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Verification and Investigation of Student Intensity Levels During Video Classroom Exercise Sessions

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VERIFICATION AND INVESTIGATION OF STUDENT INTENSITY LEVELS DURING VIDEO CLASSROOM EXERCISE SESSIONS

By

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I dedicate this to…

My loving parents have always devoted everything in their lives towards my best interest. I could not have accomplished anything in my life without them. Their enthusiasm for education and striving to be the best has been an inspiration for me throughout my life.

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ABSTRACT

There is abundant research pointing out the physiological and psychological benefits of physical activity for children (CDC, 2010a), so providing opportunities for children to be active is necessary and beneficial. "Classroom Exercises for the Body and Brain" was developed in the state of Georgia by the HealthMPowers organization to help classroom teachers provide structured physical activity in their classrooms for their students that can be done at their desks as exercise breaks, used as energy boosters, or for rainy day recess. According to the HealthMPowers (2009) organization, exercise interventions or classroom energizers are practical and time-efficient ways to increase student activity time, help focus student's attention, and provide activity that is moderate to vigorous. Many of these exercise programs are designed with good intentions, but have little data to support their claims. The purpose of this thesis was to investigate the intensity levels of nine to ten year old students participating in a video classroom exercise program in a regular classroom setting. Twenty-five fourth grade students (10 females and 15 males), from one intact class participated in this study. Four DVD video exercise sessions ranging from 1 minute 45 seconds to 2 minutes 30 seconds in length were investigated. Data were collected twice on each of the four video exercise sessions. Data collection occurred on six days over a four week period. On the first day students' were measured for weight, height, and waist circumference and learned how to properly put on the heart rate monitors. On the second day students practiced using the heart rate monitors, learned how to perform the exercise videos, and practiced the rate of perceived exertion (RPE) scale. During the final four days of data collection, students participated in two video sessions each day. A thirty minute break was given to students in between each video to allow the heart to return to a sitting heart rate level.

Results revealed that the intensity of the exercise videos resulted in almost all students reaching their target heart rate zone. There was no significant relationship found between peak exercise heart rate and responses to the RPE scale, waist circumference, or BMI. The exercise video with the highest mean heart rate was "Pretend Jump Rope" (M=162.4, SD=16.45) and the lowest mean heart rate was from "Chair Aerobics" (M=142.86, SD=23.75). The exercise videos "Air Step Aerobics" (M=148.86, SD=24.76) and "Mind in Motion" (M=148.94, SD=16.20) had

similar intensity levels. Students and the teacher reported positive feelings towards the exercise video program.

CHAPTER ONE
INTRODUCTION

Overweight and obesity resulting from poor eating habits and sedentary lifestyles have developed into a major health problem for today's childhood population (CDC, 2009a). Remedies have included interventions in schools since most children attend school and can benefit from these changes. Classroom based exercise programs have become a popular option for teachers to use to increase activity time throughout the day (Maeda & Murata, 2004). The National Association for Sport and Physical Education (NASPE, 2010a) recommends that students receive at least 60 minutes and up to several hours of physical activity per day. In addition to total activity time, NASPE recommends that prolonged periods of inactivity be avoided. The availability of several brief exercise programs for classroom teachers to use with their students, both increases physical activity time and avoids students being inactive for extended periods of time. In typical school situations, physical education teachers cannot provide their students with 60 minutes of activity time per day. Nationwide less than one-third of children aged 6-17 years engage in vigorous activity for at least 20 minutes, meaning they are sweating and breathing hard for at least 20 minutes. Since schools are increasingly focused on improving tests scores in reading, math, and science, physical education funding and support have been dramatically reduced over the past few decades in most states (Gaus & Simpson, 2009). It is estimated that only 3.8 percent of children receive 60 minutes of physical activity every day (Lee et al., 2007). It is apparent that children need increased activity time and decreased prolonged sedentary behavior throughout the day.

Over the past few decades there has been a substantial amount of research studying the role physical activity has on many aspects of health. The 2008 *Physical Activity Guidelines for Americans* (US Department of Health and Human Services, 2008) recognizes that Americans should be physically active in order to prevent undesirable health outcomes. They also emphasize that children and adolescents who are active are more likely to continue the same behavior into adulthood (Pate, Baranowski, Dowda, & Trost, 1996). The Centers for Disease Control and Prevention (CDC) acknowledge that physical education can have an impact on students gaining the skills, knowledge, and attitudes necessary to engage in lifelong physical fitness (Lowry et al., 2004). When physical education teachers are not given the necessary class

time, they should be prepared to use other methods. One strategy is to assist classroom teachers in providing meaningful physical activity for their students. Interventions used by classroom teachers, such as video exercise programs, can be one answer for increasing activity time for children throughout the day.

Statement of Problem

There has been a limited amount of research investigating the physical, cognitive and affective goals that video exercise interventions attempt to accomplish (Levin, Martin, McKenzie, &DeLouise, 2002). One result of a video exercise intervention is to increase students' heart rates (HR) for mental and physical benefits. The HR during exercise is an accurate measure of the intensity of the workout during cardiovascular activities. The HealthMPowers organization has created an exercise video entitled "Classroom Exercises for the Body and Brain" (HealthMPowers, 2009). The purpose of this video exercise program is to increase blood flow to the brain and to give students an exercise break. It is predicted that the intensity of these exercises increases students' HR but independent, objective data are not available for this exercise program. In fact, no research has been published to verify the HR of children performing exercise to these video programs. Objective data on the intensity levels of these exercise videos will provide more accurate information to support the benefits claimed by this program.

Purpose

The purpose of this study was to investigate the intensity levels of nine to ten year old students using a video exercise program entitled "Classroom Exercises for the Body and Brain" in a regular classroom setting.

