

Impact of a Physical Education Curriculum on Fitness Levels of High School Girls

by

Jennifer Rowden

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Abstract

The purpose of this study was to determine the impact of participation in fitness components of the Baltimore County Physical Education curriculum on four fitness criteria of 29 female high school students. This study used a single group, pre-post test design. The independent variable was physical activity. Physical activities were varied in intensity, difficulty, length and type. The dependent variable was fitness level measured by the FITNESSGRAM tests of muscular endurance, muscular strength, body composition and cardiovascular fitness. Results showed that participants' fitness levels did improve significantly on each test; however, scores did not improve enough to put all students into the healthy fitness zone for each test. The analysis showed a significant decrease in body composition, $t(24) = 6.31, p < .05$. The curl-up scores increased significantly with the daily use of muscular endurance exercises, $t(24) = -4.85, p < .05$. There was a significant increase in upper body strength after the participation in muscle-specific exercise, $t(23) = -6.15, p < .05$. The analysis of the pacer test revealed a significant improvement, $t(24) = -8.49, p < .05$. There are many factors that play into fitness scores; for a more reliable recording a longer trial period may show more significance in findings.

CHAPTER 1

INTRODUCTION

Overview

America's children are heavier than ever, according to the American Heart Association (Daniels, Jacobson, McCrindle, Eckel, & Sanner, 2009) and the Centers for Disease Control and Prevention (2009a; 2009b). Children are consuming more calories each day and exercising less. In 2007 the obesity rate for children under the age of 19 hit an all-time high (CDC, 2009b). Researchers at Memphis State University and the University of Tennessee in 2007 explored the link between watching television and metabolism, and found that kids' metabolisms were lower while they were watching television than when they were resting and doing nothing at all (Klesges, Shelton, & Klesges, 1993). The typical teen now spends almost 30 hours a week in front of the television, while eating high-fat snacks. "The medical community has been sounding the alarm: America's kids are in worse physical shape than they were 20 years ago. This is particularly appalling since overweight teens often grow into overweight adults, and overweight adults develop more heart disease, diabetes, gout, and arthritis" (Cook, 2005, p. 5).

It is common knowledge that being physically fit is good for individuals, but not everyone understands exactly why physical fitness is important. The American Heart Association has developed a list of major benefits one can gain through physical fitness. Exercise has not only the relatively immediate benefits of improved muscle tone, energy, and stamina; it also has longer-term health benefits. Some of these benefits include weight management, improved mental health and mood, and increased life expectancy.

The American Heart Association suggests that teens raise their heart rates for 20 minutes without stopping, three or more times a week. Some possibilities include running, in-line skating,

cycling, swimming, power- or race-walking, tennis, full-court basketball, aerobic dancing, kick-boxing, Tae Bo, hockey, soccer, rowing, elliptical trainer, cross-country skiing, jumping rope, racquetball, handball, ice-skating, and trampoline (CDC, 1997).

Despite the current rise of obesity among teens and the research showing multiple benefits from physical fitness and exercise, Maryland schools are not increasing the required amounts of physical education for students at any grade level. The push in education for Maryland is for students to improve reading, writing and math by completing the High School Assessment before they can graduate. In order for schools to improve test scores they are removing programs such as Physical Education and the arts. Educators, who are interested in seeing children grow, learn and live happy and healthy lives, should take a stand for healthy living. This study aimed to determine whether physical education activities are an effective method of improving teens' fitness levels, in hopes of providing local policy makers evidence of the importance of physical education in schools.

Statement of Problem

This study examined the impact of physical activity on the body composition of female physical education students ages 13-18. With the increase in overweight children and physical education programs being cut across the state, understanding the relationship between physical activity and body composition is crucial.

Hypothesis

Getting students involved in physical activity every day for 60 minutes, where the heart rate is elevated and calories are being expended, during Physical Education class will increase the fitness levels, as measured by the FITNESSGRAM test, of female students aged 13 to 18 in one semester.

Operational Definitions

The independent variable was physical activity. This was operationalized using the Baltimore County curriculum guide for team sports, individual sports and aerobics. Each activity is designed with a specific health and skill component to fitness in mind. The dependent variable was fitness levels. Fitness levels were determined by using the FITNESSGRAM test that requires each student to complete a push-up, curl-up, pacer, sit and reach, body composition, trunk lift and shoulder stretch.

CHAPTER 2

REVIEW OF THE LITERATURE

Introduction

This literature reviews looks at the impact of Physical Education at the high school levels on the body composition of students. Section one goes over the prevalence of obesity. The second section describes in detail the risks associated with obesity, what will happen if one becomes obese and why. Section three examines body composition, looking at what it is and why it is important. The fourth section goes through many examples of why Physical Education is important to students and what benefits individuals will receive if they are engaged in regular physical activity. Section five describes guidelines for physical activity for adolescents. The sixth section examines the programs being offered at the high school level and their goals, and section seven discusses measurements of fitness, including the most common test being used in Baltimore County to determine the current fitness levels of students. The last section examines the research literature on the effectiveness of physical education programs.

Prevalence of Obesity

The increased rate of obesity continues to be a health concern for adults, children and adolescents in the United States. Data from the most recent NHANES survey shows that among adult men the percentage of obesity was 31.1% in 2003-2004, and 33.3% in 2005-2006, a small but not statistically significant change. Among adult women, the presence of obesity in 2003-2004 was 33.2%, and in 2005-2006 was 35.3%, again a small but not significant change (CDC, 2009b).

Another recent NHANES survey found that obesity appeared among children and adolescents showed no significant changes between 2003-2004 and 2005-2006. Based on the

study, in the combined years of 2003-2006, 16.3% of children and adolescents aged 2–19 years were obese (CDC, 2009b).

