system in East Tennessee developed a partnership to take action in the fight against obesity and the lack of physical activity of children. The Young Men Christian Association (YMCA) in cooperation with the Bristol Tennessee City School System (BTCS) Coordinated School Health Program implemented the Activate Bristol ActiPed Digital Pedometer Program to help fight inactivity by motivating students to get more steps and be more active.

Statement of the Problem

This study examined if students' aerobic capacity and body composition (body mass index) scores were different for students who participated in a pedometer intervention program as opposed to students who elected not to participate or participated on a limited basis. Students were categorized as either being in the control group or treatment group. The control group wore pedometers for 0-5 weeks, while the treatment group wore pedometers 6-12 weeks. The focus is to determine if the pedometer intervention program would sustain or improve aerobic capacity or body composition over a 12-week period for students in a small school system in East Tennessee.

Significance of the Study

This study will be useful to school administrators, governmental officials, and teachers as findings will make a significant contribution to the body of knowledge about pedometers use in school and programs and tools to increase physical activity in schools. This program does not require highly trained personnel to implement and the study has the potential of adoption by schools across the nation due to the ease of use. This is the first time for implementation of an ActiPed digital pedometer program in a school setting in the United States; therefore, minimal research exists on digital pedometers in school settings. In fact, due to initial cost ($30 per pedometer) there is minimal research on any type of pedometer use in school settings. This study may also lead to trends of physical activity or inactivity in schools as pedometers track student activity levels. .

Research Questions

Research questions that will guide the study are*:*

Question 1.

Is there a difference in the Body Mass Index Classifications from pretest to posttest between students in the control and treatment groups?

Question 2.

For students who had a Pretest Body Mass Index score higher than the healthy range for students' age and gender (overweight), is there a difference in the Posttest Body Mass Index Classification between students in the control and treatment groups?

Question 3.

Is there a difference in the aerobic capacity gain scores between students in the control and treatment groups?

Question 4.

For students whose Pretest Body Mass Index Classification exceeded the healthy range for their age and gender (overweight), is there a difference in the aerobic capacity gain scores between students in the control and treatment groups?

Definitions of Terms

ActiPed Pedometer: The ActiPed is a digital pedometer produced by FitLinxx that tracks the number of steps taken and calculates distance traveled, walking versus running steps, and calories burned. It is the size of a quarter. It is noiseless, nearly weightless, and worn at flat part of the shoe just behind the toes. The ActiPed does not have a display so the information (step count) uploads via Remote Access Point (electronic reader). It takes less than10 seconds to upload the information to the link as it is read wirelessly through the Remote Access Point (RAP). In order for the ActiPed to be read the person wearing the ActiPed must stand within 50 meters of the RAP. The ActiPed can store step counts up to 12 days before it must be uploaded (FitLinxx ActiPed, 2009b).

Aerobic Capacity: "Aerobic capacity reflects the maximum rate oxygen can be taken up and used by the body during exercise" (Cooper Institute, 2010, p. 9). The FitnessGram Pacer test measured aerobic capacity in this research (Human Kinetics, 2009).

Body Composition: **"**Body composition refers to components that make up body weight" measuring the percent of fat in the body" (Cooper Institute, 2010, p. 10). The FitnessGram Body Mass Index Chart uses height and weight determines the percent of body fat for students. Boys are considered obese when their body fat is over 25%. Girls are considered obese when their body fat is over 32% (Human Kinetics, 2009).

Pacer: The FitnessGram Pacer test measures aerobic capacity. The Pacer test is a 15- or 20-meter running test that is set to a musical cadence. The PACER test progressively gets faster with each set (every minute). If students miss a cadence twice or stop running, their test is over. A criterion measure is set for each age group as a goal for students to achieve in the Healthy Fitness Zone (Human Kinetics, 2009).

Pedometer: A pedometer senses when the body is in motion (walking, stepping, running). Each time a step is taken a step count and distance are calculated (JSC Engineering LLC., 2008). Pedometers are typically worn on the waist and have a display. The ActiPed pedometer is worn on the flat part of the shoe just behind the toes (FitLinxx ActiPed, 2009)

FitnessGram: The FitnessGram is a health-related fitness test battery used to measure aerobic capacity, body composition, flexibility, muscular strength, and muscular endurance. This is a criterion referenced test in which students try to achieve a Healthy Fitness Zone that is set for their ages. Each fitness component has multiple options to assess students (Human Kinetics, 2009).

Physical Activity: Physical activity is the act of moving the body so it uses energy (Ekulund, 2009). Physical activity should be moderate to vigorous and add up to at least 60 minutes a day to achieve health related benefits (Center for Disease Control and Prevention, 2009).

Limitations and Delimitations

This study is delimited to students in the Bristol Tennessee City School System in grades 3-8 with complete data on body mass index and aerobic capacity fitness test. In addition, the experimental group is delimited to students who received an ActiPed, kept possession of the ActiPed pedometer, and consistently wore the pedometers.

This FitnessGram Body Mass Index data and Pacer Aerobic Capacity Data are limited to the accuracy of the instructors assessing students. It is assumed the data are accurate and valid. The results of this study may be generalized to similar school systems throughout the United States.

Overview of the Study

The study contains five chapters. Chapter 1 contains the introduction, statement of the problem, significance of the study, research questions, definitions of terms, limitations, delimitations, and an overview of the study. Chapter 2 consists of a review of literature of the following sections, physical activity, obesity, Tennessee Law and Legislation, Coordinated School Health, Pedometers, ActiPed /FitLinxx Pedometers, FitnessGram fitness assessment, programs to promote physical activity in schools, and the YMCA Activate Bristol Program. Chapter 3 provides discussion on the methodology.

Chapter 4 describes the results of the data analysis. Chapter 5 presents the summary of findings, conclusions, and recommendations for future research.

CHAPTER 2

REVIEW OF LITERATURE

The literature review contains information relevant to physical activity, legislation regarding physical activity, school-based programs to increase physical activity, measuring physical activity, and measuring fitness components. Chapter 2 consists of four sections: (a) physical activity, benefits of physical activity, school based programs to increase physical activity, and risk and cost associated with inactivity, (b) national and state legislation issued to increase physical activity levels of school age children, (c) measuring physical activity levels via pedometers, the history of pedometers, types of pedometers, and the ActiPed pedometer used in this research, and (d) measuring physical fitness levels including the FitnessGram aerobic capacity test and the Body Composition test. Chapter 2 concludes with a summary.

Physical Activity

The National Association for Sport and Physical Education (NASPE) (2009) recommends 15 minutes of physical activity several times a day for at least 60 minutes a day. Physical activity should last no longer than 2 hours or more during the day. It is recommended by the Center for Disease Control (CDC) that students participate in 1 hour of physical activity a day focusing on aerobic activity, bone strengthening, and muscle strengthening. Both NASPE (2009) and the CDC (2009) agree the child should participate in each of these activities three times per week; however, aerobic activity should make up most of the child's 60 minutes of physical activity per day. Aerobic activity includes activities that are moderate to vigorous such as walking briskly, hiking up hill, singles tennis, aerobic dancing, and running. Muscle strengthening and bone strengthening activities include push-ups, rope jumping, or running (CDC, 2009). The standard goal for physical activity for the general population is 10,000 steps per day (JSC Engineering LLC., 2008). However, the NASPE recommended goals for physical activity for school age children states that girls should achieve 12,000 steps a day and boys should achieve 15,000 steps a day (Pangrazi, 2003; Sallis et al., 2006; Tudor-Locke et al., 2004).

Benefits of Physical Activity

The benefits of participation in physical activity and daily exercise are known throughout the country. Physical activity builds and maintains healthy bones, muscles, and joints and prevents or delays the development of high blood pressure in adolescents (Surgeon General Report, 2009). In addition, physical activity has reduced triglycerides and insulin levels of overweight children (Hardin, Herbert, Bayden, Dehart, & Mazur, 1997; Steinberger & Daniels, 2003). Good cardio-respiratory endurance (aerobic capacity) reduces the risk of obesity, hypertension, heart disease, and some forms of cancer in adults (Blair et al., 1989; Blair, Kohl, Gordon & Paffenbarger, 1992). Physical activity is key in maintaining a healthy body, enhancing psychological well being, and preventing premature death (U.S. Department of Health and Human Services [USDHHS], 2009).

Despite the benefits associated with participating in physical activity, Americans are becoming less active than ever before. In fact, the Surgeon General reports (2009) state that nearly 50% of America’s youth are not vigorously active on a regular basis, and as age or grade increases physical activity decreases. Daily enrollment in high school physical education classes dropped from 42% in 1991 to 25% in 1995. Daily Physical Education under NASPE's recommended guidelines is offered at a rate of "8% of elementary schools, 6.4% of middle or junior high schools, and 5.8% of senior high schools" across the nation (Lynn, 2007, ¶ 5).

School-Based Programs to Increase Physical Activity

Curriculum adoption, specialized integration programs, pedometer step counting, and pedometer intervention programs appear to have a positive impact on physical activity levels across the country. While the focus has been on gathering the physical activity trends of youth and motivation using pedometers, more research could determine the benefits of pedometer intervention (Luepker et al., 1996; Sallis et al., 2003; Seigel, 2006).

Physical Education Curriculum Based Interventions

Increases in physical activity have been demonstrated through the adoption of curriculums that are aligned with national physical education standards (Sallis et al., 2003). Adoptions of one of the nationally acclaimed curriculums (a) The Child and Adolescent Trial for Cardiovascular Health (CATCH), (b) Sports, Play, and Active Recreation for Kids (SPARK), and (c) Exemplary Physical Education Curriculum (EPEC) have yielded positive results. CATCH and SPARK intervention studies revealed an increase of 7-12 minutes in physical activity when the curriculum was adopted for physical education (Hortz & Petosa, 2006). In addition, obese children 6-10 years of age who participated in the Catch or Spark curriculums over a period of 6 months improved body composition (Lazaar et al., 2007). The EPEC model has been well researched and has proven itself to reduce health risks associated with chronic diseases while "improving object-control skills, locomotor skills, personal/ social skills and concepts and principals related to nutrition and physical activity" (Governor's Council on Physical Fitness, 2007, ¶ 14). As a part of the healthy youth initiative in Michigan EPEC Personal Conditioning implemented in six Detroit middle schools, student's cardio-respiratory endurance scores increased 41% while health related fitness knowledge rose 9.4% (McCaughtry, 2005).

School-Wide Curriculum Integration Interventions

Tennessee enacted legislation in 2008 to require 90 minutes of physical activity per week; however, local education agencies were allowed to determine how to achieve the objective. Within the last decade, Kentucky and North Carolina developed programs to integrate physical activity with academic concepts yielding positive results (TAHPERD, 2007a).

Kentucky increased physical activity in the classroom with the Take 10 program. Teachers lead students through 10-minutes of activity 1-2 times per day. Stewart (2004) conducted a study in which each class participated in 10-minute sessions of the Take 10 program 8-9 times per week. Accelerometers (pedometers) indicated students achieved moderate to vigorous physical activity levels while reinforcing academic concepts (Stewart, 2004).

North Carolina used a 10-minute program called Energizers which was developed by East Carolina University in 2005. The Energizers goal is to increase physical activity of children during school. The philosophy of the program is to increase physical activity while increasing the retention of academic concepts of math, language arts, science, social studies, and health (TAHPERD, 2007a). The Energizers program is a downloadable free program (http://www.ncpe4me.com/energizers.html) for grades K-8. Mahar et al. (2006) researched the benefits associated with the Energizers Program and found students who participated in the Energizers intervention program significantly (p =.05) achieved more steps than the control group. In addition, observations revealed students attentiveness and time on task increased by 20% after Energizer activities.

Pedometer Intervention Programs

The focus of pedometer use has been on measurement of physical activity instead of intervention. Therefore, little research exists on pedometer intervention programs with school age children (Oliver, 2006; Scruggs et al., 2003).

Seigel (2006) conducted a study with pedometers with 1,839 students (1,046 females, 793 males; ages 6-18) in a metropolitan area of Arizona. Data were collected for 4 weeks. Males in grades 1-3 averaged 13,110 steps and males in grades 4-6 averaged 13,631. Males significantly had more steps than girls in the same grade. Female grades 1-3 averaged 11,120 steps per day and females in grades 4-6 averaged 11,125 steps per day. Seigel (2006) concluded that “pedometers can be used to assess activity in youth” and “that pedometers are a motivational tool for students to become more active” (page173). Schofield, Mummery, and Schofield (2005) examined pedometers as a motivational tool to increase physical activity of low-active adolescent girls over a 12-week period. A population of 85 girls were randomly assigned to the control or treatment group. Both groups were issued pedometers; however, the control group set goals per minute for physical activity time while the intervention group set step goals to achieve while being physically active. Both the control group (time counters), and the pedometer group (step counters) significantly increased step counts ($p = 0.00$ - 0.01). In addition, the step counters group had a greater increase at mid-intervention point ($p = 0.01$). Schofield (2005) concluded that pedometers could be a motivational tool to increase physical activity.