Research Questions

1. Are there differences in intensity, as measured by peak HR, among the four exercise video programs?
2. What percentage of students will reach their target HR zone while participating in each video exercise program?
3. Are there differences in intensity, as measured by peak exercise HR, between the first and second data collections?

4. Is there a relationship between peak exercise HRs of students and their BMI measurement?

5. Is there a relationship between peak exercise HRs of students and their waist circumference measurements?

6. Is there a relationship between intensity of exercise as measured by students' rate of perceived exertion (RPE) and peak exercise HR?

7. What are the views of all of the students about the use of the HealthMPowers exercise video program during the school day?

8. What are the views of the teacher about the use of the HealthMPowers exercise video program during the school day?

Research Hypothesis

1. There will be differences in intensity among the four exercise video programs.

Significance of Study

With increasing demand for student achievement on standardized tests and decreased fiscal support for physical education there are fewer opportunities available for students to be active during the school day. There is abundant research pointing out the physiological and psychological benefits of physical activity for children (CDC, 2010a), but no research to verify the potential benefits of classroom video exercise programs. "Classroom Exercises for the Body and Brain" was developed to assist classroom teachers with providing structured physical activity for their students that can be done at their desks as exercise breaks, used as energy boosters, or for rainy day recess. Many of these exercise programs are designed with good intentions, but have little data to support their claims. This study will examine the aerobic intensity levels of an intervention used in the state of Georgia developed by the HealthMPowers organization. The data collected in this study will help to assess the value of this specific exercise video intervention.

Assumptions

1. It is assumed that students represent a typical sample of 4th grade students in a regular classroom setting.

2. It is assumed that students will give their best effort during the exercise video sessions and will provide their honest rating on the RPE scale.

Limitations

1. The sample size is limited to one elementary school class of 25 students.
2. The sample does not include all demographics or ethnicities.

Abbreviations

1. Body Mass Index: BMI.
2. Rate of Perceived Exertion: RPE.
3. Centers for Disease Control: CDC.
4. National Association for Sport and Physical Education: NASPE
5. Heart rate: HR

Definition of Terms

1. Peak exercise HR: the highest HR reached by a student during each exercise session.
2. Maximum HR: a prediction for the highest HR that will be reached during a maximum effort; the calculation [208-(0.7 x age)] is used to estimate the maximum HR and is based on age.
3. Target HR zone: the optimal training zone for cardiovascular benefits, which is 40-85% of a student's predicted maximal HR. The current formula for predicting maximum HR and the HR Reserve Method for determining the target HR zone will be used in this study. The calculation is: target HR zone = {[208-(0.7 x age) – resting HR] x %(40-85%)} + resting HR.

CHAPTER TWO
REVIEW OF LITERATURE

The purpose of this thesis is to investigate the intensity levels of nine to ten year old students using a video exercise program entitled "Classroom Exercises for the Body and Brain" in a regular classroom setting. A review of literature was conducted on this topic and the independent and dependent variables were reviewed. The topics that will be reviewed for this study include the following: a) benefits of physical activity, b) intermittent exercise, c) fewer exercise opportunities for children, d) exercise prescription, e) role of exercise interventions in schools, and f) the investigation of data collection measures.

Benefits of Physical Activity

There is a vast amount of research confirming the benefits of regular physical activity. This includes physical, mental and psychological benefits (CDC 2010a). Davis, et al., 2007 investigated how physical activity affects cognitive functioning in overweight children. Cognitive functioning was measured by the Cognitive Assessment System. This was administered individually before and after the exercise intervention. Their analysis of post-test scores identified significant effects on executive functioning of the brain. They proposed that this may be a result of an arousal of the sympathetic nervous system stimulated by aerobic exercise, cortical stimulation resulting from organized motor activity and social interaction, and metabolic adaptations resulting from aerobic exercise. From this study it was found that exercise may prove to be an easy and effective method to enhance aspects of children's mental functioning that are needed for cognitive and social development.

In The National Association for Sport and Physical Education's "Shape of the Nation" report many physical activity benefits for youth are cited (NASPE, 2010). They found that children who are physically active are more likely to have healthy cardiopulmonary and respiratory systems. Physically active students will have stronger bones and muscles than children who are not physically active. It is also noted that active children will have a lower percentage of body fat. The position of NASPE is that physically active students have a reduced risk for chronic diseases such as heart disease, high blood pressure, type 2 diabetes, and osteoporosis. These diseases which are usually associated with adults can be developed during childhood and physical activity is a major preventive measure of these chronic diseases. NASPE states that a

physically active child should be active in some manner for at least 60 minutes and up to several hours per day.

Intermittent Exercise

Physical activity programs not only increase activity time but they also increase the frequency throughout the day that children are active. Campbell, Wallman, and Green (2010) compared the effects of a 12 week caloric restriction and continuous aerobic training program versus a 12 week caloric restriction and interval training program on physiological variables of obese' children. Each group exercised in two 15 minute bouts of walking per day five days per week. The continuous aerobic group maintained 50-55% of their VO2 peak. The interval group used a 2:1 ratio of 40-45% and 70-75% of their VO2 peak. They found that the interval training group significantly decreased their very low density lipoprotein levels compared to the continuous exercise group. In addition to these findings it is pointed out that obese children are much more capable of using interval training consisting of alternating high and low intensity exercise than using continuous moderate exercise.

Page, Cooper, Stamatakis, Foster, Crowne, Sabin, and Shield (2005) were interested in identifying the activity patterns of obese versus nonobese children. There was not an intervention used in this study. The researchers objectively measured physical activity using accelerometers. On school days when comparing moderate intensity exercise obese boys were 15% less active than nonobese boys. On weekends when comparing moderate intensity exercise obese boys were 20% less active than nonobese boys. On school days when comparing moderate intensity exercise obese girls were 20% less active than nonobese girls. On weekends when comparing moderate intensity exercise obese girls were 36% less active than nonobese girls. This study also compared activity levels throughout the day for obese and nonobese children while they were active. They found that when children have freedom to choose what to do, such as during recess or at lunch, nonobese children are more active, including participating in moderate to vigorous intensity exercise. Nonobese children were more active during nearly every hour of the study. However the times when children had the freedom to choose what to do was when the most noticeable differences in activity levels between the obese and nonobese children occurred. It was found that the nonobese children participated in activity in intermittent segments throughout the day.