Risks Associated with Obesity

Americans of all ages who are obese put themselves at risk for many life threatening diseases. Because many diseases can occur from being overweight, obesity is a major concern for the medical world. Some of the conditions that can be attributed to being obese include but are not limited to coronary heart disease, type 2 diabetes, cancers, high blood pressure, high total cholesterol or high levels of triglycerides, stroke, liver and gallbladder disease, sleep apnea and respiratory problems, osteoarthritis (a degeneration of cartilage and its underlying bone within a joint), and gynecological problems (abnormal menses, infertility).

According to the Centers for Disease Control and Prevention obese children and teens are more likely to become obese adults. A study done by the CDC found that approximately 80% of children who were overweight at ages 10–15 years were obese adults at age 25 years (CDC, 2009b). They also conducted another study finding that 25% of obese adults were overweight as children (CDC, 2009b). The latter study also found that if overweight begins before 8 years of age, obesity in adulthood is likely to be more severe.

A body composition high in fat percentage will generally mean more injuries and problems for individuals in their back, knees, and ankles. Most importantly, coronary heart disease will take the lives of those with excessive body fat percentages due to the inability of the vital organs being able to work together efficiently to supply the entire body what it needs to operate daily.

Understanding Body Composition

The ratio of lean body mass (structural and functional elements in cells, body water,

muscle, bone, heart, liver, kidneys, etc.) to body fat (essential and storage) mass is s the definition of body composition. Essential fat is necessary for normal physiological functioning of the body. Storage fat constitutes the body's fat reserves; this is the part that people typically try to lose through diet and exercise.

Body composition is used to describe the percentages of fat, bone and muscle in human bodies. Muscular tissue takes up less space in the body than fat tissue, body composition, as well as weight, determines leanness. Two people at the same height and same body weight may look completely different from each other because they have a different body composition (Vehrs & Hager, 2006).

Knowing the percentage of body fat a person has prior to creating and implementing a workout plan is vital to the success of the program. Body fat can be measured in multiple ways. The most common way body composition is measured in schools is calipers to measure the thickness of subcutaneous fat in multiple places on the body. This includes the abdominal area, the sub-scapular region, arms, buttocks and thighs. This is a machine that the students hold and electro waves are sent through the hands to the body. The amount of time it takes the waves to get back to the machine determines the fat levels. These measurements are then used to estimate total body fat with a margin of error of approximately four percentage points (Vehrs & Hager, 2006). Calipers are most commonly used in the elementary and middle school grades, as student's progress to high school another form of body composition measurements is used; this is called a bioelectrical limpedance analysis (BIA), which uses the resistance of electrical flow through the body to estimate body fat. This is the most common form used in high school Physical Education classes (Corbin & Le Masurier, 2006). The most accurate but least accessible way is to use a large tank of water to measure body buoyancy. Increased body fat will

result in greater buoyancy, while greater muscle mass will result in a tendency to sink. This is known as hydrostatic weighting. A technique for measuring body composition has been developed using the same principles as under waterweighing (Vehrs & Hager, 2006).

There are always problems that arise from any body composition measurements that are taken in the schools. Manore, Meyer, and Thompson (1984) examined some of the issues that are raised by determining body fat levels in Physical Education and Health classes. The most accurate way to determine body mass index is underwater weighing. Unfortunately this is not available in schools so alterative forms of measurements have to be used. This article exposed some of the issues with body mass index measurements and how they can give a false reading for students. This means educators could be developing programs to reduce body composition in students that do not need it. The skin fold caliper is the least accurate way to measure body mass index that is used in schools. The caliper often gives a false reading because many students regardless of weight carry extra skin in the triceps area. This will cause the readings to be higher. The height-weight tables, though some use them to determine body mass index, do not measure body fatness. They also do not take into account an athletic or muscular-build person who weights a lot due to muscle being heavier than fat. They could mistakenly be placed in an overweight category. The body fat analyzer had its issues too. The machine can give false readings if the information is not put in correctly. The machine asks for height, weight, age and gender. If the user does not have the accurate information on height and weight, an accurate reading will not be obtained. The machine also does not give accurate readings on athletic people. The more athletic students will weigh more and this could alter the readings. The problem of measuring body fatness in school sand in physical education classes is the lack of instruments and their effectiveness (Manore, Meyer, & Thompson, 1984).

Benefits of Physical Education

The American Heart Association agreed in a 2007 published report that living a consistent physically active life will reduce a person's chance for disease and premature death (American Heart Association, 2007). When a person engages in vigorous activity the heart is required to do more work to supply blood to the vital organs as well as the rest of the body. When the heart works harder the individual's heart rate will become elevated. To achieve cardiovascular fitness benefits a person must keep his or her heart rate in the target heart rate zones for a twenty minute period. The target heart rate zones vary depending on age. The equation for determining the target heart rate zone is $220 - \text{age} \times .60, .70 \text{ or } .80$. An individual should not work below 60% of the target heart rate zone for it will not improve cardiovascular fitness. Individuals should also not work above 80%, due to the strain it will put on the heart and instead of improving fitness it becomes dangerous for the heart. The harder one makes the heart work, and the more often one makes the heart work, over time the heart will adjust to more intense workouts. What is hard for someone to do day one of activity should be easier by day 10, because the heart has been conditioned for activity.

Recommendations for Physical Activity

The Federal Government has issued its first-ever Physical Activity Guidelines for Americans based on research results done on childhood obesity rates in the U. S. They describe the types and amounts of physical activity that offer substantial health benefits to Americans. Accompanying the guidelines is an advisory committee report that reviewed existing scientific literature to identify evidence to develop the physical activity recommendations. The Physical Activity Guidelines for Americans are the most comprehensive of their kind. They are based on the first thorough review of scientific research about physical activity and health in more than a

decade. A 13-member advisory committee appointed in April 2007 by Secretary Leavitt reviewed research and produced an extensive report (U.S. Department of Health & Human Services, 2007).