Manley (2008) examined whether a school-based pedometer intervention program would improve self-efficacy, physical activity levels, aerobic fitness, and body composition and prevent weight gain in 6-7 graders in mid-south schools (116 students). The Digiwalker 200 Pedometer was used to measure physical activity. Height and weight of students calculated body mass index (BMI) and the one-mile walk test assessed aerobic capacity.

The intervention program involved wearing the pedometers during school day for a 12-week period. Students participated in 10 minutes of physical activity beyond their daily school activities. Students chose to walk briskly or jog for 10 minutes. The baseline data indicated that only 59% of students were at a healthy weight, 13% were overweight, and 29% were obese. Only 19% of students met the recommended amounts of daily physical activity. Manley (2008) found a positive correlational relationship between self-efficacy and aerobic fitness ($r = 0.269$, $p = 0.004$) and a weak inverse relationship between self-efficacy and BMI scores ($r = -.0243$, $p = 0.009$). A weak correlation existed between physical activity and aerobic fitness ($r = 0.309$, $p = 0.001$). No significant statistical differences were found between the intervention group and the control group, yet the intervention group had greater scores for self-efficacy, aerobic capacity levels, and body mass index.

Associated Health Risk and Cost of Physical Inactivity

Obesity is an epidemic in this country. Nearly 50% of adults are overweight or obese (U.S. Department of Health and Human Services, 2009). In fact, Tennessee, Mississippi, and Alabama have the highest obesity rates in the country. In Tennessee over 37% of adults are overweight and 31% of adults are considered obese (U.S. Department of Health and Human Services 2009). Nearly 15% of America’s youth are overweight (NCSL, 2006). In the past 20 years, “the rates of overweight children has doubled, and even tripled in adolescents” (NCSL, 2006, ¶ 1). The cost of health care for this country is increasing as preventable diseases associated with obesity such as heart disease, stroke, cancer, and diabetes are rising. In 2000 obesity cost our country $117 billion, accounting for 9% of the nation’s total health care cost. The Center for Disease Control and Prevention estimate “that if the current obesity trends continue, one-third of all children and one-half of African-American and Hispanic children born in 2000 will develop diabetes” (NCSL, 2006, ¶ 17). These figures have caught the attention of legislators and curriculum specialists who are determined to achieve health reform for school age children.

National and State Legislation Regarding Physical Activity

The Child Nutrition and WIC Reauthorization Act mandated the adoption of local wellness policies to address the childhood obesity epidemic (House Education & Workforce Committee, 2004). “States are continuing to focus on refining or increasing physical education requirements or encouraging positive physical activity programs for students" during and after the school day and improving the nutrition content of food available to students during the school day (NCSL, 2006, ¶ 4). "Thirty-nine states considered legislation related to the nutritional quality of school foods and beverages" (NCSL, 2006, ¶ 5). However, only 17 states enacted nutritional legislation. Tennessee is 1 of 21 states to enact legislation for physical education or physical activity (NCSL, 2006).

Tennessee has the third highest obesity rate in the country (U.S. DHHS, 2009). Obesity cost Tennessee $1879 million dollars in between 1998-2000. This is one reason why the state enacted legislation to fight the health crisis (Finkelstein, Fiebelkorn, & Wang, 2004). In fact, Tennessee is at the forefront in the fight against obesity as it is only one of three states to receive an "A" in their efforts to control the health crisis. California and New York also received the "A" status (Faulk, 2007). Table 1 provides an overview of the more prevalent legislative approaches enacted in Tennessee, Virginia, and North Carolina in comparison to the other states in America (NCSL, 2006).

Table 1

Legislative Approaches to Increase Physical Activity and Health

Types of legislation to decrease obesity	**States**	**TN**	**VA**	**NC**
Requires Physical Education in schools in some form	48	Yes	Yes	No
State Legislation on Childhood Obesity	43	Yes	Yes	Yes
Diabetes Screening and Management	8	No	No	No
Taxes on Foods and Beverages with Minimal Nutritional Value	2	No	No	No
Measuring Body Mass Index in Schools (BMI)	3	Yes	No	No
Task Force, Commission, Studies	6	Yes	Yes	Yes
School Wellness Policies	6	Yes	No	No
Nutrition Content for School Foods	6	Yes	Yes	No
Nutrition Education	21	Yes	Yes	No

Note: From "National Conference of State Legislators" (2006). Childhood Obesity: update and overview of policy options in legislation. Retrieved April 10, 2007, from http://www.ncsl.org/Default.aspx?TabId=13883

Tennessee passed the Physical Activity Bill 49-6 that states:

> Elementary and secondary schools must provide students with 90 minutes of physical activity per week into the instructional school day. Opportunities to engage in physical activities may include walking, jumping rope, playing volleyball, or other forms of physical activities that promote fitness and well-being (NCSL, 2006, ¶ 3).

Many administrators have looked to the Tennessee Association for Health, Physical Education, and Dance (TAHPERD) to define physical activity. TAHPERD (2007a) defines physical activity “as a behavior consisting of bodily movement that requires energy expenditure above the normal physiological (muscular, cardio-respiratory) requirements of the typical school day” (¶ 2). TAHPERD (2007b) also suggests implementations:

> (a) regular physical education, co-curricular activities and recess, (b) physical education class should be offered with moderate to vigorous physical activity being an integral part of the class, and (c) co-curricular activities that include physical activity integrated into areas of the school program-classroom, gymnasium, and/or outdoor activity spaces. (p.3)

In addition to the Physical Activity Bill, amendments included a Coordinator School Health Program (49-1-1002). Each school system with more than 3,000 students must have a full-time school health coordinator who supervises health programs for the school system. Coordinators organize and support an advisory council on school health, develop and maintain healthy school system policies, provide staff development, develop and maintain a system for assessing and identifying health and wellness needs, incorporate and implement surveys, develop and maintain a comprehensive pre-K-12 health education and physical education curriculum, identify and manage expenditures, and obtain additional financial support (Tennessee Department of Education, [TDE], 2007).

Tennessee has made gains toward fighting obesity through its Physical Activity Bill, School Health Coordinator, Body Mass Index Measures, and Task Force and Wellness Policies; however, much still needs to be done. There is a need to increase programs and the amount of time allowed for physical education taught by a qualified physical education teacher with a quality curriculum (TAHPERD, 2007a).

Not all schools in the nation or state of Tennessee have Physical Education teachers; furthermore, school systems are not required to have “highly qualified” physical education teachers. Often schools do not have a specified physical education curriculum. While teachers are looking first to benchmarks and state and national standards to determine if they are meeting the wellness goals, there is a continued push for programs to promote fitness (TDE, 2007).

Measuring Physical Activity

There are a variety of techniques available to measure physical activity in adolescents (Seigel, 2006). Ekelund (2009) states the most precise techniques to measure energy expenditure are room calorimetry, doubly labeled water, and indirect calorimetry. However, these methods are costly, invasive, and impractical to use on large population groups (Ekelund, 2009; Haskell & Kieman, 2000). Heart rate monitors, movement sensors (pedometers), and self-reports are more feasible to measure adolescents due to the ease of administration and cost efficiency (Bjornson, 2005; Manley, 2008; Seigel, 2006). However, children tend to overestimate the amount of time they spend in activity for self-reports (as much as 5 times their activity level) and heart rate monitors are still quite costly and impractical for long-term everyday use (Haskell &

Kieman, 2000). Accelerometers are more practical, accurate, and reliable pedometers that can measure physical activity in children (Bjornson, 2005; Seigel, 2006).

History of Pedometers

Thomas Jefferson and Leonardo Da Vinci created early pedometers. Pedometers observe the body's motion, count steps taken, and can be used to measure distances. Jefferson attempted to invent the pedometer to help make maps and measure distance accurately (Kissell, 2004; Martin, 1961). The modern day pedometer emerged in the 1960s and became popular in the 1964 Olympics in Japan. There was a broad adoption in the United States to use pedometers to motivate individuals to become more active during the 1960s (Martin, 1961). Research with pedometer use is a relatively new area especially for school-aged children.

Pedometers Defined

Pedometers are 1-2 inch mechanisms that sense the body's motion and count the number of steps taken. Depending on the make and model, pedometers can be worn on the waist, bra strap, or the foot. Pedometers are made in a variety of shapes and sizes. Advanced pedometers can give readings of calories burned and contain clocks, stopwatches, and speed estimators. Some pedometers have a 7-12 day memory and pulse rate readers. Pedometers range in price from $10 to $30; however, pedometers geared for medical research can cost between $500 to $800 (JSC Engineering LLC., 2008).

Piezo-electric accelerometers, a coiled spring mechanism, and a hairspring mechanism are the mechanisms used in pedometers to count steps. Accelerometers can determine the softness or hardness of steps and are the most accurate but more expensive pedometer. The key to achieving accurate results depends on the type of pedometer purchased, the pedometers worn correctly, and the stride length of the individual being set correctly (JSC Engineering LLC., 2008).

ActiPed Pedometer

The pedometer used in this study is the FitLinxx ActiPed accelerometer pedometer. The ActiPed is an accelerometer digital pedometer produced by FitLinxx that tracks the number of steps taken and calculates distance traveled, walking versus running steps, and calories burned. The ActiPed is the size of a quarter and is noiseless and nearly weightless. This ActiPed is different from most pedometers as it is worn on the shoe instead of the waist. The step is counted as the foot is lifted, moves forward, and impacts the ground. Accuracy increases as the required foot motion to achieve a step eliminates the ability to shake a pedometer to log more steps. Shaking pedometers is often appealing to children to get higher scores and achievable with pedometers worn on the waist (FitLinxx ActiPed, 2009a).

The ActiPed does not have a display to view the step count so the information uploads via Remote Access Point (RAP). It takes less than 10 seconds to upload the information to the link wirelessly. The RAP can process 50 ActiPed per minute from a range of 50 meters. In a school setting the RAP readers are typically placed in the cafeteria. In a health club setting the RAP reader is often placed at the entrance. The ActiPed can store step counts up to 12 days before steps must be uploaded (FitLinxx ActiPed, 2009).

In order to view progress of steps, the individual must walk past the RAP and then login to the FitLinxx website. Step progress can also be monitored via Pocket View Display and the ActiLink USB Drive. However, the Pocket View Display and ActiLink USB Drive were not used in the study due to cost. The Pocket View hand held display allows participants to track steps in real time to monitor daily goals. The ActiLink USB drive is a receiver that records the ActiPed results on one computer as the individual passes by. The ActiLink is intended for home use and eliminates the need to visit the RAP at the health club or school cafeteria in order for the ActiPed to be uploaded to the web site (FitLinxx ActiPeda, 2009).

Measuring Physical Fitness

Despite factors out of a person's control such as genetics and maturation researchers agreed "that physical activity and physical fitness are reciprocally related;" in addition, it was essential to be physically active for fit and unfit individuals to obtain health benefits (Corbin, 2001, p. 96). Physical activity has been linked to specific health and fitness outcomes for adults. However, it has been harder to detect the relationship

between physical activity and health benefits for children (Baranowski et al.,1992). Lack of physical activity can lead to obesity, yet it is not clear if obesity is the "causal" factor for inactivity. The increased health benefits and fitness levels can be assessed in adolescents through specialized assessments such as the President's Challenge or FitnessGram Fitness Test (Cooper Institute, 2009).

The FitnessGram founders believe children benefit from physical activity during childhood; however, to retain the benefits the child needs to adopt an active lifestyle as an adult. The Fitnessgram goal is “providing schools, parents and communities tools to help children become more active every day and eat healthier food” (Cooper Institute, 2010, ¶ 7). The end result of this goal is producing adults who live a healthy active lifestyle.

Fitness Tests

The President’s Challenge and FitnessGram Fitness Test are conventional methods to assess fitness levels of youth throughout schools in the United States (Beighle, Pangrazi, & Vincent, 2001). Fitness tests can enhance instruction, be used as a diagnostic tool for exercise prescription, provide self-monitoring of skills and goal setting, and promote fitness knowledge (Whitehead, Pemberton, & Corbin, 1990). The President’s Challenge (2009) features norm referenced (Presidential Award) and criterion referenced (National Award) standards. The FitnessGram (2009) is criterion referenced and encompasses healthy fitness zones as standards for children. Both tests contain a variety of test batteries to asses each component for cardio-respiratory fitness, muscular strength, muscular endurance, flexibility, and body composition (FitnessGram, 2009; President’s Challenge, 2009). This study employs the FitnessGram Pacer test to measure aerobic capacity (cardio-respiratory fitness). Height and weight measures will determine body composition via FitnessGram Body Mass Index Chart.

FitnessGram recommends that students learn about the program and practice the test during Kindergarten to 3rd grade. Formal testing should begin in 4th grade. The

Cooper Institute (2004) indicated that "standards of performance are not reliable" nor do students understand the meaning of the results before 4th grade (p.8).

Aerobic Capacity Pacer Test

Cardiorespiratory endurance (aerobic capacity) reflects the maximum rate that the body uses oxygen during exercise. Aerobic capacity is a measure of the ability of the body to carry out exercise for extended amounts of time at a strenuous pace (Astrand, Rodahl, Dahl, & Stromme, 2003). The ability for extended strenuous exercise is reflected by the capacity of the respiratory and cardiovascular systems (Mitchell, Sproule, & Chapman,1958, p. 546).