Fewer Exercise Opportunities for Children

Despite the research documenting the benefits of physical activity, many children increasingly have fewer opportunities to be physically active. Evenson, Ballard, Lee, and Ammerman (2009) reported that 30% of 106 school districts surveyed provided less than 60 minutes of physical education per week. John Allegrante said in *Education Week*

> The bad news is that, under the budget priorities dictated by the federal standardized-test requirements in reading and math under the 'No Child Left Behind Act', our schools—the most logical point of intervention is to ensure the health of our children—are perversely cutting health and physical education programs to the detriment of young people's health and learning. (Allegrante, 2004, p. 38)

NASPE recommends that children be active for at least 60 minutes and up to several hours per day. Furthermore it is recommended that elementary aged students are given at least 150 minutes of instructional physical education every week of the school year (NASPE, 2010). In 2006, the CDC produced the School Health Policies and Programs Study (CDC, 2006). This report revealed only 69.3% of elementary schools required physical education. Of these elementary schools that required physical education, 20.8% of them allowed students to be exempt for various reasons. Only 3.8% of elementary schools in the study provided students with daily physical education or its equivalent; the recommendation from NASPE is daily physical education adding up to 150 minutes of physical education per week. It is evident that the majority of students in the United States are not receiving the recommended amount of physical education. The School Health Policies and Programs study also analyzed the amount of physical activity students receive outside of physical education. Of the schools included in this study, 96.8% provided students with regularly scheduled recess averaging 4.9 days per week and 30.2 minutes per day.

Maeda and Murata (2004) while studying the use of classroom energizers investigated why physical education is being cut. They report that physical activity time for students is often being cut because of a reduction in time allotted for physical education for various reasons. During a regular school day students do not have enough time to develop and maintain fitness levels and motor skills. The authors suggest that "all subjects are important, but those subjects

not considered 'core' subjects are often reduced or cut" (p.1). Not only is time a factor in determining opportunities for children to be active at school, but also a school's allotted budget. Because of budget cuts which result in teacher or program cuts, administrators are often either hesitant or incapable of providing students with the recommended time to be in physical education class each week (McGhie, Dyar, & Simmons 1994).

Beaulieu, Butterfield, and Pratt (2009) completed a study entitled "Physical Activity Opportunity in United States Public Elementary Schools". The purpose of this study was to examine physical activity opportunities (PAO) for children in elementary grades 1-5. They found that students had PAO on average in the United States 42-44 minutes per school day. This is far short of NASPE's recommended 60 minutes of moderate to vigorous exercise each school day. The authors also found that from grade one to five opportunities for students to be active decreased each year; from 222 minutes to 204 minutes per week. Schools with smaller enrollments provided more PAO than all schools with larger enrollments. Schools in rural areas provided more PAO than schools in urban or suburban areas. Schools in the Western U.S. provided more PAO than schools in the Southeast, Northeast, or Central states. Schools with low minority enrollment provided more PAO than those with high minority enrollment. And finally schools with low enrollment in free or reduced price lunch provided more PAO than those with high enrollment. The probability of each category for occurring by chance was $<.01$, supporting the fact that physical activity opportunities across the U.S. are being reduced.

Researchers interested in studying the effectiveness of an instrument used to measure physical activity energy expenditure (PAEE) during a short classroom energizer stated:

> Unfortunately, increased pressure placed on schools to improve academic achievement has decreased the time available for physical education classes, thus diminishing the level of physical activity during the school day. However, interventions designed to increase PAEE in the classroom by incorporating physical activity with academic lessons may have the potential to increase PAEE to levels sufficient to reduce the development of overweight and obesity, while not diminishing classroom instruction time (Dubose, K.D., 2008). (Honas et al., 2008, p.439)

Cardon and De Bourdeaudhuij (2008) objectively measured preschool children's activity time throughout the day using accelerometers. Only 5% of children in the study attained 60 minutes

of activity time throughout the day. According to the parent reports that were sent out during the study preschool children on average spent 74 minutes watching television or playing on a computer; and 140 minutes on the weekends.

Exercise Prescription for Children

Exercise prescription for children cannot be assumed to be identical to that of adults. It has been a recent discussion in the field of physical education whether specialists should focus on the process or product, and at what level. By focusing on physical activity participation rather than achieving fitness scores physical educators will have a greater chance of promoting lifelong fitness (Fisher, 2009).

When comparing absolute aerobic capacity in children and adults, children have lower aerobic capacities than adults. When taking into account growth and body size, however, children are alike (Wilmore & Costill, 2004).

Gilbert (2005) studied the appropriateness and effectiveness of training children to use target HR zones while exercising. She found that using the new maximal HR formula [target HR= {[208-(0.7 x age) – resting HR] x %(40-85%)} + resting HR] was more accurate than using the traditional formula of (220-age). Gilbert also found that maximal HR is dependent on age, particularly when dealing with children. She suggests that using either the percentage of maximal HR method or the HR reserve method should be avoided to train children; although they can be accurately calculated. It should be noted that this study was aimed at investigating the appropriateness of children using precise training zones to judge intensity, not teachers monitoring students' HR.

Role of Exercise Interventions in Schools

Evenson, Ballard, Lee, and Ammerman (2009) studied the effect of a statewide policy on physical activity opportunities for children during the school day. The policy implemented statewide was that school children receive 30 minutes of moderate to vigorous physical activity each day. The researchers asked schools which programs they used to reach the mandated thirty minutes of physical activity per school day. They found that of 106 school districts surveyed, 69% reported daily recess, 34% reported daily use of classroom energizers, and 28% reported daily physical education.