The key guidelines for children and adolescents are to have sixty minutes or more of moderate or vigorous aerobic physical activity a day which will elevate the heart rate, at least three days a week. Some examples of moderate intensity aerobic activities include hiking, skateboarding, bicycle riding and brisk walking. Vigorous intensity aerobic activities include continuous rope jumping, running and sports such as soccer, basketball and ice or field hockey. Children and adolescents should incorporate muscle-strengthening activities, such as rope climbing, sit-ups, and tug-of-war, three days a week. Bone-strengthening activities, such as jumping rope, running and skipping, are recommended three days a week for a total body balance level of fitness (American Heart Association, 2007).

The Centers for Disease Control have established a national guide for activity benefits by creating a physical activity threshold and target zones for teenagers. Teens should engage in 20 or more minutes of vigorous activity to see fitness benefits (Centers for Disease Control, 1997).

Physical Education Programs in High School

The required Physical Education course offered in Baltimore County is Fitness Foundations Mastery (Baltimore County Public Schools, 1997). The Fitness Foundations Mastery course desired outcomes are for students to become physically fit and demonstrate competency in motor skills and movement patterns needed to perform a variety of physical activities. Also, students are expected to demonstrate an understanding of movement concepts, principles, strategies, and tactics as they apply to the learning and performance of physical activities. Baltimore County Physical Education leads the way to meeting the challenges and

concern of childhood obesity head on. The curriculum's focus is on teaching students about being healthy and primary fitness concepts through physical activity. The Baltimore County curriculum makes a connection between team and individual sports to overall fitness and wellness. The focal points are to expose students to a variety of activities and team sports so that they can find something they enjoy doing and make it a lifetime activity (Corbin & Lindsey, 1997).

The course objectives are that students will participate regularly in physical activity in order to achieve and maintain a health-enhancing level of physical fitness. Students will learn to exhibit responsible personal and social behavior that respects self and others in physical activity settings. Through participation in various activities students will come to value physical activity for health, enjoyment, challenge, self-expressions as well as social interactions (Williams, 2008).

In order for the students to achieve fitness goals, a well-balanced Physical Education program is the first step. A balanced program in Physical Education is intended to encourage and foster the development and maintenance of personal physical fitness. The goal is to instill in students an appreciation for physical activity and promote the "joy of effort" while providing an element of fun and enjoyment through participation (Corbin & Lindsey, 1997). Instructors are supposed to help students to learn, manage, and control activities in a variety of situations. Students are aided in attaining levels of skill development that will allow them to participate more competently in physical activities, including team and individual sports.

In addition to the physical benefits of physical education, students are guided along to develop attitudes, concepts, and values that will assist in problem solving and decision-making through the implementation of cooperative. Physical Education also helps students to develop better social skills and attitudes including independence, responsibility, leadership, cooperation,

fair play or spirit of sport, and to appreciate the capabilities and limitations of self and others (Corbin & Le Masurier, 2006).

Each state has different requirements for Physical Education; in Maryland high school students are required to complete one full credit of Physical Education in their four years of high school. Each state does have Physical Education as a part of their educational credits, but the amount varies by state. Delaware has no mandated P.E. in K-6. However, most schools provide 30-60 minutes per week. P.E. is mandated in grades 7-8. Grades K-6 in Georgia has 90 hours required. Grades 7-8 might have available classes but they are not mandatory. In high school, two classes are required and are usually done in 9th grade. P.E. is mandated at all levels as part of a larger program in Indiana. Two semesters are required to graduate from high school. In Louisiana grades 9-12 must pass 270 hours of P.E. and 90 hours of health to graduate. In all grades 120 minutes per week every semester is required as a part of New York state's educational processes. Physical Education is required by grades K-8 but they have no specific time requirements for North Carolina students. One semester is required for grades 9-12. In South Carolina, P.E. is required for all levels, but no specific minutes per week are required for grades K-8. Grades 9-12 must complete one semester of personal fitness and one semester of lifetime fitness. Lastly, in Vermont grades K-8 have P.E. every year, twice a week. Grades 9-12 must have three semesters. (Corbin & Le Masurier, 2006).

Assessing Whether the Program Will Work

The FITNESSGRAM Test assesses three areas of health-related fitness. Many test items offer multiple options, so teachers can choose which test students would achieve a high level of success. Student scores are evaluated against criterion-referenced standards that have been established to indicate levels of fitness corresponding with health. Standards have been set for

boys and for girls based on age. The use of health-related criteria helps to minimize comparisons between children and to emphasize personal fitness for health rather than goals based solely on performance. The first assessment item is the aerobic capacity test which measures the student's cardiovascular fitness levels. The aerobic capacity test can be done by the PACER test, one-mile run/walk, or the walk test for students ages 13 and older.

The second test in the FITNESSGRAM is the body composition portion. Body composition can be determined by using the percent body fat, which is calculated from body mass index that is calculated from height and weight.

The muscular strength test measures the upper body strength and endurance from doing either push-ups, modified pull-ups, or the flexed arm hang. Muscular endurance is measured through an abdominal endurance test, by completing curl-ups. Lastly flexibility is measured in the back, legs and arms. The trunk extensor as known as the trunk lift measures the flexibility of the back. The sit-and-reach test measure the flexibility of the hamstrings, and shoulder stretch test to see how flexible a person's shoulder joints are. Each of these tests will help in determining the levels of fitness in students (Welk & Blair, 2008).