The FitnessGram Pacer test was used to assess aerobic capacity. The Pacer Test is a multi-stage aerobic capacity test that can be set at a distance of 15 or 20 meters (a great alternative to the mile walk or run). The PACER test is a cadence with music that progressively gets faster with each set (every minute). If students miss a cadence twice or stop running their test is over. A criterion measure is set for each age group as a goal for students to achieve in the Healthy Fitness Zone (Cooper Institute, 2009).

Body Composition and Body Mass Index

Body composition refers to components of body weight measuring the percent of fat in the body. The FitnessGram Body Mass Index Chart employs height and weight to determine the percent of body fat for students. The average fat content for boys is 15% with a range between 10%-25% considered normal. The normal range of fatness for girls is between 18%-32% with 25% of body fat considered average. Boys are considered obese if their body fat is over 25%; while girls are considered obese with a body fat over 32% (Cooper Institute, 2009).

Summary

Obesity is an epidemic in our country. Adults and youth are heavier than they have ever been. In fact, Tennessee has one of the highest obesity rates for youth and adults in the nation. There is a need to instill the importance of physical activity in America's youth to prevent obesity and the onset of disease due to obesity. According to literature, the benefits of physical activity are abundant. However, physical activity levels continue to decline as obesity rates increase costing the country millions in health care cost.

Legislation has been passed on state and national levels to combat the obesity epidemic such as (a) requiring physical education, (b) requiring diabetes screening, (c) taxing foods with minimal nutritional value, (d) measuring body mass index, (e) creating task force, (f) implementing school wide wellness policies (g) improving the nutritional content of school foods, and (h) offering nutrition education. Physical Education curricula are being adopted, specialized integration programs have been implemented, and pedometer implementation is occurring in schools across the nation in efforts to fight the battle with obesity and physical inactivity.

The NASPE and CDC physical activity guidelines suggest students need to be active for 1 hour each day but no more than 2 hours. The activity can be in 15-minute intervals throughout the day. Pangrazi, Beighle, Vehige, and Vack (2003) and Seigal (2006) translate activity time into steps accumulated suggesting girls achieve 12,000 steps per day while boys achieve 15,000 steps a day. Increasing the number of steps a student takes a day through curriculum changes, obesity prevention mandates from state and national legislation, or special programs are steps toward alleviating the obesity epidemic in our country. The intent of the following research is to use the ActiPed Pedometer Intervention Program to make students aware of their activity level and improve fitness levels of youth.

CHAPTER 3

METHODS AND PROCEDURES

This purpose of this study was to determine if students' aerobic capacity and body composition (body mass index) scores were affected by participation in a pedometer intervention program as opposed to students who elected not to participate or participated on a limited basis. Students were categorized as either being in the control group or the treatment group. The control group wore pedometers for 0-5 weeks while the treatment group wore pedometers 6-12 weeks. The focus is to determine if the pedometer intervention program would sustain or improve aerobic capacity or body composition over a 12-week period for students in a small school system in East Tennessee.

The purpose of this study was to examine the relationship between aerobic capacity and body composition (body mass index) of students who participated in the ActiPed pedometer (treatment group) program and those students in the control group who wore the pedometer 0-5 weeks. The treatment group wore the pedometer for 6-12 weeks. The focus is to determine if the pedometer intervention program would sustain or improve aerobic capacity or body composition over a 12-week period for students in small school system in East Tennessee.

Chapter 3 describes the methodology and procedures used in this study. This section contains the research design, population, instrumentation, data collection, and research questions.

Research Design

This quantitative study examined the effect of a 12-week (January through April) digital pedometer program. Physical activity levels, aerobic capacity, and body composition of youth in the treatment group and control group were analyzed. The control group wore pedometers for 0-5 weeks while the treatment group wore pedometers 6-12 weeks. Pretest and posttest measures of FitnessGram Components, Body Mass Index, and Aerobic Capacity assessed differences in the control and treatment groups.

Participants

The Bristol Tennessee School System was selected for the study because of its partnership with the YMCA to incorporate the ActiPed Digital Pedometer Intervention Program into its schools (5 elementary schools, 1 middle school, and 1 high school). Students in the Bristol Tennessee City Schools were targeted because of an increase in obesity levels in the state of Tennessee and the link of obesity in youth and diabetes. The Bristol Tennessee YMCA received a grant from Wellmont Health Systems to fund the intervention program. The aim of the grant is to reduce the onset of childhood diabetes by controlling contributing factors of obesity such as inactivity. There are 2,000 students and 1,000 staff members in the Bristol Tennessee School System. Over 1,000 ActiPeds were distributed to students and staff members. The research design included students in grades 2-6 who were 8-12 years. There were 310 students in the treatment group and 295 students in the control group for the body composition analysis for students at a healthy weight. The body composition analysis for overweight students included 83 students in the treatment group and 82 students in the control group. The aerobic capacity analysis for students at a healthy weight included 371 students in the treatment group and 323 students in the control group. The aerobic capacity analysis for overweight students included 78 students in the treatment group and 79 students in the control group. Population numbers differed because of missing or incomplete data on students.

All students in grades 2-6 received a packet from the YMCA and Bristol Tennessee City Schools describing the ActiPed digital pedometer program. Parental consent and child assent were obtained for students to receive the ActiPed. The ActiPed pedometer was free for students. If the pedometer was lost, students were not assessed a fee. However, if students chose to continue to participate they could elect to purchase another ActiPed from the YMCA. The YMCA initiated incentives for wearing the ActiPed and accumulating steps and for participating in the program. The team leader (homeroom teacher or staff member) awarded small novelty prizes on weekly basis for reaching a goal. A grand prize of a bicycle and theme park tickets was awarded at the end of the program.

Instrumentation

The FitnessGram fitness test measured physical fitness components of students. The Cooper Institute created the FitnessGram in the 1980s as the only health-related fitness assessment using the criterion referenced standards, called Healthy Fitness Zones. Students are able to determine what zone is optimal or define what good health is. The fitness test included assessments for body composition and aerobic capacity (FitnessGram, 2008).

Individual physical fitness scores (secondary data provided by the school system) were collected during physical education classes. The instructors used the FitnessGram Testing guidelines to assess pretest and posttest fitness levels of students body composition (height and weight scores to calculate Body Mass Index) and aerobic capacity (Pacer test). Students who received a pedometer (treatment group) and those who do not receive a pedometer or those who received a pedometer but wore it less than 6 weeks (control group) in grades 2-6 were assessed. Student Pretest scores were taken in November and December of 2008 and posttest measures were collected in April 2009.

Procedures

Data were collected after approval from East Tennessee State University Institutional Review Board and the Director of Schools of the Bristol Tennessee City School System. Individual identifiers were not requested or used in this research. The Bristol Tennessee City School System provided individual fitness test scores and the ActiPed Digital Pedometer step counts for individual students without student names attached. Data were analyzed using the version 16.0 of the Statistical Package for Social Science. Data summaries and results of the analysis are presented in Chapter 4. This study used cross-tabulated Chi Square and Independent *t* tests to analyze the data.

Questions 1 and Question 2 were analyzed in using a cross tabulated Chi Square method. BMI Index scores for both the pretest and posttest were classified as below a healthy range for students' age and gender (underweight), within a healthy range, or above a healthy range (overweight) in order to answer this research questions. Using the pretest and posttest BMI classifications, another variable was created to reflect change in BMI classifications from the pretest to posttest. This variable was measured as: (1) The Posttest BMI Classification was worse than the Pretest BMI Classification; (2) the Posttest BMI Classification was the same as the Pretest BMI Classification (no change in status); and (3) the Posttest BMI Classification was better than the Pretest BMI Classification.

A *t* test for independent samples tested the null hypotheses for Question 3 and Question 4. Because aerobic capacity scores are evaluated based on students' age and gender, separate analyses were conducted for age and gender groups. The dependent variable, aerobic capacity gain score was created by subtracting the pretest aerobic capacity scores from the posttest aerobic capacity scores. Research questions that guide the study are:

Research Questions

Question 1

Is there a difference in the Body Mass Index Classifications from pretest to posttest between students in the control and treatment groups?

$Ho1_1$: There is no difference in the Pretest to Posttest Body Mass Index Classifications between students in the control and treatment groups.

Question 2

For students who had a Pretest Body Mass Index score higher than the healthy range for students' age and gender (overweight), is there a difference in the Posttest Body Mass Index Classification between students in the control and treatment groups?

$Ho2_1$: For students with a Pretest Body Mass Index Classification above a healthy range (overweight), there is no difference Posttest Body Mass Index Classification between students in the control and treatment groups.

Question 3

Is there a difference in the aerobic capacity gain scores between students in the control and treatment groups?

$Ho3_1$: For 8-year-old girls there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho3_2$: For 8-year-old boys there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho3_3$: For 9-year-old girls there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho3_4$: For 9-year-old boys there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho3_5$: For 10-year-old girls there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho3_6$: For 10-year-old boys there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho3_7$: For 11-year-old girls there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho3_8$: For 11-year-old boys there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho3_9$: For 12-year-old girls there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho3_{10}$: For 12-year-old boys there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

Question 4

For students whose Pretest Body Mass Index Classification exceeded the healthy range for their age and gender (overweight), is there a difference in the aerobic capacity gain scores between students in the control and treatment groups?

$Ho4_1$: For overweight 8-year-old girls there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho4_2$: For overweight 8-year-old boys there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho4_3$: For overweight 9-year-old girls there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho4_4$: For overweight 9-year-old boys there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho4_5$: For overweight 10-year-old girls there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho4_6$: For overweight 10-year-old boys there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho4_7$: For overweight 11-year-old girls there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho4_8$: For overweight 11-year-old boys there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho4_9$: For overweight 12-year-old girls there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho4_{10}$: For overweight 12-year-old boys there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

Statistics

Descriptive and inferential statistics are computed using the Statistical Program for the Social Science (SPSS) 16.0. Independent-sample t test determine if differences in the control and treatment groups are significant. Furthermore, a Paired-sample t test analysis comparing student pretest and posttest measures determine significant differences in individual achievement over the 12-week intervention period.

Summary

Chapter 3 presents the research design, population, instrumentation, procedures, research questions, and data analysis procedures. This study used quantitative procedures to examine the effectiveness of the pedometer intervention program by analyzing fitness scores of the control and treatment groups. In addition, pretest and posttest comparisons of body mass index scores and aerobic capacity fitness scores were evaluated to determine if the pedometer intervention program would sustain or improve these variables over a 12-week period.

CHAPTER 4

DATA ANALYSIS

The purpose of this study was to examine the relationship between aerobic capacity and body composition (body mass index) of students who participated in the ActiPed pedometer program for at least 6 weeks (treatment group) and those students who elected not to use a pedometer or wore the pedometer for 0-5 weeks (control group). The focus was to determine whether the pedometer intervention program would sustain or improve aerobic capacity or body composition over a 12-week period for students in a school system in East Tennessee.

The quantitative data indicators were aerobic capacity scores measured through the FitnessGram Pacer Test. Height and weight measurements determined Body Composition using the height and weight calculations from the FitnessGram Fitness Assessment, secondary data collected by physical education teachers as part of the biannual assessment conducted in physical education classes. The YMCA provided ActiPed Pedometer information based on its grant to implement the *Get Active* program in the city school system.

Research Questions

The following research questions controlled the research for this study.

Research Question 1: Is there a difference in the Body Mass Index classifications from pretest to posttest between students in the control and treatment groups?

BMI Index scores for both the pretest and posttest were classified as below a healthy range for students' age and gender (underweight), within a healthy range, or above a healthy range (overweight) in order to answer this research questions. Using the pretest and posttest BMI classifications, another variable reflected change in BMI classifications from the pretest to posttest. Measurement of this variable included: (1) the posttest BMI classification was worse than the pretest BMI Classification; (2) the posttest BMI classification was the same as the pretest BMI classification (no change in status); and (3) the posttest BMI Classification was better than the pretest BMI classification. A 2 by 3 cross-tabulated table and the Chi square test tested the null hypothesis:

$Ho1_1$: There is no difference in the pretest to posttest Body Mass Index classifications between students in the control and treatment groups.

The Chi square test indicated a significant difference in the pre- to posttest BMI status of the two groups, χ^2 (2) = 9.31, *p* = .01, thus rejecting the null hypothesis. The strength of the relationship between Group and BMI status as measured by Cramer's *V* was weak (.12). However, there were 19 students (16.4%) of the control group whose BMI became worse over time compared to only five students (1.6%) in the treatment group. Table 2 displays the cross-tabulated pretest and posttest BMI status.

Table 2

Cross-Tabulated Table for BMI Status from Pretest to Posttest by Group

BMI Status	Control		Treatment	
	N	%	*N*	%
BMI Worse from Pretest to Posttest	19	6.40	5	1.60
Stayed the Same	261	88.50	287	92.60
Improved from Pretest to Posttest	15	5.10	18	5.80
Total	295	100.00	310	100.00

Research Question 2: For students who had a Pretest Body Mass Index score higher than the healthy range for students' age and gender (overweight), is there a difference in the Posttest Body Mass Index classification between students in the control and treatment groups?