Freshwater, Sherwood, and Mbugua (2008) investigated the practice of Kenyan grade school teachers. They presented observations of the common practices of teachers in Kenya. The researchers noted that the teachers used physical play and music much more than U.S. teachers in the classroom. This descriptive report proposed that many of these teaching behaviors that included the use of lots of physical activity in the classroom were effective because it involved students in interactive activities. Informal observations noted physical, mental, and social benefits created as a result of the high level use of physical activity and music.

In a study designed to test the reliability of an indirect calorimeter measure called The System for Observing Fitness Instruction Time (SOFIT) researchers attempted to create an equation to correctly estimate physical activity energy expenditure (Honas et al., 2008). They compared the indirect measure SOFIT to a Portable Indirect Calorimetry Cosmed K4b2. The students' energy expenditure was measured during a 10 minute program that was designed to increase physical activity in the classroom in order to decrease gains in BMI. Example activities in the program include invisible jump roping, geography being taught by walking or running to the appropriate area, and teaching spelling by having students jump to the appropriate letter. They found that on average, the sample of thirty-eight male and female participants scored at 3.04 (kcal/min) during the 10 minute physical activity in the classroom activities. This illustrates the point that classroom activities can result in students significantly raising their energy expenditure.

In a study designed to advocate physical education specialists assisting classroom teachers in leading students in quick and easy classroom exercise breaks, Maeda and Murata (2004) point out that usually physical education teachers cannot usually provide enough quality movement activity for children. Although any activity is better than none, well designed and planned activity from a physical education specialist is more effective than that coming from an untrained classroom teacher. To assist in easing this dilemma the authors suggest that classroom teachers facilitate activity to "…provide students with more opportunities to be active and strike a better balance in all domains of learning" (Maeda & Murata, 2004, p.43). The two purposes of this study were (a) to assist physical education specialists in helping classroom teachers inculcate a classroom energizer entitle "Getting Energized and Recharged" (GEAR), and (b) to show how a group of classroom teachers in Hawaii implemented short classroom energizers regularly into the school day. Twenty four teachers from three schools participated in the study. Researchers

received positive and enthusiastic feedback from teachers concerning the effectiveness and simplicity of implementing the GEAR program. Five minute aerobic exercise videos were utilized during this study. Teachers noted that they planned on continuing using the programs after the study was over to ensure that the effects displayed in students during the study would continue.

Kouli, Rokka, Mavridis, and Derri (2009) conducted a study to see if an intervening dance aerobic program would increase health related fitness and intrinsic motivation. The treatment group participated in the rhythmic aerobic program while the control group participated in a traditional physical education class. Their results showed statistical significance, from the ANOVA repeated measures analysis, that students in the rhythmic program increased both their health related fitness and intrinsic motivation as a result of the intervention. Intrinsic motivation was recorded using a questionnaire (IMI - McAuley, Duncan, & Tammen, 1989). The Prudential Fitnessgram test battery (Cooper Institute for Aerobics Research, 1992) was used for the evaluation of the physical condition of the pupils. Results from the ANOVA showed significant differences between the control and treatment groups when comparing physical abilities and intrinsic motivation. Although this is an example of a physical education intervention, the study did use a rhythmic activity that is similar to that used in "Classroom Exercises for the Body and Brain".

Yetter (2009) investigated obesity prevention programs in youth. It was identified that public health inspired obesity prevention programs have not been strongly linked to positive outcomes. Within the study many exercise interventions were analyzed identifying the positive results that were a result of the program. Three programs were found to be highly successful: 1) "Planet Health" decreased the number of overweight children, 2) Stanford Adolescent Heart Health Program decreased the number of overweight children and the resting heart rate, and 3) a small scale study that reported decreased BMI and skinfold thickness. Overall seven interventions were analyzed in this research and each could support some type of positive benefits.

Lotan, Yalon-Chamovitz, & Weiss (2010) investigated the effectiveness of a virtual reality video exercise program on individuals with intellectual and developmental disabilities on participants' physical fitness levels. This video program included technology as a fun and enjoyable method for participants to increase their fitness levels. Researchers found that the

exercise intervention program reduced participants resting heart rates from an average of 84 beats/minute to 79 beats/minute. This shows successfully using technology in an exercise program to improve participant's physical fitness levels.

Investigation of Data Collection Measures

There will be several procedures used to collect data in this study. The following information applies to HR monitors, the RPE scale, waist circumference, and BMI.

Heart rate monitors. HR monitors are a practical and effective method to measure energy expenditure (Janz, 2002). HR monitors are an instrument used to measure the intensity of exercise during aerobic exercise. Aerobic exercise requires the body to use oxygen; because of this HR monitors can not only measure the intensity of aerobic exercise but also indirectly estimate energy expenditure (Montoye et al., 1996). There is a linear relationship between HR and oxygen consumption. A potential disadvantage is that all models of HR monitors can be subject to electronic interference from other devices that transmit signals.

Researchers interested in increasing the use of HR monitors in physical education say that monitors have become increasingly popular because of their ability to "(1)supplement the physical education fitness curriculum; (2) motivate students to achieve higher intensity levels; and (3) assess students progress in reaching higher intensity levels" (Nichols, Davis, McCord, Schmidt, & Slezac, 2009, p.1).

Gilbert (2005) studied the appropriateness of using aerobic training zones with children. An aerobic training zone is a range of hearts that is an appropriate intensity of exercise. It is categorized as the speed of the heart beat. Within this article she speaks directly to the use of HR monitors.