Some states have gone as far as setting state goals for childhood obesity. Rhode Island is one that has taken the health of their children seriously and established obesity goals based on their current Fitness Gram scores. Their state goals are by 2015 to reduce by 50% the proportion of children entering kindergarten who are overweight, and also by 2015 a reduction in the proportion of children entering the 7th grade that are overweight. Finally by the year 2018 the graduating class will leave being healthier than they were when they started school (Rhode Island Department of Elementary and Secondary Education, 2008).

The Effectiveness of High School Physical Education Programs

Several studies have been done looking at how effective Physical Education programs in school really are in relation to the health and well being of children. The main concern educators pose is that Physical Education is not offered enough in schools over their schools career to see true benefits. A study conducted by Killen and Robinson (1988) shows that there is a benefit to one's resting heart rate, body mass index, triceps skin fold thickness, and subscapular skin fold thickness. The importance of a person's resting heart rate is that it tells what cardiovascular fitness level a person is currently which reflects their overall fitness. A person with a lower resting heart rate will have better fitness scores in the cardiovascular portion of the fitness testing. The study shows that through school-based training on disease prevention paired with physical activity the body will improve fitness. The keys to the study were constant monitoring of activity levels and delivery of material to educate students on their bodies. If the body is required to do more each day the vital organs will adapt and become stronger making it not as difficult to complete simple activities (Killen & Robinson, 1988).

Katz, O'Connell, Njike, Yeh, and Nawaz (2008) found that evidence clearly demonstrated that school-based interventions had significant effects on weight. This article supports the claim that if students are engaged in a daily physical education program where they are required to do activities that are geared toward elevating the heart rate, for cardiovascular fitness and instruction on proper nutrition, there will be a decrease in body composition. Forcing students to spend 20-40 minutes in class working in their target heart rate will have a direct impact on the body and weight. The heart is a muscle and as it is exercised during activity it will become stronger and more efficient. The key for increasing the fitness levels is that as the body begins to adapt, workouts should be increased to continue benefits.

Katz, et al.(2008) showed through their study that the physical activity piece must be accompanied by nutrition in order to see a reduction in weight. Their study showed that “nutrition and physical activity interventions resulted in significant reductions in body weight compared with control” (Katz et al., 2008, p. 1780). The study also found that parental or family involvement led to a standardized mean difference of 0.20 weight loss more than those of uninvolved families (Katz et al., 2008). The nutrition piece was found to be key in this study because they had the students engaged in regular activity but the eating habits of the children was canceling out all the hard work they were doing. The lesson from the study was that they must understand what they eat will affect their bodies even though they are active. The key is for individuals to burn more calories than they eat. In order to do that calorie counting is essential. Goals are set for a 1-2 pound a week weight loss, which calculates to be 3500-7000 calories expended over intake in a week.

Through the articles mentioned above it was shown that Physical Education class alone will not make a significant impact on an individual’s body composition. Diet and exercise go hand in hand. If an individual does not watch what he or she eats and neglects to lower calorie and fat intake all the exercise in the world will not help. Individuals must expend more calories than ingested each day if the goal is to reduce body composition.

Though Physical Education is effective in high schools and will lower the body composition of high schoolers if taught in connection with good eating it has been said that if educators stress physical activity at the elementary and middle school levels along with the health education and eating strategies they could catch children early enough to avoid obesity as teenagers. By exposing children at a young age to healthy eating habits and regular exercise it will become second nature to them instead of a fight to get them involved. Elementary school

teachers have to help the Physical Education teachers and support the idea that children must have a healthy body to store the brain, and not just see Physical Education as play time.

The Fitness for Life curriculum found in Baltimore County Public Schools is an excellent source for effective teaching for health and wellness concepts. The curriculum is geared toward getting students to engage in activity that will elevate their heart rates in the target fitness zone. By achieving this on a daily basis the heart will get stronger and the body will burn calories.

Education is all about tailoring to the needs of children. It is important to know and understand the physical needs of students. Research suggests that by tailoring a physical education program around a student's abilities and interest will help keep them involved. The idea is to get them moving, elevate the heart rate and teach the benefits of what happens to the body while eating right and exercising (American Heart Association, 2007). The most important thing is to evaluate each person based on their health and not compare them to others. Physical fitness goals should be set on an individual need and in a way that one can monitor progress. If an individual sees progress they will be more likely to stay on track.

Some barriers that prevent Physical Education classes to be as effective as they can be is scheduling in the schools. Each school has a unique way that classes are scheduled based on student need and state requirements for graduation. Most schools have a focus of raising test scores. In order to achieve this school wide goal of increasing test scores students are being pulled out of elective classes for extra core class work. Maryland's High School Assessments are a huge push in the high schools since they are required for graduation. Time is being taken for special areas for cram sessions, which is impacting the effectiveness on the fitness goals physical educators have established for students. Staff is also a barrier for schools and their implementation of Physical Education classes. Schools have a certain number of faculties they

are allowed to carry and usually the push is for math, science and English teachers, areas like art music and physical education fall last and often lead to limiting the number of courses that can be offered due to staffing.

Physical educators and health professionals will document with medical research that shows physical activity is good for the body and mind. Regular activity accompanied by a well balanced diet will keep people healthy and trim.

Summary

The prevalence of obesity and the rise in obesity rates shows cause for concern, because of its implications for the health of Americans. The literature review has explored the benefits to being a part of regular physical activity.

While there are differences among states and districts, they all agree that physical education is a key component in the education of youth. The research literature shows some impact of physical education on the physical fitness and obesity levels in high school students. No research is available on the required Physical Education courses offered in Baltimore County, Fitness Foundations Mastery.