To answer this question only students who had a BMI Index above the healthy range (overweight) for their age and gender were included. The dependent variable was the posttest BMI Classification measured as: (1) posttest BMI was within a healthy range for students' age and gender and (2) posttest BMI was above the healthy range (overweight). One hundred sixty-five students had a BMI Index above a healthy range (overweight) for the BMI pretest. Using these students, a 2 by 3 cross-tabulated table and the Chi square test tested the null hypothesis:

> $Ho2_1$: For students with a Pretest Body Mass Index classification above a healthy range (overweight) there is no difference Posttest Body Mass Index classification between students in the control and treatment groups.

The 2 by 3 Chi square results indicated no difference in the posttest BMI Index classifications between overweight students in the control and treatment groups, χ^2 (1) = .17, *p* = .68, therefore retaining the null hypothesis. The strength of the relationship as measured by Phi was weak (.03). No students in this group had a posttest BMI below the healthy range (underweight). Table 3 displays posttest BMI index classifications for overweight children by group.

Table 3

Cross-Tabulated Table for Overweight Students' Posttest BMI Index Classification by Group

	Control		Treatment	
Posttest BMI Classification	*N*	%	*N*	%
Within a Healthy Range	11.0	13.4	13.0	15.7
Above a Healthy Range	71.0	86.6	70.0	84.3
Total	82.0	100.0	83.0	100.0

Research Question 3: Is there a difference in the aerobic capacity gain scores between students in the control and treatment groups?

Evaluating aerobic capacity scores depended on students' age and gender, thus those scores underwent separate analyses. Subtracting the pretest aerobic capacity scores from the posttest aerobic capacity scores created the dependent variable, aerobic capacity gain score. A *t* test for independent samples tested the following null hypotheses:

$Ho3_1$: For 8-year-old girls there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho3_2$: For 8-year-old boys there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho3_3$: For 9-year-old girls there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho3_4$: For 9-year-old boys there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho3_5$: For 10-year-old girls there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho3_6$: For 10-year-old boys there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho3_7$: For 11-year-old girls there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho3_8$: For 11-year-old boys there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho3_9$: For 12-year-old girls there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho3_{10}$: For 12-year-old boys there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

Independent *t* tests evaluated the hypothesis that there were no differences between the students who wore the ActiPed pedometer for 6-12 weeks (treatment group) and the students who wore the pedometer for 0-5 weeks (control group). Evaluating aerobic capacity scores depended on students' age and gender, thus those scores underwent separate analyses. Age and gender groups included male and female students who were 8, 9, 10, 11, and 12 years old.

An independent *t* test for Pacer gain scores differences for 8-year-old girls was not significant, $t(71) = 1.18$, $p = .24$, therefore retaining hypothesis $Ho3_1$. Students who were in the control group ($M = 6.35$, $SD = 8.92$) tended to have similar gains on the Pacer test as students in the treatment group ($M = 4.13$, $SD = 6.97$). However, the mean gain score of the control group was higher. The 95% confidence interval for the difference in the means was -5.98 to 1.54. The effect size as measured by η^2 was small (.02). Figure 1 shows the boxplot for aerobic capacity gain scores for the two groups.

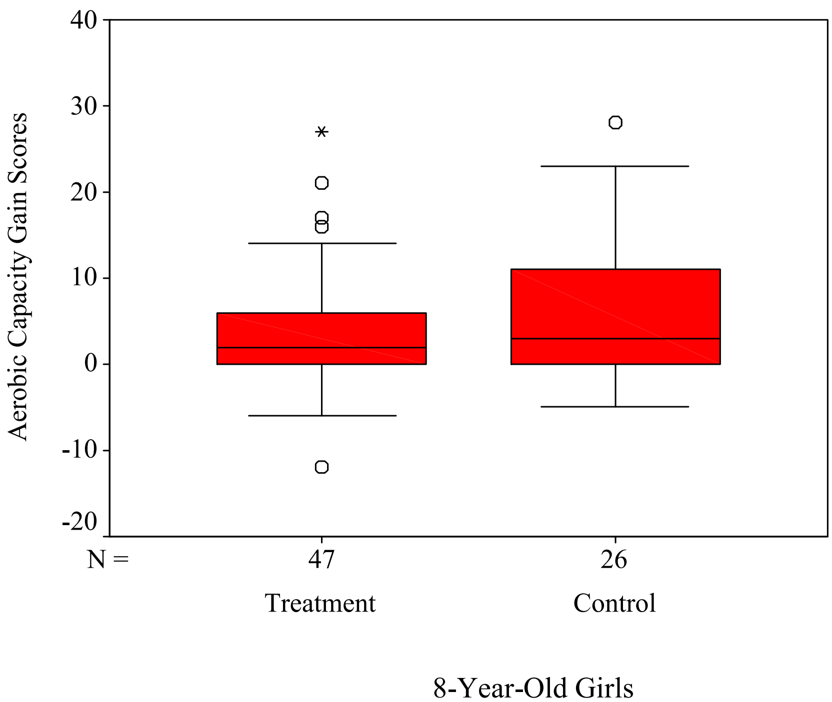

Figure 1. Boxplot for aerobic capacity gain scores for 8-year-old girls by group.
Note: o = an observation between 1.5 times to 3.0 times the interquartile range
→ = an observation more than 3.0 times the interquartile range

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For 8-year-old boys the independent *t* test for Pacer gain scores differences was not significant, $t(47) = .60$, $p = .55$, thus retaining hypothesis $Ho3_2$. Students in the treatment group ($M = 3.16$, $SD = 7.87$) tended to have similar gains to the control group

(M = 1.58 SD = 7.88). However, the mean gain score of the treatment group was higher. The 95% confidence interval for the difference in the means was -3.68 to 6.84. The effect size as measured by η^2 was small (.01). Figure 2 shows the boxplot for aerobic capacity gain scores for the two groups.

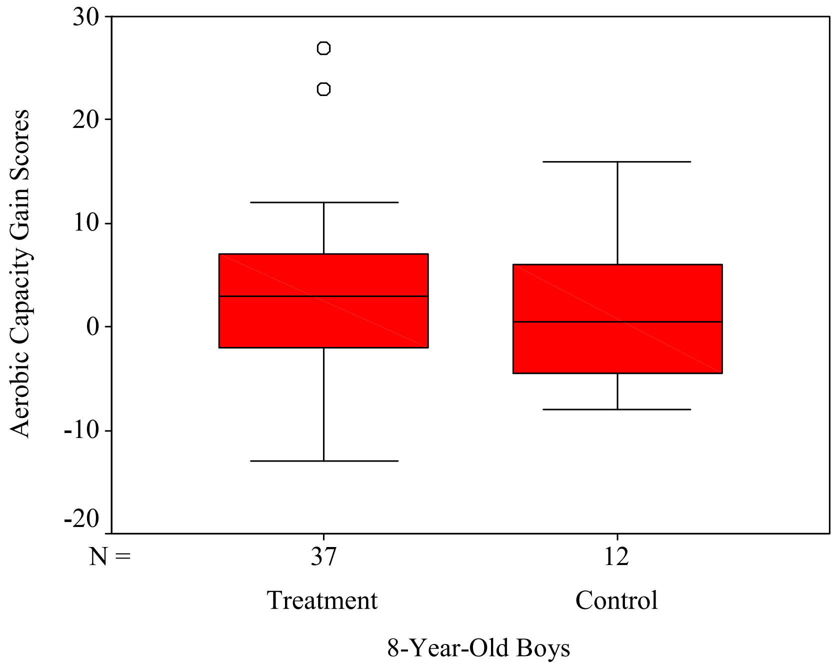

Figure 2. Boxplot for aerobic capacity gain scores for 8-year-old boys by group
Note: o = an observation between 1.5 times to 3.0 times the interquartile range

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An independent t test for the Pacer gain scores differences for 9-year-old was significant, t (84) = 2.52, p = .01, rejecting hypothesis $Ho3_3$. Students in the treatment group (M = 6.76, SD = 10.24) had considerable mean gains on the Pacer Test compared to students in the control group (M = 1.05, SD = 10.80). The 95% confidence interval for the difference in the means was 1.19 to 10.23. The effect size as measured by η^2 was medium (.07). Figure 3 shows the boxplot for aerobic capacity gain scores for the two groups.

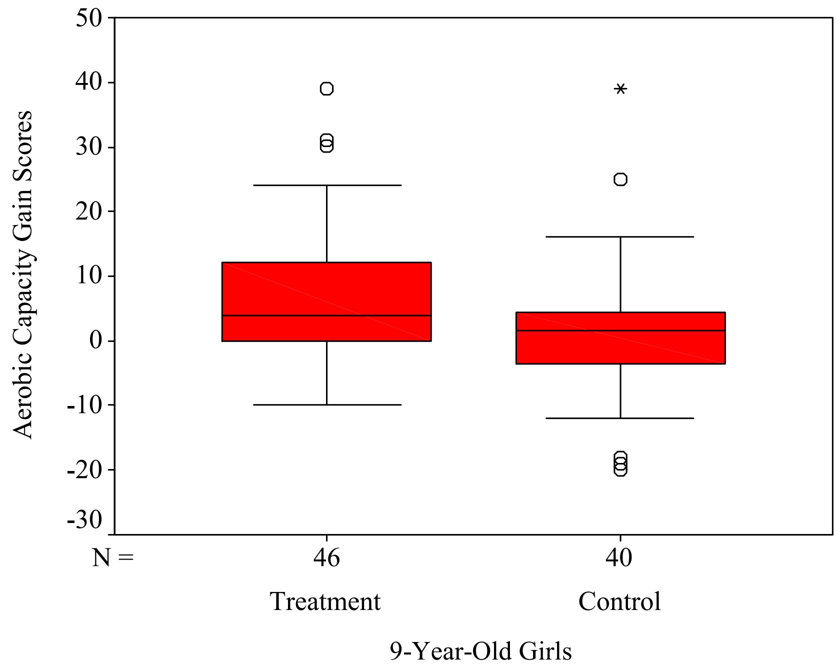

Figure 3. Boxplot for aerobic capacity gain scores for 9-year-old girls by group.
Note: o = an observation between 1.5 times to 3.0 times the interquartile range
* = an observation more than 3.0 times the interquartile range

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The Levene's Test for Equality of Variances was significant, F (103) = 7.49, p = .01; therefore, the t test that does not assume equal variances was used. An independent t test for Pacer gain score difference for 9-year-old boys was not significant t (82) = .16, p = .88 and the null hypothesis $Ho3_5$ was retained. Students in the treatment group (M = 6.48, SD = 8.59) tended to have similar gains as the control group (M = 6.14, SD = 12.89). The 95% confidence interval for the difference in the means was -3.85 to 4.53. The effect size as measured by η^2 was small (.01). Figure 4 shows the boxplot for aerobic capacity gain scores for the two groups.

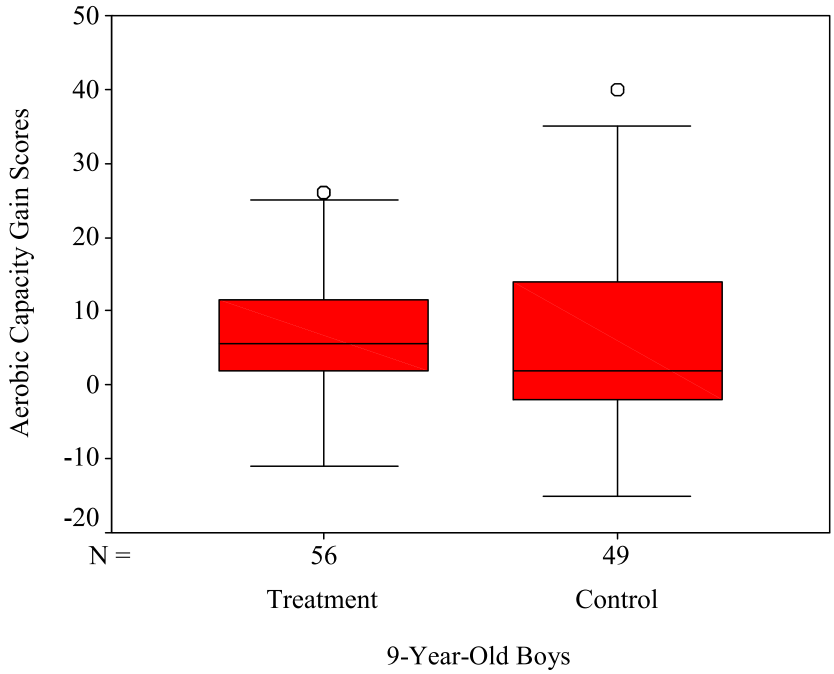

Figure 4. Boxplot for aerobic capacity gain scores for 9-year-old boys by group.
o = an observation between 1.5 times to 3.0 times the interquartile range

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An independent *t* test for aerobic capacity gain score difference for 10-year-old girls was not significant, *t* (81) = .07, *p* = .95. The Levene's Test for Equality of Variances was significant, *F* (1) = 23.56, *p* < .01; therefore, there was no assumption of equal variances and hypothesis $Ho3_6$ was retained. Students in the control group (*M* = 4.54, *SD* = 12.79) tended to have similar gains as those in the treatment group (*M* = 4.67, *SD* = 5.69). The 95% confidence interval for the difference in the means was –3.90 to 4.16. The effect size as measured by η^2 was small (<.01). Figure 5 shows the boxplot for aerobic capacity gain scores for the two groups.