> Although this method is very exciting for children and adults to use, a student should be competent in other methods of monitoring intensity before using a monitor. The exception to this suggestion may be children below the fourth grade, who may have difficulty taking a pulse manually. If you are using heart rate monitors at the elementary level, ensure that they are for fun and for teaching aerobic fitness concepts, and not for attainment of specified heart rates. (p.26)

Perceived exertion scale. Borg's RPE Scale is a rating of perceived exertion. This scale is a self reporting instrument used to predict HR during exercise (CDC, 2010b). It includes numbers

six to twenty, which represents the current level of exertion. It has been found that a rating of 12-14 generally represents moderate exercise. There is a strong correlation between the heart rate during exercise and the RPE multiplied times ten (CDC, 2010b). If RPE is 12, then the estimated heart rate is 120 b/min. Karavatas and Tavakol (2005) found a moderate correlation of 0.58 between RPE and HR. This study was limited by the sample size of twelve individuals. The authors suggest that Borg's RPE Scale may be used to indirectly assess exercise intensity.

Doering (2002) investigated how the perceived exertion instrument can be used as an instructional tool. She always emphasizes the ability and importance of using the instrument as a teaching tool to assist students' in measuring their exercise intensity saying "helping children learn how to feel their own intensity levels during physical activity might be one of the most significant contributions that physical educators can provide to their students" (p.1). The researcher explains a systematic method for using the perceived exertion instrument as an instructional tool. A problem identified in the study was teaching students to pace themselves during the mile run. They found that contrasting the ideas of "hard" and "easy" was an effective place to start. Researchers noted that children could discuss after and during short pretend jump rope activities that they went "too hard" in the beginning and they ran out energy or felt bad. This led them to the idea that they need a "medium pace" throughout activity. When students were guided through different ideas of intensity they could discuss how each different intensity level made them feel.

Waist circumference. Waist circumference is a measurement of the outside of the abdominal region. There are five different areas that have been used to measure waist circumference: 1) midpoint between the lowest rib and the iliac crest 2) the umbilicus 3) narrowest (minimum) or widest (maximum) waist circumference 4) just below the lowest rib and 5) just above the iliac crest (Klein et al. 2007).

The U.S. Department of Health and Human Services (2005) presents the appropriate method for measuring waist circumference: 1) place the tape measure around your bare abdomen, 2) make sure the tape measure is just above the hip bone, 3) make sure the tape is tight but not compressing, 4) make sure the tape measure is parallel to the floor, 5) exhale and measure.

A method for identifying if someone is at a healthy weight is to measure their waist circumference (CDC, 2009b). For a man over the age of twenty a measurement of over forty

inches increases the risk of developing obesity related diseases and for women the measurement is over thirty five inches. When someone has excessive body fat they put themselves at risk for developing obesity-related conditions. These conditions include Type 2 Diabetes, high blood cholesterol, high triglycerides, high blood pressure, and coronary artery disease.

BMI. A method for identifying if someone is at a healthy weight is to measure his or her BMI (CDC, 2009c). BMI is interpreted differently for children than it is for adults. The healthy BMI zones change in relation to age in months and sex. BMI also changes in relation to height. BMI is a measurement that can be used to identify children that are overweight or obese. Overweight and obesity amongst children is associated with higher risk for chronic diseases including Type 2 Diabetes, high blood cholesterol, high triglycerides, high blood pressure, and coronary artery disease.

Nihiser et al. (2007) conducted a study on appropriate measures and reasons to measure BMI in schools. They found that "from 1980 to 2004, the percentage of youth who were obese tripled from 7% to 19% in children (6-11 years) and 5% to 17% in adolescents (12-19 years) (p. 1).

Based on this review of literature no hypotheses were formed for the current study. However based on the pilot study included in chapter 3 one hypothesis was formed: 1) there will be differences in intensity among the four exercise video programs. It was unknown if there would be a relationship between peak exercise HR and waist circumference, BMI, or RPE. Although there is strong evidence found for differences in activity patterns of obese and non obese children, there is little support for differences in exercise intensity level differences of the two groups of children. Also it was unknown if students would have the ability to accurately respond to the RPE scale. The calculations used for target heart rate zone and BMI were confirmed by multiple sources. The literature outlines a need for increased moderate to high intensity exercise for children. Further, it was found that classroom energizers have been a practical and simple solution to this problem. However there is no information on the intensity of these classroom energizers. This study aims to investigate the intensity of a classroom energizer used throughout the state of Georgia.

CHAPTER THREE

METHOD

Participants and Setting

Twenty-five fourth grade students (10 females and 15 males), between the ages of nine to eleven, from one intact class at the Florida State University School (FSUS) participated in this study. This school was selected because of the stated purpose to serve as a research laboratory for the Florida State University. The specific fourth grade class was selected by the research coordinator at FSUS. Prior to any contact with students or teachers involved in this study, approval was given for the project by the Human Subjects Committee and Florida State University (Appendix A). Every student in the treatment class was given the option to participate in the study and no student was required to participate. Before taking part in the study participants signed the assent form and their parents or guardians signed the informed consent form. Every student signed the assent form and had their parent or guardian give their consent to participate in this study. The primary investigator verbally informed all students that no personal information would be identified with their names, and that this information would not be linked back to them at any time or in any way. All data were analyzed and kept on a hard drive computer through digital format using Microsoft Word, and Microsoft Excel, that requires a password known only by the primary investigator. All digital data will be kept on an external hard drive for a period of one year. All data collected including heart rate, waist circumference, BMI, responses on the RPE scale, and responses on the questionnaire will be deleted on or prior to September 1st, 2011.

Physical Characteristics. On the second day of the study, measurements of physical characteristics were taken for weight, height, sex, and age to calculate BMI and waist circumference. The BMI and waist circumference measurements were used for testing two of the research hypotheses. A summary of the physical information can be found in Table 1. There were twenty five students (N=25) in this study, ten females (n=10) and 15 males (n=15).