CHAPTER 3

METHODS

Design

This study used a single group, pre-post test design. The independent variable was physical activity. Physical activities were varied in intensity, difficulty, length and type. The dependent variable was fitness level measured by the FITNESSGRAM test. The test was administered at the beginning of the semester and at the end of the semester to determine students' fitness levels.

Participants

The participants in this study consisted of 29 female students 13 to 18 years old in grades 9 through 12. The students were predominantly African American. The African American population made up 98% of the students 1.5% White and 0.5% Asian. The group selection was one group of students that were assigned to the researcher through enrolling in the Fitness Foundations course that is required for graduation in Baltimore County. The Fitness Foundations class in which the students are enrolled is a one-credit required class for graduation.

Instrument

The Cooper Institute, a non-profit organization, created the FITNESSGRAM method of measuring fitness in 1982. Their purpose was to create an objective and quantitative method for communicating students' fitness progress from schools to parents, similar to academic report cards (Human Kinetics, 2009). Then and now, students are assessed in the following areas of health-related fitness: cardiovascular fitness, muscle strength, muscular endurance, flexibility, and body composition. Scores were evaluated against objective criterion-based standards, called Healthy Fitness Zones that indicated the level of fitness necessary for health. FITNESSGRAM/

ACTIVITYGRAM software generated the student and parent reports, which contained objective, personalized feedback and positive reinforcement. These reports served as a communications link between teachers and parents. The limitations of the test are that if each student is not watched carefully than the test could be invalid based on the improper skill being completed. The fitness test takes time to be done correctly. The best way to record accurate scores is to have a one on one test with the instructor. This test is appropriate for students at all grade levels, K-12. The goals for each age group will vary, but the test remains the same.

The Healthy Fitness Zone standards were established by the FITNESSGRAM Advisory Board, which includes some of the foremost scientists and practitioners in fitness and physical activity. The use of health-related criteria helps to minimize comparisons between children and to emphasize personal fitness for health rather than goals based solely on performance. This keeps the test reliable and valid. Since only modest amounts of exercise are needed for obtaining health benefits, most students who participate in physical activity almost every day will be able to achieve a score that will place them in the Healthy Fitness Zone.

Procedure

Each day student's participated in a cardiovascular warm-up activity lasting 5 to 8 minutes, in addition to the lesson for that day. Along with the cardiovascular warm up students completed curl-ups and push-ups each day. The goal was for each student to do one more than what was done the day before.

The researcher administered the FITNESSGRAM test to the group of students at the beginning of the semester. The first test, body composition, was measured using the body fat analyzer machine. In order for the machine to calculate body fat each student inputted individual height and weight (which were taken by the researcher), as well as age and gender. Once personal

information had been entered students grasped the machine with a firm grip and waited for the data to appear. Once data had been recorded students filled out their personal assessment sheets which were used to track fitness progress.

The second test was the curl-up test to measure muscular endurance of the abdomen. The curl-up test was administered with the use of a cadence CD. The CD tells the students “up, down.” The students were to do as many curl-ups as possible without stopping. Students started lying down, knees bent and feet flat on the floor. No one could hold the students’ feet. Students’ hands were at the bottom of their thighs; as they curled up their hands should come up to their knees. Motions are repeated until the student cannot do any more. The CD counts in fives. Students were in partners. The partner’s job was to count and make sure the curl-up was done correctly.

The third test was push-ups which measures muscular strength. The push-up test was administered also with a CD. Students were to start in the up position, hands shoulder width apart, elbows straight, legs straight (knees not touching the floor), and butt down. There should be a straight line from head to toe. The CD called cadences to go up and down. Students were to do as many push-ups as they could without stopping. Students were in partners during the push-up test. The partner’s job was to count the number of push-ups completed and to make sure the push-up was done correctly. Once students were finished with the push-ups they recorded their scores on the personal assessment sheets.

The fourth test was sit and reach. The sit and reach test measures flexibility in the hamstrings. Students came over one by one to the sit and reach box. The sit and reach box is a cube with a hangover tab which contains ruler. Each student sat at the box with one foot flat against the box, leg straight. Keeping the leg straight, the student reached down the box as far as

she could, keeping her hands together, and measured each leg. Once the student measured each leg she recorded her score for each leg on her personal assessment sheet.

The next test was the pacer test. The pacer test is designed to measure a student's cardiovascular fitness. Students must run laps in cadence to a CD. The distance is that of a basketball court. When the CD beeps the students must run to the opposite end line. They must reach the line before the next beep. At each beep students change direction heading to the opposing line. There are 5 beeps in a stage. As the stages progress the beeps get closer together, forcing the students to run faster. If the student does not reach the end line before the beep they are finished with the test. The longer they are able to go the better the cardiovascular score will be.

Each student input her personal scores into her score sheets. They compared their scores to the national averages. Based on individual score comparison students created goals on how to improve their fitness scores.

Over the next several months students engaged in activities that were intended to help improve their fitness levels. The Physical Education class followed the Baltimore County curriculum for the Fitness Foundations and Mastery course. The first part of the semester included soccer, tennis, and weight training. At the mid-way point in the semester students repeated the same procedures they did in the fall for fitness testing. The second part of the semester included jumping rope, badminton, track, basketball, and football.