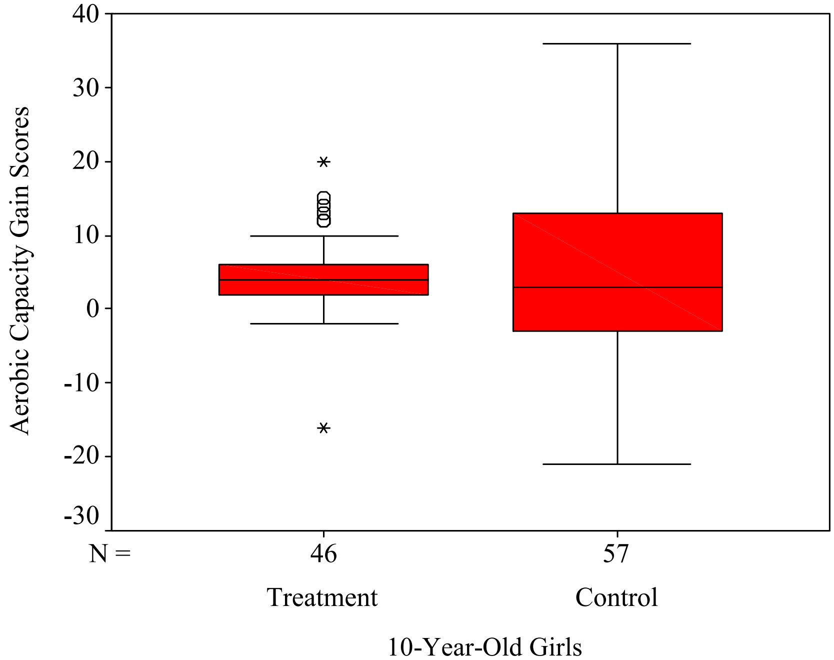

Figure 5. Boxplot for aerobic capacity gain scores for 10-year-old girls by group.
Note: o = an observation between 1.5 times to 3.0 times the interquartile range
* = an observation more than 3.0 times the interquartile range

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An independent samples *t* test for gain differences For 10-year-old boys revealed no significant difference in aerobic capacity scores between the treatment and control groups, *t* (77) = .19, *p* = .85, thus retaining the null hypothesis. Students in the treatment group (*M* = 4.52, *SD* = 10.05) tended to have similar gains as the control group (*M* = 4.08, *SD* = 11.27). The 95% confidence interval for the difference in the means was – 4.33 to 5.22. The effect size was small (<.01). Figure 6 shows the boxplot for aerobic capacity gain scores for the two groups.

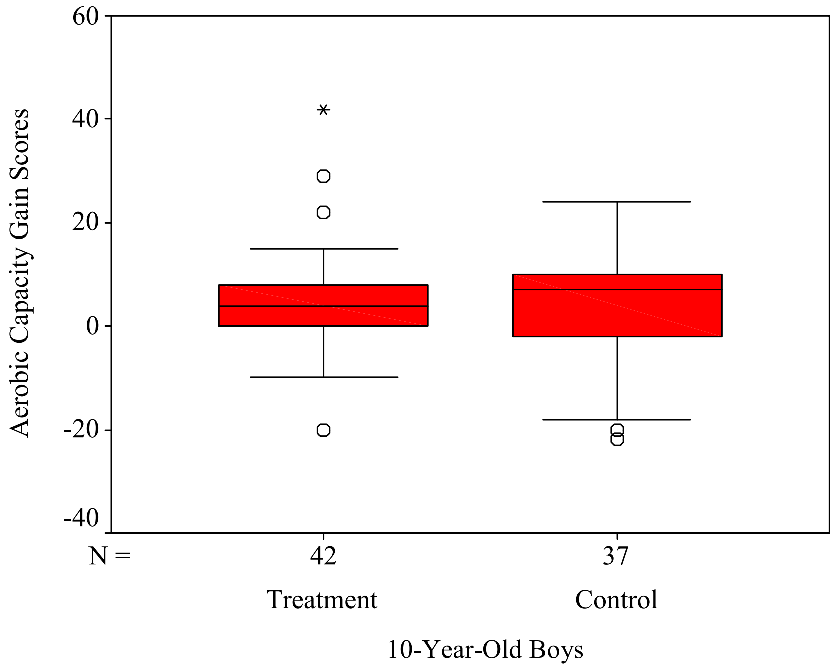

Figure 6. Boxplot for aerobic capacity gain scores for 10-year-old boys by group.
Note: o = an observation between 1.5 times to 3.0 times the interquartile range
* = an observation more than 3.0 times the interquartile range

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An independent *t* test for gain differences for 11-year-old girls revealed no significant difference in aerobic capacity scores between the treatment and control groups, t (69) = .34, p = .74, thus retaining the null hypothesis. Students in the treatment group (M = 4.03, SD = 7.35) had slightly higher mean score gains than students in the control group (M = 3.34, SD = 9.70). The 95% confidence interval for the difference in the means was – 3.38 to 4.75. The effect size was small (<.01). Figure 7 shows the boxplot for aerobic capacity gain scores for the two groups.

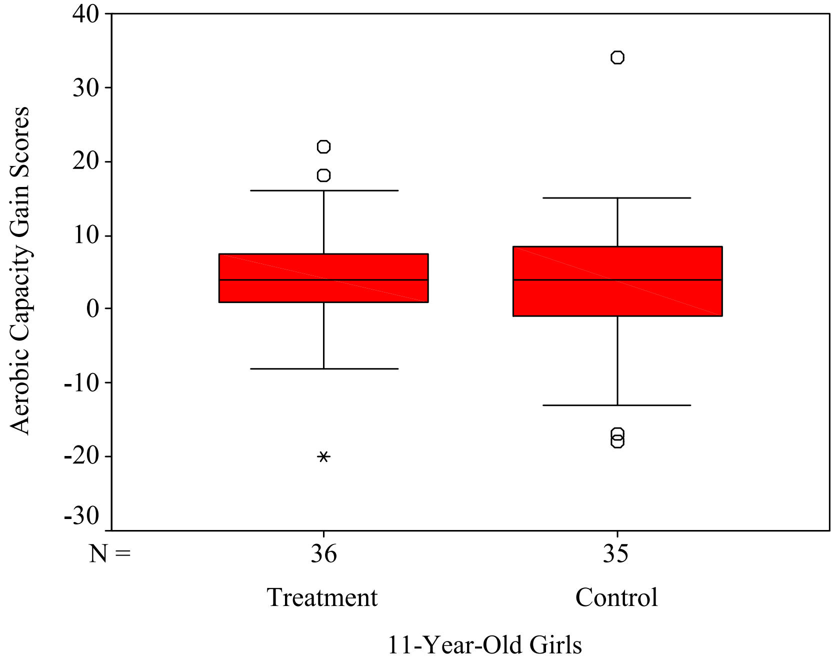

Figure 7. Boxplot for aerobic capacity gain scores for 11-year-old girls by group.
Note: o = an observation between 1.5 times to 3.0 times the interquartile range
* = an observation more than 3.0 times the interquartile range

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For 11-year-old boys the independent *t* test for Pacer gain scores differences was not significant, t (83) = 1.32, p = .19, thus retaining hypothesis $Ho3_8$. Students in the treatment group (M = 7.17, SD = 9.41) had greater mean score gains than the control group (M = 4.27, SD = 10.74). The 95% confidence interval for the difference in the means was –1.47 to 7.27. The effect size as measured by η^2 was small (.02). Figure 8 shows the boxplot for aerobic capacity gain scores for the two groups.

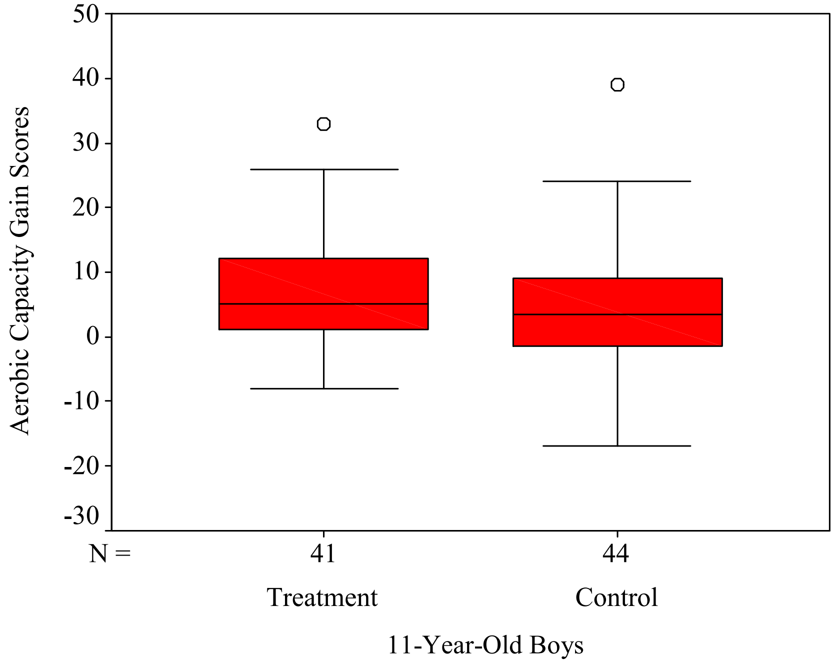

Figure 8. Boxplot for aerobic capacity gain scores for 11-year-old boys by group.
Note: o = an observation between 1.5 times to 3.0 times the interquartile range

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An independent *t* test tested for differences in aerobic capacity scores for 12-year-old girls. The *t* test revealed no significant difference in Pacer test scores between the treatment and control groups, t (16) = .08, p = .94, thus retaining the null hypothesis. Students in the treatment group (M = .14, SD = 7.97) had similar gains scores as students in the control group (M = .55, SD = 11.05). The 95% confidence interval for the difference in the means was -10.66 to 9.85. The effect size was small (<.01). Figure 9 shows the boxplot for aerobic capacity gain scores for the two groups.

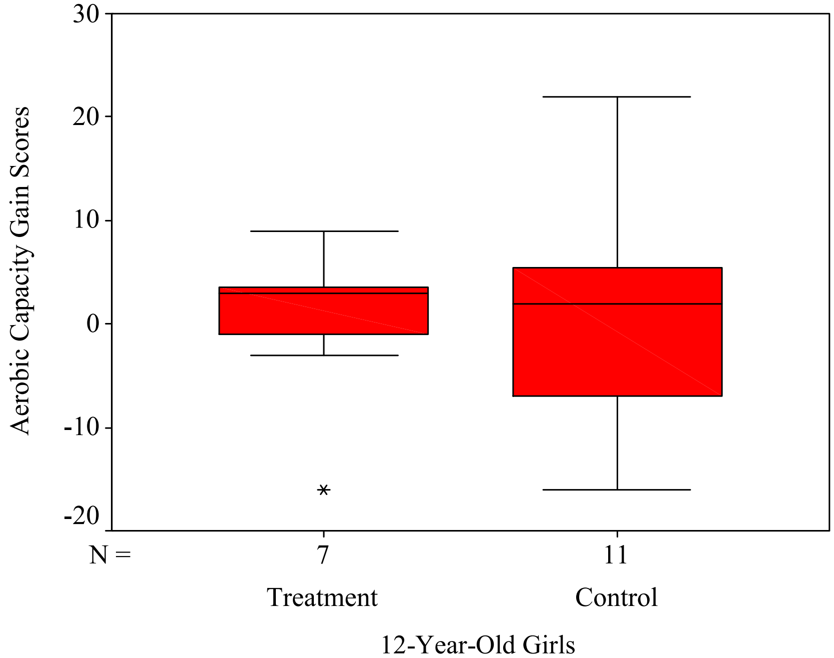

Figure 9. Boxplot for aerobic capacity gain scores for 12-year-old girls by group.
Note: * = an observation more than 3.0 times the interquartile range

For 12-year-old boys the independent *t* test gain scores for aerobic capacity between the control and treatment group was not significant, t (23) = 1.21, p = .24, thus retaining the null hypothesis. Students in the treatment group (M = 6.77, SD = 13.34) had smaller mean gains than did students in the control group (M = 12.25, SD = 8.52). The 95% confidence interval for the difference in the means was –14.83 to 3.87. The effect size as measured by η^2 was medium (.06). Figure 10 shows the boxplot for aerobic capacity gain scores for the two groups.