Table 1

Summary of Children's Physical Characteristics

	Ht. (cm.)	Wt. (kg.)	BMI	WC (cm.)
Mean	140.41	37.38	18.78	65.91
Median	140.97	36.20	17.70	63.50
Max	153.67	63.14	28.60	86.36
Min	125.73	24.40	14.80	52.07
Range	27.94	38.74	13.80	34.29
SD	7.28	8.91	3.34	8.92

Note. Individual measurements for all children can be found in Appendix B.

Instrumentation and Materials

Six different measures were taken from the participants to address the research questions. These measurements were weight, height, waist circumference, HR, RPE, student questionnaire responses, and teacher questionnaire responses.

Weight and height. Weight and height was used to calculate each student's BMI. Weight was taken using a digital scale. Height was taken by standing participants against a wall with a tape measure taped to the wall from the floor going up. Shoes were removed for both measurements. To ensure privacy weight and height were taken in a large closed closet connecting to the classroom and both a male and female researcher conducted the measurements. A male researcher measured every male student and a female measured every female student.

BMI. BMI was calculated by using the Child and Teen BMI calculator provided by the CDC (2009d). The calculator uses the standard formula which also accounts for age and gender. The categories of healthy weight, overweight, or obese were those recommended by the CDC.

Waist circumference. Waist circumference was used to determine the girth at the abdominal region. This measurement was taken at the school on the first day of the study. A tape measure

was used to measure waist circumference according to the following procedure: 1) place the tape measure around the bare abdomen, 2) make sure the tape measure is in the smallest portion around the waist, 1-2 cm below the last rib, 3) make sure the tape is tight but not compressing, 4) make sure the tape measure is parallel to the floor, 5) exhale and measure (U.S. Department of Health and Human Services, 2005). To ensure privacy all students were measured individually in a large closed closet connected to the classroom. A female co-investigator trained in how to measure waist circumference assisted with this procedure. A male researcher measured every male student and a female measured every female student.

Heart rate. HR was taken using a Polar FT40 HR monitor. The FT40 has shown to be reliable at +/- 1 beat per minute (Polar, 2010). This instrument includes a chest strap and a wrist watch. The HR monitor displays the current HR and a review of peak exercise HR during a specified time period. Children were shown how to properly put on the HR monitors on the first and second days of the project. They were not allowed to manipulate the HR monitors. Only the primary and co-investigator had control over the HR monitors. Researchers assisted students to ensure that they were worn properly and were functioning accurately. A female co-investigator trained in how to wear the HR monitor assisted with this procedure. The only contact with the HR monitors that children had was putting them on and wearing them.

RPE scale. Borg's RPE Scale was used as a subjective measure of exercise intensity (CDC, 2010b) (See Appendix C). This instrument is commonly used by physical education and health specialists. The numbers of 6-20 were printed on a slip of paper and given to each participant after each exercise session. Students circled the number that corresponded with how hard the exercise felt to them. Before testing the researcher explained and demonstrated how this scale works to the students and taught the students how to rate their effort of exertion. Students practiced the procedure two times before the data collection began.

Student questionnaire. A student social validity questionnaire was administered as a subjective measure of student perceptions (see Appendix D). This questionnaire was adapted from a similar questionnaire used in a dissertation that investigated the effects of the video exercise program "Classroom Exercises for the Body and Brain" on students' on-task behavior (Brooks, 2010). The main purpose of this questionnaire was to find out if students found the video exercise program enjoyable and useful. Students made their responses to this

questionnaire on the last day of the study. A sample question included in the questionnaire is: "Do you like doing the HealthMPowers video exercise breaks?"

Teacher questionnaire. A teacher social validity questionnaire was administered as a subjective measure of the teacher's perceptions (see Appendix E). This questionnaire was also used in a dissertation that investigated the effects of the video exercise program "Classroom Exercises for the Body and Brain" (Brooks, 2010). The main purpose of this questionnaire was to find out if the teacher thought the video exercise program was beneficial for students and if she plans to continue to use it after the study is completed. The teacher made her responses to this questionnaire on the last day of the study. A sample question included in the questionnaire is: "Do you believe the HealthMPowers video exercise clips provided appropriate exercise breaks?"

Exercise video. The exercise video used during this study was entitled "Classroom Exercises for the Body and Brain". This program was developed in 2007 by a non-profit organization called HealthMPowers. This program is designed for classroom teachers to use during morning or afternoon breaks, as a quick energy booster, to improve learning, or in place of recess on a rainy day. It consists of four short video clips, each lasting approximately two minutes, with elementary students leading the exercises. For the purpose of this study, only the aerobic sections of the video program were used. The aerobic sections included Air Step Aerobics (2:15 minutes), Pretend Rope Jumping (1:45 minutes), Chair Aerobics (2:30 minutes), and Mind in Motion (1:50 minutes). This program is designed for students to perform in or in front of their classroom desks. From the latest data available HealthMPowers serves 44, 476 students in 59 schools in 15 school districts in the state of Georgia (HealthMPowers, 2009).

Procedures

Each data set that was collected in this study was coded with an ID number. Each student was given a number to ensure privacy. Each student was given a HR monitor which corresponded with their assigned number. This number matched the data entries for each student throughout the study including weight, height, BMI, waist circumference, RPE, sitting HR, peak exercise HR, and questionnaire responses.

Prior to meeting with the class that was used in this project, informed consent forms (see Appendix F) were given to each student by the classroom teacher. The primary investigator

delivered these forms two weeks prior to the first scheduled day of the project in the classroom. Students' were asked to take these forms home and have them signed. The primary researcher had an informal meeting with the classroom teacher and research coordinator at FSUS to discuss the procedures for this project. Prior to collecting any data an observation was conducted of the class during the scheduled time of the research to gather information about space, classroom routines, and other factors that might influence the study.