Soccer

The unit objective for soccer was that the student will be able to demonstrate basic soccer skills such as dribbling, passing, shooting, field positioning and rules in order to participate in skill stations and game play. Students began each day with a warm up consisting of a 5-minute

jog, curl ups, push -ups and then stretching prior to skill work. Skill work lasted about 20 minutes. During skill work students practiced their dribbling skills partner passing and shooting through various activities. These skill activities were done in a variety of ways. The last 20 minutes of class students engaged in small group games where they worked on positioning, rules and teamwork. The units lasted 2 1/2 weeks. During the unit students' cardiovascular fitness was assessed using a timed 1- mile run on day 5, day 9, and day 12. Timed mile one scores were recorded on the students' personal fitness sheets, scores for timed runs 2 and 3 were recorded in the teacher's grade book. For homework after the timed run on day 2 students wrote a brief constructed response (BCR) analyzing their cardiovascular fitness using the timed mile run scores.

Tennis

The unit objective for tennis was that students will be able to demonstrate basic tennis skills such as serving, forehand, backhand, scoring, and rules of the game in order to participate in skill development and tournament play. Students began each day with a 5-minute run followed by stretching, curl-ups and push- ups. After the warm-up and stretching was complete students went into skill work. Skill work lasted for 20-30 minutes each class. During skill work students were required to practice serving. During tournament play students were in groups of two playing a tennis match against another group of two. Groups rotated so each group played against different people each day. During skill stations students were required to demonstrate forehand and backhand strokes several times. To prepare for the increased demand in arm use for tennis, during the stretching and warm-ups the class implemented daily push- ups, in hopes of increasing muscular strength. The unit lasted 2 ½ weeks. Students took a push-up test on day 5, day 9, and day 12.

Weight Training

The unit objective for weight training was that students will be able to demonstrate weight training principles to improve muscular strength and muscular endurance in order to increase fitness test scores. Students completed stations that worked on arms, legs and abdominals. The arms stations consisted of bicep curls, ups, push -ups, triceps extensions, bench press, and lateral raises. The push-up station had a goal for students to complete 9 or more push-ups. Nine push-ups completed would qualify for being in the healthy fitness zone for muscular strength. The leg stations were squats and leg press. Lastly the abdominal stations were curl-ups, throw downs and knee lifts. The goal at the curl-up station was to do 35 or more curls-ups. Thirty-five curl-ups completed would qualify as being in the healthy fitness zone for muscular endurance. At each station students were required to identify muscles being used as well as which station is muscular strength and which is muscular endurance. The weight training unit lasted 2 ½ weeks. During the unit students were called at random to complete a push-up and curl-up test one-on-one with the teacher.

Rope Jumping

The unit objective for rope jumping was that students will be able to demonstrate a steady jump for 30 seconds, 45 seconds, and 60 seconds. Students took their heart rate pre and post jumping. Students completed curl-ups, push -ups and stretching daily as they continued to work on our muscular strength and muscular endurance. Each day students were given 3 skills, basic to advanced, that they must practice and demonstrate for a grade before the end of the period. Once skills tests were completed the students had several options to choose from for additional credit. This unit lasted 2 ½ weeks. Students were given a cardiovascular test day 5, day 9, and day 12. The test consisted of asking the students to jump rope as long as they can while the

teacher timed the student. Scores were recorded and compared from one day to the next.

Students who struggled with jump rope could do jumping jacks, for they also test cardiovascular fitness.

Badminton

The unit objective for badminton was that students will be able to demonstrate basic strokes with practice. Students also engaged in footwork stations. Stations forced students to complete skills like line slides, grapevine, and line jump. Students must be able to move quickly across the court in order to volley the birdie. Students began each day with a 6-minute run followed by stretching, curl-ups and push-ups. At this point in the year students increased the warm-up run 1 minute to push their bodies to work harder. After the warm-up and stretching was complete students went into skill work. Skill work lasted 20 minutes each class. The footwork stations required continuous movement which elevated the heart rate, therefore affecting the cardiovascular fitness of students. During tournament play students were in groups of two playing badminton matches against another group of two. Groups rotated so each group played against different people each day. There was a weighted racquet at a few of the skill stations for added muscular strength. As with tennis, to prepare for the increased demand in arm use for badminton, during the stretching and warm-ups the class implemented daily push-ups, in hopes of increasing muscular strength. The unit lasted 2 ½ weeks. Students took a push-up test on day 5, day 9, and day 12. Scores were recorded for each test on individual fitness sheets.

Track

The unit objective for track was that students will be able to demonstrate a basic understanding of the Olympic track events. Each class students warmed up with a 6-minute jog, followed by push-ups, curl-ups and stretching. The first week of the unit students engaged in a

specific event. Day one was shot put. Students started with a softball to learn technique. As technique was acquired the shot put ball weight increased. Day two event focus was hurdles. Students started by using a trainer hurdle which was half the height of standard size hurdle of 36 inches. Students learned the proper techniques of hurdling, emphasizing the trail leg. Higher hurdles were allowed, and those who wanted to stick to the lower hurdles were not penalized. Day three was sprints. Students ran the 50-yard dash and 100-yard dash. The 50 and 100 yard are sprints; they are to be run as fast as possible. Students competed against each other if they chose, or against themselves. Each dash was timed. The goal was to improve each sprint, each time. The first and last sprint times for the 50 and 100 yard dashes were recorded for comparison. Day four was used to practice relays. Students practiced a 4x100 meter race. The 4x100 has 4 people spread out to run 1 complete lap around the track together. Each student runs 1/4 of 100 meters. The relay races allow students to improve cardiovascular fitness. Students were required to run a specific distance as fast as they can. This increased heart rate therefore affecting the cardiovascular system. Students completed several trials of both the 50 yard dash and the 100 yard dash. The distance runs were last. The course allotted two days to do the distance runs. Students started with a 1 mile run. They were timed. Their scores were recorded. Students' ability to maintain pace and speed during the 1 mile run had a direct impact on the pacer test. Day two of the distance run was a 1½ mile walk or run. The likelihood of the students to run a straight 6 laps was slim. Students were able to speed walk 2 of the 6 laps, with the provision that the speed walking laps cannot be run back to back. Scores were recorded. For two weeks students were back to the track for a one-day, one-time timed mile run.