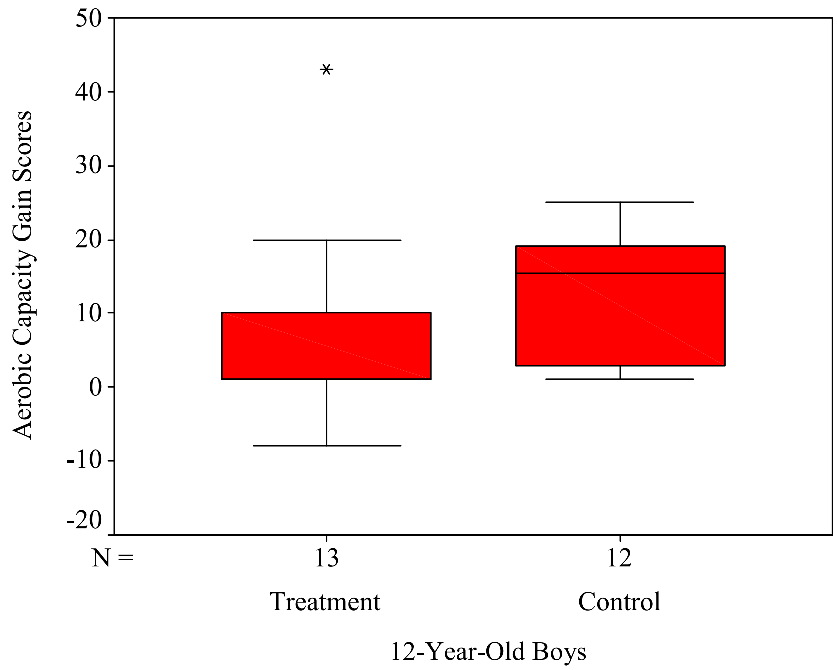

Figure 10. Boxplot for aerobic capacity gain scores for 12-year-old boys by group.
Note: * = an observation more than 3.0 times the interquartile range

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Research Question 4: For students whose Pretest Body Mass Index Classification exceeded the healthy range for their age and gender (overweight), is there a difference in the aerobic capacity gain scores between students in the control and treatment groups?

The evaluation for aerobic capacity scores based on students' age and gender required separate analyses for age and gender groups., Subtracting the pretest aerobic capacity scores from the posttest aerobic capacity scores created the dependent variable, aerobic capacity gain scores. A *t* test for independent samples tested the following null hypotheses:

$Ho4_1$: For overweight 8-year-old girls there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho4_2$: For overweight 8-year-old boys there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho4_3$: For overweight 9-year-old girls there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho4_4$: For overweight 9-year-old boys there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho4_5$: For overweight 10-year-old girls there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho4_6$: For overweight 10-year-old boys there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho4_7$: For overweight 11-year-old girls there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho4_8$: For overweight 11-year-old boys there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho4_9$: For overweight 12-year-old girls there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

$Ho4_{10}$: For overweight 12-year-old boys there is no difference in the aerobic capacity gain scores between students in the control and treatment groups.

For 8-year-old girls an independent samples *t* test revealed no significant difference in the Pacer gain scores between overweight students in the treatment and control groups, t (13) = .37, p = .72, thus retaining the null hypothesis. Students in the control group (*M* = .20, *SD* = 3.35) had similar mean gains to students in the treatment group (*M* = .90, *SD* = 3.55). The 95% confidence interval for the difference in the means was –3.42 to 4.82. The effect size as measured by η^2 was small (.01). Figure 11 shows the boxplot for aerobic capacity gain scores for the two groups.

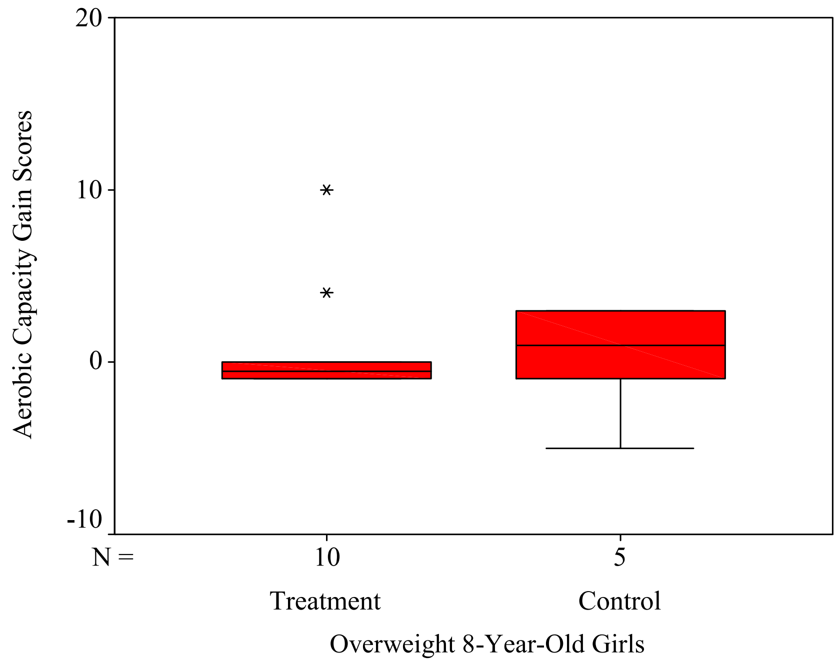

Figure 11. Boxplot for aerobic capacity gain scores for 8-year-old girls by group above a healthy range (overweight).
Note: * = an observation, which is more than 3.0 times the interquartile range

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An independent sample *t* test evaluated the difference in Pacer gain scores for overweight 8-year-old boys between the students in the treatment group and the control group. There was no significant difference in the Pacer gain scores between the groups, $t\ (10) = 1.18$, $p = .24$, therefore retaining the null hypothesis. However, students in the treatment group ($M = 2.33$, $SD = 6.77$) had higher mean gains scores than students in the control group ($M = -1.67$, $SD = 4.76$). The 95% confidence interval for the difference in the means was –3.53 to 11.53. The effect size as measured by η^2 was medium (.12). Figure 12 shows the boxplot for aerobic capacity gain scores for the two groups.

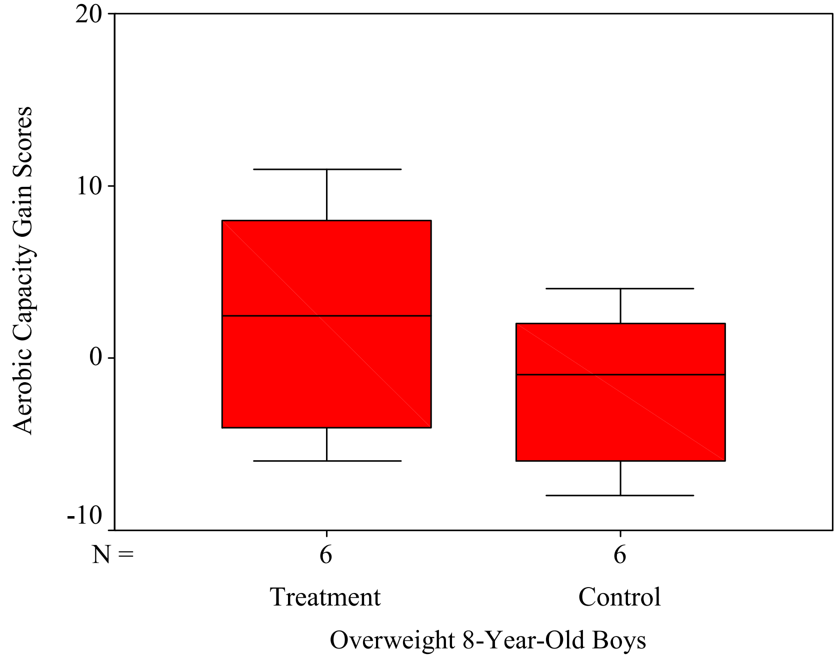

Figure 12. Boxplot for aerobic capacity gain scores for 8-year-old boys by group above a healthy range (overweight)

For 9-year-old girls an independent samples *t* test revealed no significant difference in the Pacer gain scores between overweight students in the treatment and control groups, t (10) = 1.03, p = .34, therefore retaining the null hypothesis. However, students in the treatment group (M = 4.17, SD = 3.37) had higher mean gains scores than students in the control group (M = 1.00, SD = 6.75). The 95% confidence interval for the difference in the means was –3.70 to 10.03. The effect size as measured by η^2 was medium (.10). Figure 13 shows the boxplot for aerobic capacity gain scores for the two groups.

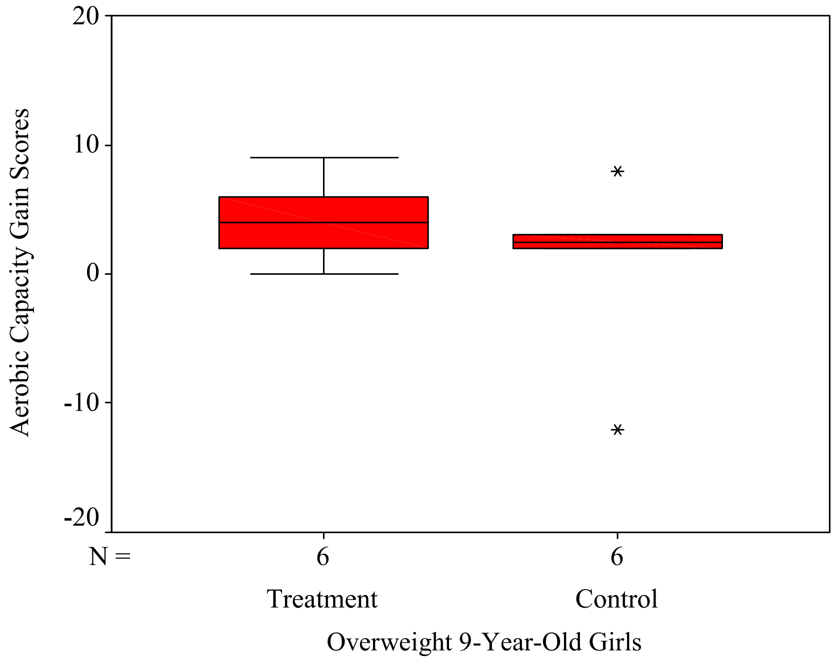

Figure 13. Boxplot for aerobic capacity gain scores for 9-year-old girls by group above a healthy range (overweight).
Note: * = an observation more than 3.0 times the interquartile range

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An independent samples *t* test evaluated the difference in Pacer gain scores for overweight 9-year-old boys between the students in the treatment group and the control group. There was no significant difference in the Pacer gain scores between the groups, t (10) = 1.18, p = .24, thus retaining the null hypothesis. However, students in the treatment group (M = 6.92, SD = 7.30) had higher mean gains scores than students in the control group (M = 4.71, SD = 10.66). The 95% confidence interval for the difference in the means was –5.09 to 9.51. The effect size as measured by η^2 was small (.02). Figure 14 shows the boxplot for aerobic capacity gain scores for the two groups.

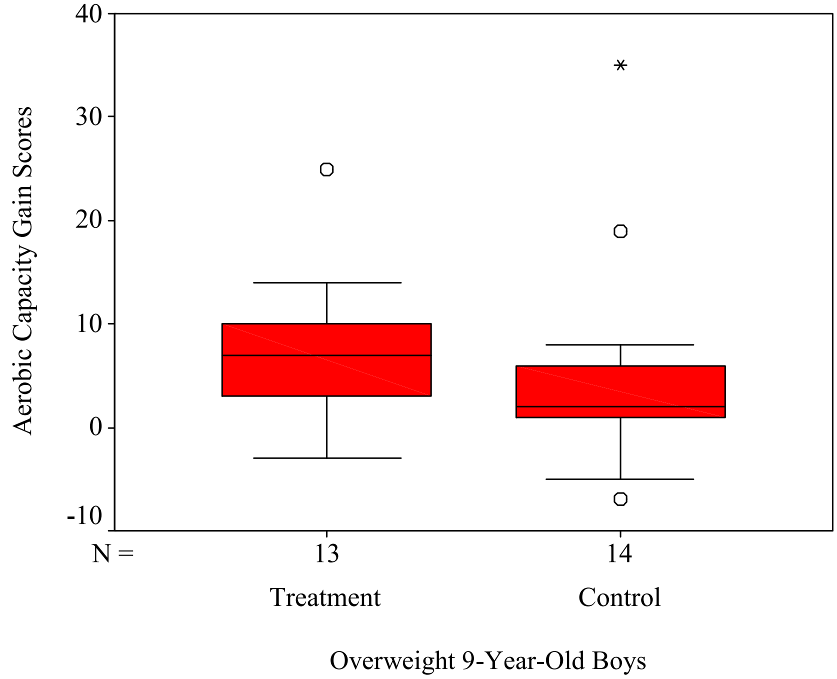

Figure 14. Boxplot for aerobic capacity gain scores for 9-year-old boys by group above a healthy range (overweight).
Note: o = an observation between 1.5 times to 3.0 times the interquartile range;
* = an observation more than 3.0 times the interquartile range

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For 10-year-old girls an independent samples *t* test revealed no significant difference in the Pacer gain scores between overweight students in the treatment and control groups, *t* (16) = .24, *p* = .81, thus retaining the null hypothesis. However, students in the treatment group (*M* = 4.40, *SD* = 4.51) had higher mean gains scores than students in the control group (*M* = 2.92, *SD* = 13.28). The 95% confidence interval for the difference in the means was –11.60 to 14.55. The effect size as measured by η^2 was small (<.01). Figure 15 shows the boxplot for aerobic capacity gain scores for the two groups.