During the first day of the study the primary researcher explained the assent form (see Appendix G). Students that agree to the form and who had submitted their signed parental informed consent form were allowed to take part in the project. All of the students had parent approval and signed the child assent forms. While explaining the child assent form, students were given an overview of the entire study. Height, weight, and waist circumference measurements were conducted on the first day. The primary researcher, the co-investigator, and the classroom teacher all assisted in taking these measurements. Finally, during the first day, students put on the HR monitors and used them in brief activities. During this time the researcher and assistants checked to see that the HR monitors were working properly. Five assistants and one co-researcher helped collect data in the study.

The second day of the study consisted of a review of the training of how to properly put on the HR monitors. The monitors were checked again to see that they were working properly. In addition, students learned how to perform each exercise routine that was used during the study. On day two it was confirmed that each student could properly put on their HR monitor and understood the process that would take place while collecting data. It was necessary to assign each student to a specific HR monitor on the second day. Each HR monitor was marked with a number. Students used the same HR monitor during data collection for sanitation reasons, and to keep the chest strap fitted for size from day to day. Each HR monitor could store data and assign a date for each exercise session. Data were automatically stored on each HR monitor and included the peak exercise HR during each session of exercise and the date. The data were accessible on the HR monitors until it was manually cleared.

On days three to six regular data collection took place. Data collection took place twice a week for three consecutive weeks. Each day two students participated in two videos. After the first video a thirty minute break was taken each day to allow students HR to return to a sitting

HR level. When the researchers arrived in the classroom, all students put on their assigned HR monitors. The primary researcher and assistants moved throughout the classroom to ensure each child had the HR monitor on correctly and then pressed the center button which began measuring the number of times each students' heart was beating per minute. After this a sheet of paper with a line for sitting HR and peak exercise HR was placed in front of each student. Each page had a number corresponding to their HR monitor. The Borg RPE scale was also on the piece of paper with their name so that the students could give their exertion rating. Students were told to relax and breathe normal while the researchers walked to each student to record the current HR which represented the sitting HR. Once this was completed the exercise routine began. The researchers and the classroom teacher circulated throughout the classroom to assist with any problems and encourage students to give their best effort. After the exercise session students were immediately asked to circle the number on the Borg RPE scale that represented the intensity of the exercise session. Once students circled the appropriate number researchers assisted students in taking off the HR monitors. The primary researcher recorded data from each wrist watch after each video then cleared the watches of all data.

The order of the videos used in data collection made it possible for each video to be the first video one day, and the second video one day. The order of videos used was: 1st day) "Air Step Aerobics", "Chair Aerobics", 2) "Pretend Jump Rope", "Mind in Motion", 3) "Chair Aerobics", "Air Step Aerobics", 4) "Mind in Motion", "Pretend Jump Rope".

On the last day of the study students and the teacher took the social validity questionnaire. Students and teachers were reminded that their responses were anonymous and would not be matched with their name. They were encouraged to respond honestly.

Analysis of Data

Data collected during this project was entered into a Microsoft Excel 2007 spreadsheet. This was done to create charts and graphs that could assist in analyzing the data. To ensure that data analysis were correct and consistent, calculations were conducted three times by the primary investigator. To compare relationships between variables calculations were completed using Microsoft SPSS 15.0.

Research question 1. Are there differences in intensity among the four exercise video programs? The mean class peak exercise HR from each video was recorded. Then the four

averages were compared and ranked from highest intensity to lowest intensity. A one-way between subjects ANOVA was conducted to compare the effects the four HealthMPowers exercise videos had on students' peak exercise HR. A post hoc comparison using a Tukey correction test was used to find if there were significant differences between the four exercise videos.

Research question 2. What percentage of students will reach their target HR zone while participating in the video exercise programs? The current formula for predicting maximum HR and the HR Reserve Method for determining the target HR zone was employed (Gilbert, 2005). The calculation is:

Target HR zone = {[208-(0.7 x age) – resting HR] x %(40-85%)} + resting HR

So if students are within or above their training zones they were counted as being within their target HR zones. The mean of the percentage of students that reached their target zones was calculated by entering the data into Microsoft Excel 2007.

Research question 3. Research question three asked if there were differences between the first and second data collections for each exercise video. A 2 x 4 repeated measures ANOVA with two within-subjects factors, time (one and two) and video ("Air Step Aerobics", "Chair Aerobics", "Mind in Motion", and "Pretend Jump Rope") was used to test the effect of order of data collection on peak exercise heart rate. A Wilks' Lambda comparison was computed to find if there were significant differences between the first and second data collections of each video.

Research question 4. Is there a relationship between peak exercise HR of students and their BMI measurement? Although the BMI is calculated the same for children as it is for adults, it is interpreted differently for children than adults. BMI was calculated by using the Child and Teen BMI calculator provided by the CDC (2009d). The calculator used standard formulas which still account for age and gender. A two variable continuous parametric Pearson correlation coefficient was used to analyze the relationship between peak exercise HR and BMI. All data collections from every video were grouped together for this calculation. Next only the relationship between BMI and the peak exercise of each video was found using a two variable continuous parametric Pearson correlation coefficient. If students were not in class for both data collections of the video being analyzed they were not included in the calculation. Finally the class was split into half by their BMI calculation. One group had the highest BMIs and the other

group had the lowest BMIs. Because there were an odd number of students one group had one more student than the other. At the median split there were two students with the same BMIs so the extra student was added to the group with the higher BMIs. A one-way between subjects ANOVA was conducted to compare the effects students' BMI had on their peak exercise HR.