Basketball

The unit objective for basketball was that students will be able to demonstrate basic basketball skills such as dribbling, shooting and passing. Students began each day with a 7-minute run followed by stretching, curl-ups and push-ups. At this point in the year students increased the warm-up run 1 minute to push their bodies to work harder. After the warm-up and stretching were complete students went into skill work. Skill work lasted 20 minutes each class. During skill work students were required to practice ball handling such as dribbling, passing to a partner and shooting. Students were required to complete several dribbling stations. The ball was used as resistance. There was also some partner work to practice defense. Students rotated through stations each day. The basketball units lasted 2 weeks. Each class emphasized something new in terms of game play and strategies. After station work was complete students formed teams of 5 to play 5-on-5 games. Students were required to run up and down the court in 5-minute periods to play a basketball game.

Football

The unit objective for football was that students will be able to demonstrate basic football skills such as throwing, catching, and field positions along with game play. Students began each day with a 6-minute run followed by stretching, curl-ups and push-ups. After the warm-up and stretching was complete students went into skill work. Skill work lasted 20 minutes each class. During skill work students were required to practice throwing and catching to a partner. Stations were set up for students to rotate through. At each station students were required to practice a different run pattern. The ball was weighted in order to require students' muscles to work harder. Forcing muscles to work harder will build muscle tissue. The football unit lasted 2½ weeks. Students were in groups of 6 to 8 and rotated each class to play a different team. Students also

participated in challenge day. Students competed to see who can throw the football the furthest, punt the furthest, and kick off the furthest from the tee. Challenge day was just for fun, and therefore scores were not recorded.

At the end of the semester students were tested again to finalize fitness scores. The FITNESSGRAM was administered again just as it was day one.

CHAPTER 4

RESULTS

This study was done to determine whether the fitness levels of high school girls would increase after completing a semester of Physical Education using the Baltimore County curriculum. Figure 1 displays the pre-test and post-test mean scores for the 4 tests that comprise the FITNESSGRAM assessment: body composition, curl-ups, push-ups, and pacer test.

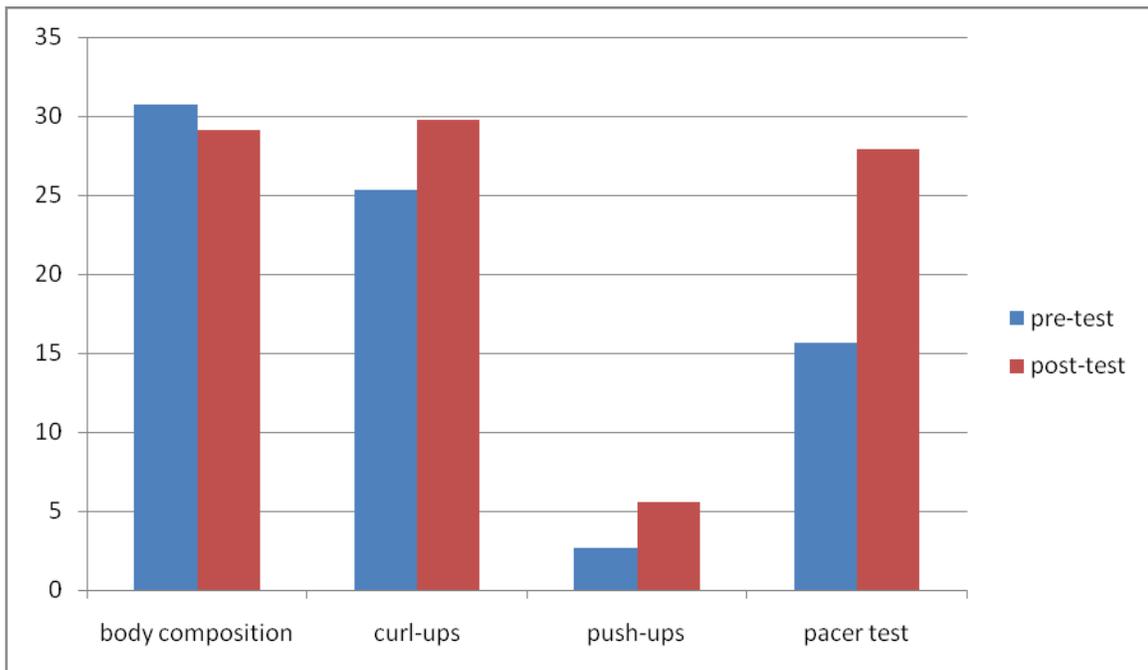


Figure 1. Pre-test and post-test mean scores on 4 FITNESSGRAM assessments.

Body composition scores were measured using the body fat analyzer machine. Lower body composition scores reflect better fitness. Body composition scores are attained by using the student's height, weight, and age information into the body fat analyzer machine which students hold with a firm grip until scores are loaded. The lower the body fat percentages the better the score. Scores that are in the 17% to 32% range of body fat are considered to be in the healthy fitness zone which ultimately means they are at a lower risk for heart problems. The mean of the body composition scores prior to implementation of the physical education

curriculum was 30.76, and after participation in activities the mean body composition score dropped to 29.15, which is the purpose of the exercise. The decrease in body composition showed a significant difference between pre and post test scores, $t(24) = 6.31, p < .05$.