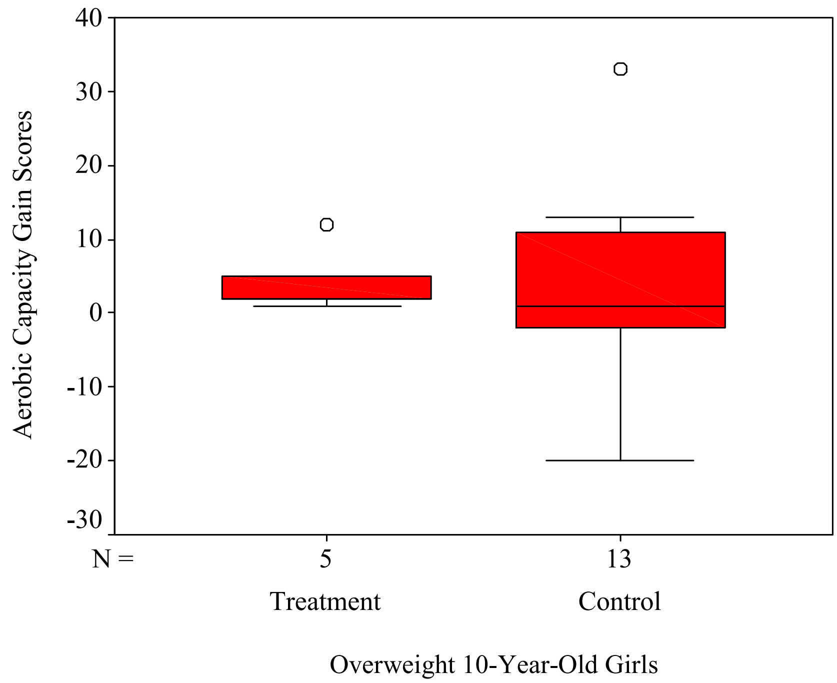

Figure 15. Boxplot for aerobic capacity gain scores for 10-year-old girls by group above a healthy range (overweight)
Note: o = an observation between 1.5 times to 3.0 times the interquartile range

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An independent samples *t* test evaluated the difference in Pacer gain scores for overweight 10-year-old boys between the students in the treatment group and the control group. There was no significant difference in the Pacer gain scores between the groups, t (18) = 1.26, p = .23, therefore retaining the null hypothesis. Students in the treatment group (M = 2.42, SD = 4.23) had smaller gains than did students in the control group (M = 4.75, SD = 3.81). The 95% confidence interval for the difference in the means was –6.24 to 1.57. The effect size as measured by η^2 was medium (.08). Figure 16 shows the boxplot for aerobic capacity gain scores for the two groups.

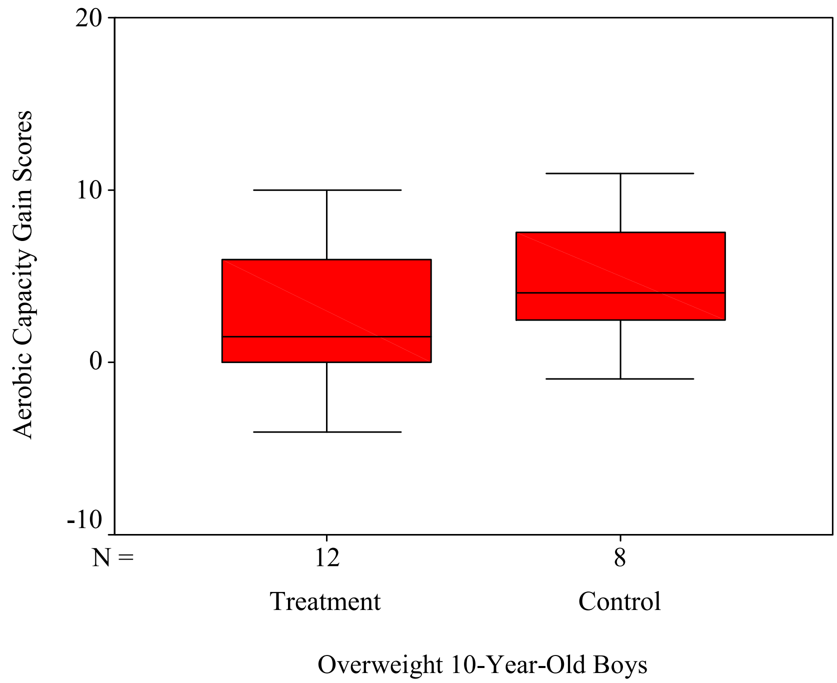

Figure 16. Boxplot for aerobic capacity gain scores for 10-year-old boys by group above a healthy range (overweight)

For 11-year-old girls an independent samples *t* test revealed no significant difference in the Pacer gain scores between overweight students in the treatment and control groups, *t* (13) = .58, *p* = .57. therefore retaining the null hypothesis. Students in the treatment group (*M* = 4.63, *SD* = 4.53) had slightly smaller gains than did students in the control group (*M* = 5.86, *SD* = 3.48). The 95% confidence interval for the difference in the means was –5.80 to 3.33. The effect size as measured by η^2 was small (.03). Figure 17 shows the boxplot for aerobic capacity gain scores for the two groups.

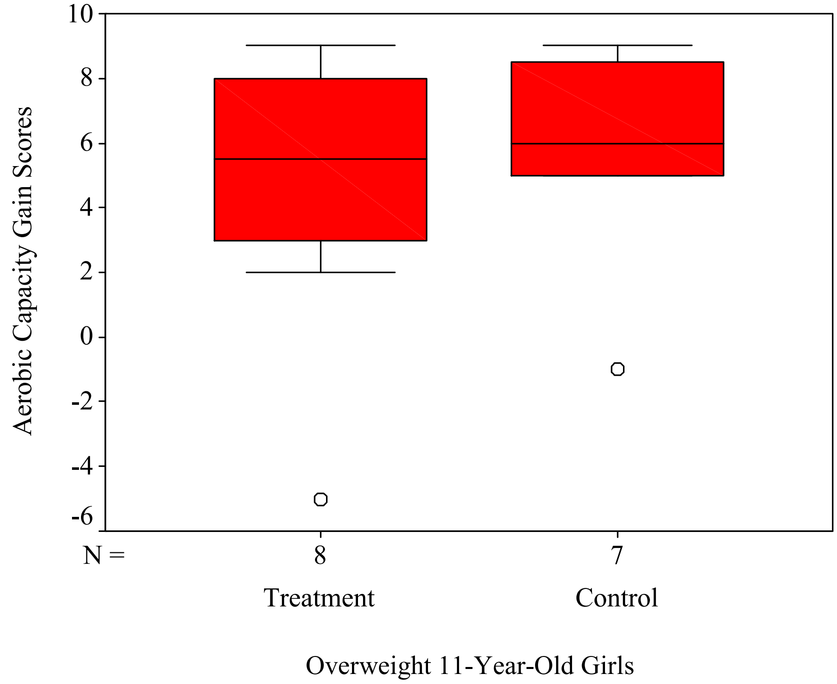

Figure 17. Boxplot for aerobic capacity gain scores for 11-year-old girls by group above a healthy range (overweight)
Note: o = an observation between 1.5 times to 3.0 times the interquartile range

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An independent samples *t* test evaluated the difference in Pacer gain scores for overweight 11-year-old boys between the students in the treatment group and the control group. There was no significant difference in the Pacer gain scores between the groups, t (28) = .34, p = .74. Therefore, the null hypothesis was retained. Students who were in the treatment group (M = 3.85, SD = 5.58) had smaller gains than student in the control group (M = 2.82, SD = 9.75). The 95% confidence interval for the difference in the means was –5.19 to 7.23. The effect size as measured by η^2 was small (<.01). Figure 18 shows the boxplot for aerobic capacity gain scores for the two groups.

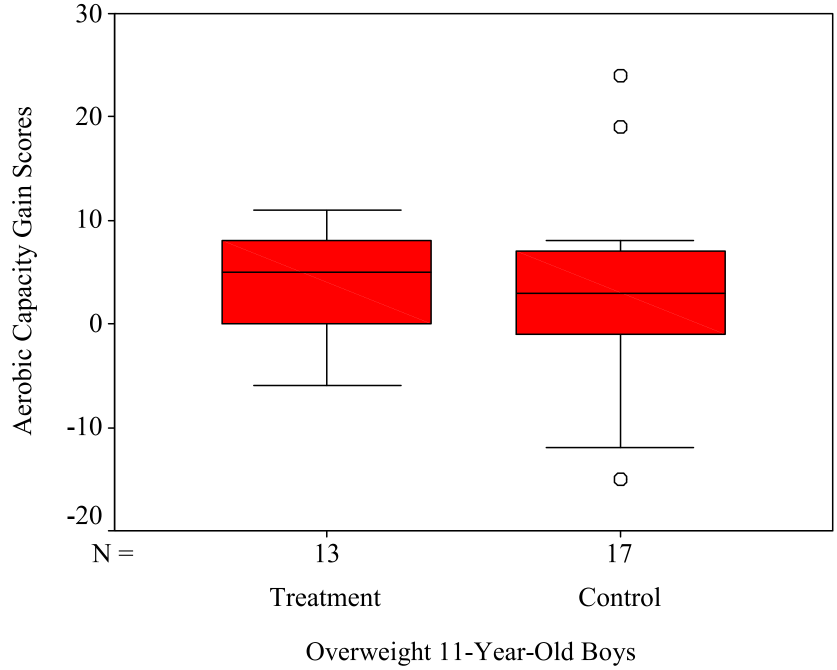

Figure 18. Boxplot for aerobic capacity gain scores for 11-year-old boys by group above a healthy range (overweight)
Note: o = an observation between 1.5 times to 3.0 times the interquartile range

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Overweight 12-year-old boys and girls were not part of the analysis because the sample size was too small, thus the hypotheses were not tested. The girls had one student in the treatment group and one in the control group. Twelve-year-old boys had four students in the treatment group and two students in the control group.

The cross-tabulated Chi square and independent *t* test analysis yielded mixed results for body composition and aerobic capacity. While Chapter 4 included the results of the analysis, Chapter 5 further explains the summary of these findings. In addition, Chapter 5 offers rationale for conclusions and recommendations for future research.

CHAPTER 5

SUMMARY, FINDINGS, CONCLUSIONS, RECOMMENDATIONS

Chapter 5 includes a summary of findings of research questions, conclusions, and recommendations for future implementation of a pedometer programs as well as implications for future research. The research examined the effectiveness of the ActiPed Pedometer intervention program. The study focused on whether the pedometer intervention program would sustain or improve aerobic capacity levels or body composition levels over a 12-week period for students in a school system in East Tennessee.

Methodology Review

The evaluation of the ActiPed Pedometer research employed a quantitative research design. The fitness level of all students was measured pretest and posttest implementation of pedometers for the control and treatment groups. The YMCA provided ActiPed Pedometer step data to the school system. The Director of Federal Projects for the school system provided the data.

The school system's Physical Education teachers provided secondary fitness data. The YMCA provided the ActiPed Pedometer step data based on a grant to fight obesity in the community. Students took the FitnessGram Fitness Battery twice during the school year. The current analysis focused on two variables of the FitnessGram Assessment: aerobic capacity and body composition. Students were either below a healthy level of fitness, within a healthy fitness zone, or in excess of a healthy fitness level based on test results. Levels of fitness classifications depended on the student's age and gender; thus, the study analyzed the data accordingly.

Subjects

The sample consisted of predominately-Caucasian students in a school system in East Tennessee. Students included were in elementary school in grades 2-6 and were 8-12 years old. Either students were in the treatment group or control group based on the number of weeks they wore an ActiPed Pedometer. The treatment group consisted of students who wore the pedometer for 6-12-weeks. Students in the control group wore the pedometer for 0-5 weeks. There were 310 students in the treatment group and 295 students in the control group for the body composition analysis for students at a healthy weight. The body composition analysis for overweight students included 83 students in the treatment group and 82 students in the control group. The aerobic capacity analysis for students at a healthy weight included 371 students in the treatment group and 323 students in the control group. The aerobic capacity analysis for overweight students included 78 students in the treatment group and 79 students in the control group. Population numbers differed because of missing or incomplete data on students.

Findings

Four research questions guided the study and were tested at a .05 level of significance. Analysis of research questions 1 and 2 used a cross-tabulated Chi square. Questions 3 and 4 employed independent *t* tests. Baseline findings revealed mixed results.

Research Question 1: Is there a difference in the Body Mass Index Classifications from pretest to posttest between students in the control and treatment groups?

The Chi square test indicated there was a significant difference in the pretest to posttest BMI statuses of the control and treatment groups for Body Mass Index, χ^2 (2) = 9.31, *p* = .01. The strength of the relationship between group and BMI status as measured by Cramer's *V* was weak (.12). Nineteen students (16.4%) in the control group had worsened BMI over time compared to five students (1.6%) in the treatment group. Most students in the control group (261) and the treatment group (287) received the same results on the Body Mass Index score from pretest to posttest. Fifteen students in the control group improved their status compared to 18 students in the treatment group. Changes in Body Mass Index over a 12-week period for children ages 8-12 were not drastic based on the given period. However, students in the treatment group yielded better results than students in the control group.

Research Question 2: For students who had a Pretest Body Mass Index score higher than the healthy range for students' age and gender (overweight), is there a difference in the Posttest Body Mass Index Classification between students in the control and treatment groups?

The 2 by 2 Chi square results indicated no difference in the posttest BMI Index classifications between overweight students in the control and treatment groups, χ^2 (1) = .17, *p* = .68, thus retaining the null hypothesis. The strength of the relationship as measured by Phi was weak (.03). Not surprisingly, no students in this group moved from the overweight classification zone of fitness to the underweight classification of zone during the 12-week period.

Research Question 3: Is there a difference in the aerobic capacity gain scores between students in the control and treatment groups?

The evaluation for aerobic capacity scores based on students' age and gender required separate analyses for age and gender groups for 8-, 9-, 10-, 11- and 12-year-old students. Subtracting the pretest aerobic capacity scores from the posttest aerobic capacity scores created the dependent variable, aerobic capacity gain scores. A *t* test for independent samples tested the scores by age and gender.

The independent *t* test for aerobic capacity gain scores yielded mixed results for age groups. The independent *t* indicated no significant difference based on age and gender for 8-year-old girls and boys, 9-year-old boys, 10-year-old girls and boys, 11-year-old girls and boys, and 12-year old girls and boys. The treatment groups for 11-year-old girls and boys generated higher mean gains on the aerobic capacity test than the control group. However, there was no significant difference between gains scores for 11-year-olds. The control group for 12-year old boys, while not significant, had higher mean gains than the treatment group. Only the 9-year-old girls yielded positive significant differences in aerobic capacity gain scores. All ages and gender groups had positive mean gains on aerobic capacity scores from pretest to posttest.

One reason 9-year-old girls may have had a significant difference in gain scores was implementation of a national program called Girls on the Run. The program, initiated by the local parks and recreation department, targeted girls 8-13 years of age. The Girls on the Run program issued a pedometer to many students who were eligible to be part of the treatment group. Unfortunately, specific data that linked students to the program and pedometer were unavailable to investigate the phenomenon further. The design of the Girls on the Run (2010) program is a life-changing experience that trains girls, through self-esteem enhanced workouts, to run a 3.1 mile event. “The goal is to promote positive emotional, social, mental, and physical development in girls” (Girls on the Run, 2010, p. 5).

Research Question 4*:* For students whose Pretest Body Mass Index Classification exceeded the healthy range for their age and gender (overweight), is there a difference in the aerobic capacity gain scores between students in the control and treatment groups?

The Independent *t* test for aerobic capacity gain scores for overweight students yielded no significant difference for any of the age groups. Analysis did not include 12-year-old boys and girls because the sample size was too small. Mean gains for the treatment group were higher for 8-year-old girls, 9-year-old girls, 9-year-old boys, and 10-year-old girls. The mean gains for 8-year-old boys were similar for the treatment and the control group. The control group had slightly higher mean gains than the treatment group for 10-year-old boys, 11-year-old girls, and 11-year-old boys.

Limitations

Several factors may limit the findings of the research. The selection of fitness testing components by physical education teachers in individual schools limited the number of students available for the study. All five schools tested students using the Pacer aerobic capacity test; however, only three of the five schools used the body composition test. This eliminated a large portion of the sample to analyze the body composition component. Two of the schools had classes with missing posttest data on aerobic capacity scores. In addition, while guidelines were set for testing, five different physical education teachers (1 at each of the elementary schools) conducted the fitness test battery. The pretest for the fitness testing was in a block of time after November 1, and not all schools pretested students in the same week.

Because student achievement was based on student's age and gender, groups were analyzed accordingly. The number of students in each age group varied due to number of student scores available. There was a difference in the number of scores available to analyze for body composition and aerobic capacity. Student scores were missing because students may have moved schools, had a injury preventing them from taking the test, were absent on the day the posttest fitness test day or posttest fitness test makeup day was administered, attended one of the schools that did not assess body composition, or attended one of the schools with missing posttest data on aerobic capacity scores.

The division of students into control and treatment groups limits the study. Students who wore the pedometer 0-5 weeks were less likely to wear the pedometer every day. However, it is possible that a student who wore the pedometer for 5 weeks may have worn the pedometer more days than the person who wore the pedometer for 6 weeks.

Another limitation may be that the pretest was in the fall and winter months while the posttest occurred in the spring. The scores may have been lower because students were not as active during the pretest period. This may have improved mean gain scores in the components of aerobic capacity and body composition. Students were involved in different youth sporting activities during the winter months or late spring months, which altered their activity and fitness levels. In addition, because student success depended on age and gender, the analysis depended on those categories as well. In return, there was a decrease in sample sizes for each category.

Young students are not predictable. They may not try on either of the tests. They are also aware that in order to improve on the posttest, they should score lower on the pretest. Generally, students test only twice each year and if they were not feeling well or having a bad day, the results may indicate their health level for that day.

Students often lost their pedometers or forgot to wear them on their shoes. Sometime they would lose them and put on someone else's. The serial code at the back of the pedometer was the only way to determine to whom the pedometer actually belonged. While the failure rate, as indicated by FitLinxx was 10%, it was actually higher. The turnaround time to reactivate student pedometers was between 1-2 weeks. In addition, the researcher had only the weeks (with step count) that students participated in the study instead of the number of days, which may have given a slightly different population for treatment and control groups.

Immediate feedback in relation to student activity was an issue. Daily tracking of student activity was the responsibility of the individual student or parents through online resources. Some student who did not have internet access at home found it hard to keep track of their step count scores due to inaccessibility. The team leaders presented step scores once a week while handing out prizes for achieving goals. Student progress was not always charted after lunch because the uplink was located in the cafeteria. Students did not go in the cafeteria after lunch; therefore, any activity after lunch was not recorded until the next day, which presented a 1-day delay in accurate step data.

However, some teachers took students to the cafeteria at the end of the day to rectify this issue and obtain accurate readings for step activity in the evening.

Conclusions

Based on the review of literature and the analysis of the results, the following conclusions developed.

1) Students who wore pedometers improved their score on the body mass index scores between the pretest and posttest assessment.

2) Data analysis should include the number of days students participated in lieu of the number of weeks participated as indicated in this research. Analysis by the day of participation may have yielded clearer results.

3) Students classified as overweight did not significantly improve their status for the control or treatment group. This may be because the time limits of the study constricted the ability to make changes on body mass index for this population. It would take a larger decrease in weight to move students from the overweight range to a normal weight range classification.

4) The majority of students in both control and treatment groups improved their aerobic capacity scores. Social aspects may have played a role as there was an initiative for ActiPed wearers to increase physical activity as their friends in the treatment group did. As classroom teachers increased activities for students, all students were involved in the activities whether they were wearing an ActiPed or not.

5) Nine-year-old girls had the highest gains on the Body Composition test for participating in the ActiPed Pedometer Intervention Program. This may be due to the Girls on the Run Program implemented at one of the schools. However, it may be that 9-year-old girls are more impressionable than other age groups.

6) There was little difference between gains in 8-year-old boys and girls and 10-year-old boys and girls for aerobic capacity for treatment and control groups. All groups had positive mean gains except 8-year-old boys.

7) Eleven-year-old girls and 12-year-old girls were least affected by the ActiPed Pedometer program. This may be because they were less interested in the program and the prizes awarded than were the younger boys and girls. There was also a small sample of 12-year-old boys and girls for analysis.

8) Overall, the impact of the ActiPed program made students aware of their activity levels. Incentives appeared to work for 8-, 9-, and 10-year-old students more than 11- and 12-year-old students.

Recommendations for Practice

Current obesity trends in the country and the State of Tennessee indicate the need to increase physical activity. In addition, new state legislation mandated 90 minutes of physical activity per week for all school aged children in Tennessee. Therefore, the schools collaborated with the YMCA to implement the pedometer program. While the study revealed mixed results, success of pedometer use in schools needs further exploration to determine the benefits. The YMCA, Bristol Tennessee

School System, and its administrators made great strides through program implementation. Listed below are recommendations for future implementation for the program in the school setting:

1) Implementation should begin earlier in the school year and should last for longer periods. For this study, implementation dates were specified and conditional on the release of grant money. Funds and activities were sequential with other actions of the Activate Bristol Grant, which included programs for the community and school staff.

2) There should be a designated person in each school to act as a liaison for the YMCA. Several schools had a building level representative, which helped with communication between students, teachers, and the YMCA.

3) Professional development for the ActiPed program should be available to include Internet usage, website training, and integration activities. There was an 1-hour training session before pedometers were issued. However, online training was not available.

4) School administration should create timelines for fitness testing dates and completion of the test for comparisons that are more consistent. .

5) The school system nurse could be involved in height and weight measurement to increase the reliability of data.

Recommendations for Future Research

Statistically, the ActiPed Intervention Program did not greatly affect aerobic capacity scores or body mass index scores for students. However, the program is beneficial. Further research may reveal benefits of monitoring activity levels for students to improve fitness levels. Additional research may include a longitudinal study using the ActiPed Intervention Program to track activity levels. A more inclusive study could include other fitness components, self-esteem, and academic performance. Because 9-year-old girls were most affected by the treatment, further investigation for this age group could be analyzed, including the Girls on the Run program, to determine health benefits of the program in relation to the school age population. A qualitative study could provide additional information from a student, teacher, team leader, principal, and YMCA administrator perspective in regards to the success of the program in public schools.

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APPENDICES

APPENDIX A

Letter to Seek Approval for Data Collection

East Tennessee State University
Department of Educational Leadership and Policy Analysis * Box 70550 * Johnson City, Tennessee 37614 * 439-4430
August 13, 2009

Dr. Gary Lilly
Director of Schools
615 Martin Luther King Jr. Boulevard
Bristol, Tennessee 37620

Dear Dr. Lilly:

I am writing for permission to conduct research with the Bristol Tennessee City School System as part of my dissertation project to earn my doctoral degree in educational leadership. I have previously discussed the research project with Jennifer Rouse, the Federal Projects Coordinator with your school system.

The study is entitled, “The Effects of an ActiPed Pedometer Intervention Program on Body Composition and Aerobic Capacity of Youth in a School System in East Tennessee.” The study will determine the effectiveness of the ActiPed Pedometer Program (sponsored by the Young Men Christian Association and partnered with the Bristol Tennessee School System) to help students be more active. The focus will be on determining if students decreased body mass index and increased cardiorespiratory endurance over a 12 week period.

The study will include secondary fitness test data previously collected by the elementary and middle school physical education teachers in the 2008-2009 school years. Students’ names are not requested therefore student confidentiality is assured. I have enclosed a copy of East Tennessee State University’s Institutional Review Board letter approving the research with exempt status. Research is considered exempt when there is no risk to students for participating in the study. Reviewing documents (fitness test data) is not considered research involving human subjects. If you have any questions or need additional information you may contact me at 538-3984.

Thank you in advance for your time and consideration. I am looking forward to hearing from you.

Thank you,

Kristie Coleman

Kristie Coleman
Graduate Student
East Tennessee State University

APPENDIX B

Data Collection Approved by Director of Schools

East Tennessee State University
Department of Educational Leadership and Policy Analysis * Box 70550 * Johnson City, Tennessee 37614 * 439-4430
August 13, 2009

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Director of Schools
615 Martin Luther King Jr. Boulevard
Bristol, Tennessee 37620

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Thank you in advance for your time and consideration. I am looking forward to hearing from you.

APPROVED
August 26, 2009
Bristol Tennessee City Schools

Thank you,

Kristie Coleman

Kristie Coleman
Graduate Student
East Tennessee State University

VITA

KRISTIE RUSSELL COLEMAN

Personal Data: Date of Birth: February 14, 1972
Place of Birth: Bristol, Tennessee
Martial Status: Married

Education: East Tennessee State University, Johnson City, Tennessee; Educational Leadership; Ed. D., 2010.
East Tennessee State University, Johnson City, Tennessee; Physical Education-Teaching Administration, M.A., 1996
East Tennessee State University, Johnson City, Tennessee; Physical Education K-12, B.S., 1994

Professional Experience: Program Assistant, Haynesfield Elementary, Bristol, Tennessee; 2009 to present
Physical Education Teacher, Holston View Elementary, Bristol, Tennessee, 2005-2009
Adjunct Faculty, East Tennessee State University, Johnson City, Tennessee, 2008
Lecturer, East Tennessee State University, Johnson City, Tennessee, 2005-2006
Physical Education Teacher, Holston View Elementary, Bristol, Tennessee, 2000-2005
Adjunct Faculty, King College, Bristol, Tennessee, 2005
Physical Education Teacher, Ross N. Robinson Middle School, Kingsport, Tennessee, 1999-2000
Physical Education Teacher, Sullivan Central High School, Blountville, Tennessee, 1997-1999
Special Education Assistant, Ross N. Robinson Middle School, Kingsport, Tennessee, 1996-1997
Interim Physical Education Teacher, Ross N. Robinson Middle School, Kingsport, Tennessee, 1996
Home Survival Teacher, Fairmount Elementary School, Bristol, Tennessee, Summer 1996
Graduate Assistant, East Tennessee State University, Johnson City, Tennessee, 1994-1996