On the curl-up pre-test, the mean score prior to activities was a 25.36; after implementation of the fitness curriculum the curl-up test mean score rose to 29.76. The curl-up scores were recorded as students followed the FITNESSGRAM CD. Students follow the cadence on the CD to an up, down rhythm. Students complete as many curl-ups as they can without stopping. When a student stops their test is over. If students are able to score a 32 or more on the curl up test it signifies that they have strong abdominal muscles. This helps prevent belly fat from forming. The curl-up scores increased significantly with the daily use of muscular endurance exercises, $t(24) = -4.85, p < .05$.

Analysis of the push-up pre-test results showed a mean score of 2.66; after participation in the physical education curriculum the push-up test scores increased to a 5.58 mean score. The push-up scores were recorded as students followed the FITNESSGRAM CD. Students follow the cadence on the CD to an up, down rhythm. Students complete as many push-ups as they can without stopping. When a student stops their test is over. If students are able to score a 9 or more on the push-up test it signifies that they have strong upper body muscles. This helps individuals with carrying weighted objects. The muscular strength post-test showed that there was a significant increase in upper body strength after the participation in muscle-specific exercise in physical education classes, $t(23) = -6.15, p < .05$.

The pacer test showed a pre-test mean score of 15.68; after completing a semester of physical education the mean score for the pacer test increased to 27.92. The pacer test scores were recorded as students followed the FITNESSGRAM CD. Students follow the cadence on the

CD; with each beep students had to sprint the length of a volleyball court. If the students did not make it to the line before the beep their test was over and lap scores were recorded. If students are able to score a 32 or more laps on the pacer test, they would be considered in the healthy fitness zone for cardiovascular fitness. This signifies that students have a strong lung capacity and are able to sustain in an activity for a long period of time without being tired. This helps keep individuals active and build a strong and efficient heart. The analysis revealed a significant difference between the pre and post test mean scores after the implementation of the Physical Education Baltimore County curriculum, $t(24) = -8.49, p < .05$.

Each of the FITNESSGRAM fitness tests showed marked improvements from pre-test scores to post-test scores. Though there was an improvement in scores, not all test results showed enough gains to place students into the healthy fitness zones set forth by the American Heart Association. The post-test mean score for curl ups was 29.76. Although this was an increase from the pre-test score of 25.36, it was still below the national average of 32.00 where students should be. The goal was not attained, though scores did increase. The push-up test also showed a sizable gain moving from an average of 2.6 to 5.5 push-ups, $t(24) = -4.86, p < .05$. Though the push-up average increased significantly, the goal of having student's complete nine push-ups in order to attain a healthy fitness zone reading was not accomplished. The pacer test, which showed the most gain, increased from an average of 15.6 to 27.9, $t(24) = -6.32, p < .05$. Though this was the largest gain among the FITNESSGRAM tests, it was still short of the student's goal of attaining a healthy fitness zone rating with completing 35 laps.

CHAPTER 5

DISCUSSION

The results of the study provided some support for the original hypothesis. Each of the FITNESSGRAM fitness tests showed marked improvements from pre-test scores to post-test scores. Though there was an increase in scores, not all test results showed enough gains to place students into the healthy fitness zones set forth by the American Heart Association.

A small gain was attained in the students' fitness scores through daily implementation of specific exercises geared toward the 5 areas of fitness body composition, muscular strength, muscular endurance, flexibility and cardiovascular fitness. Gains were not enough to meet minimum requirements for the healthy fitness zones as set forth by the American Heart Association. The study shows that the body will benefit from regular exercise; however, with the score starting point being well below the healthy fitness zones, it would take longer than one semester to see scores increase enough to place students in the healthy fitness zones.

The threats to the validity of the study were that the teacher could inaccurately explain and demonstrate the test which would skew the results. If the tests were administered incorrectly the student scores would be affected. The healthy fitness zones are re-evaluated every few years to ensure that the criterion is still accurate. Another threat to the validity of the test is if teachers allow students to enter score data into the computers instead of entering scores themselves. Students entering scores into the computer can allow students to alter scores which will lead to inaccurate results. Another threat to the validity of the study is the maturation levels of the students. Children regardless of age grow and develop muscles and body weight at different paces. Their bodies go through many changes in high school as they mature and this could affect their body composition results.

Many school systems who are advocates for Physical Education and improving students' fitness levels have done studies showing that student fitness levels will improve with regular activity over a period of time. School systems have used these results in trying to persuade school boards to incorporate more Physical Education throughout the school year. Many schools in Maryland use the FITNESSGRAM as this study did to show that with regular exercise each of the health components will be affected. Scores will rise as shown through the study completed.

The difference between this study and others done is the length. A study done in Colorado to advocate for more Physical Education conducted a four year study. A group of ninth graders were given fitness foundation classes every day for 45 minutes starting in their 9th grade year and every year after. Fitness test were conducted three times a year, once in the beginning, once in January, and once again in May. Scores were recorded and demonstrated in a bar graph for each student. At the end of each year scores increased significantly. After the second year of the study 75% of the students were in the healthy fitness zone, by the end of the third year 96% of the students were in the healthy fitness zone and at the end of the study 99% of the students were in the fitness zone. This showed a huge gain. In the beginning of the study only 65% of students in ninth grade passed the fitness test. Because of these results a school district in Colorado has moved from requiring .5 credits in Physical Education to 1.5 credits.

Future research would benefit from the following recommendations. The researcher should test students on a regular basis to catch students that are not progressing as they should be. If students are monitored more closely to check how they are measuring up to the American Heart Association healthy fitness zones guidelines, activities throughout the year could be altered to get more improvements in the needed areas. A longer trial period would be needed to achieve results that would place all students into the healthy fitness zone. Another change that would be

beneficial to the study would be to pull the students' scores from middle school and look at their improvements over a longer period of time. Having scores from middle school would allow the instructor to see inconsistencies with improvements.

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