Research question 5. Is there a relationship between peak exercise HRs of students and their waist circumference measurements? The peak exercise HR was recorded from the heart monitors after each data collection. The second variable was the waist circumference which was taken the first day of the study. A two variable continuous parametric Pearson correlation coefficient was then found to calculate if there was a relationship between peak exercise HR and waist circumference. All data collections from every video were grouped together for this calculation. Next only the relationship between waist circumference and the peak exercise of each video was found using a two variable continuous parametric Pearson correlation coefficient. If students were not in class for both data collections of the video being analyzed they were not included in the calculation. Finally the class was split into half by their waist circumference measurement. One group had the largest waist circumferences and the other group had the smallest waist circumferences. Because there were an odd number of students one group had one more student than the other. At the median split there were two students with the same waist circumferences so the extra student was added to the group with the larger waist circumferences. A one-way between subjects ANOVA was conducted to compare the effects students' waist circumference had on their peak exercise HR.

Research question 6. What is the relationship between the intensity levels of students when measured by the RPE and peak exercise HR? The intensity was found by recording peak exercise heart rate from the HR monitors after each data collection. The second variable was taken by recording the rating from the RPE scale. A two variable continuous parametric Pearson correlation coefficient was used to analyze the relationship between intensity and RPE. All data collections from every video were grouped together for this calculation. Next a one-way between subjects ANOVA was conducted to compare the effect of intensity on RPE of all four videos. The students' two data collections for each video were averaged for this comparison. A post hoc comparison using a Tukey correction test was used to find if there were significant differences between the RPE responses to the four exercise videos.

Research question 7. What are the views of all of the students about the use of the HealthMPowers exercise video program during the school day? This was measured using the student social validity questionnaire. The first four questions of the questionnaire included a Likert Scale. Responses to each of these questions are included in the results section. The fifth question was open ended. Responses to the fifth question are summarized.

Research question 8. What were the views of the teacher about the use of the HealthMPowers exercise video program during the school day? This was measured using the teacher social validity questionnaire. The first four questions of the questionnaire included a Likert Scale. Responses to each of these questions are included in the results section. The fifth question was open ended. Responses to the fifth question are summarized.

Pilot Study

A pilot study was conducted in preparing for this thesis research study. A fourth grade class in the state of Georgia that was already familiar and proficient participating in the exercise routines from "Classroom Exercises for the Body and Brain" was used for the pilot study. Students were given informed consent forms by their classroom teacher prior to the study. Students who had this form signed by a parent or guardian were allowed to participate if they also agreed and signed the child assent form. The fourth grade children participated in three of the aerobic exercise video clips and HR were taken from the Polar FT40 HR Monitors after each video session. Data were collected from eleven students, all in the same classroom, during an hour period scheduled in the morning. There was less than ten minutes of wait time between each exercise video.

Table 2 presents the results of this pilot study. The peak exercise HR is the highest HR recorded over the course of the entire exercise video series.

Table 2

Pilot Study: Peak Exercise HR Data for 4th Grade Students During Three Exercise Video Clips.

Student #	**Resting Heart Rate** b/min		**Peak Exercise Heart Rate** b/min		**Reach Target Heart Rate Zone**
1	135		222		Yes
2	130		222		Yes
3	85		165		Yes
4	77		175		Yes
5	87		174		Yes
6	90		181		Yes
7	88		155		Yes
8	121		188		Yes
9	78		151		Yes
14	90		144		No
16	103		203		Yes
Average Resting HR	**98 SD=20.74**	**Average Peak Exercise HR**	**180 SD=26.78**	**#% Reach Target HR Zone**	**91%**

The average resting HR for the eleven children was 98b/min (SD=20.74). This is within the average range of 70-120b/min for children ages 1-10 years old (National Institutes of Health, 2010). The average peak exercise HR for the eleven children throughout all three video clips was 180b/min (SD=26.78). Ten out of the eleven children or 91% reached their target HR zone.

Based on this pilot project the following procedures were determined for this thesis:

1) Make sure that the heart rate monitor straps are firm and in proper position around the chest to make good contact.

2) Conduct a training session on how to properly put on the HR straps.

3) Conduct a training session on how to perform the exercise routines.

4) Have a rest period after each exercise session to allow heart rate to return to a resting level.
5) Use several adults to help children put on the HR monitors and periodically check their operation.

CHAPTER FOUR

RESULTS

The purpose of this thesis was to investigate the intensity levels of nine to ten year old students using a video exercise program entitled "Classroom Exercises for the Body and Brain" in a regular classroom setting. This chapter provides the results organized for each research question and hypothesis.

Throughout data collection students would occasionally be absent from school which resulted in missing data from that student in two videos. In the complete data sheets that are located in Appendix G the symbol n/a represents the missing data points. The following number of data points are missing for each exercise video: 1)six in "Air Step Aerobics", 2) two in "Mind in Motion", 3) six in "Chair Aerobics", 4) two in "Pretend Jump Rope". This means that for both days that data were collected for the "Air Step Aerobics" video there were a total of six students absent from class. Out of all possible peak exercise HR data entries, 93% or 186 out of the possible 200 data points are included in the results. When students were missing, no data were entered for that student that day, so if one student was missing there would only be 24 sets of student data entered that day. Other than ordinary student absences there were no adverse events that affected data collection.

Research Question One and the Research Hypothesis

Research question five asked if there were differences in intensity among the four exercise videos. A one-way between subjects ANOVA was conducted to compare the effects the four HealthMPowers exercise videos had on students' peak exercise HR. There was a significant effect on peak exercise HR at the $p<.05$ level for the four exercise videos [$F(3, 96) = 4.012$, $p=.010$]. Post hoc comparisons using a Tukey correction test revealed that the mean score for "Pretend Jump Rope" ($M =162.40$, $SD =16.45$) was significantly higher than "Chair Aerobics" ($M =142.86$, $SD = 23.57$). Conversely, "Air Step Aerobics ($M = 148.86$, $SD = 24.76$) and "Mind in Motion" ($M = 148.94$, $SD = 16.20$) did not significantly differ from any of the videos. These results show that there were significant differences in intensity levels between "Pretend Jump Rope" and "Chair Aerobics", when measured be peak exercise HR. Figure 1 displays the differences in the class mean peak exercise HRs.

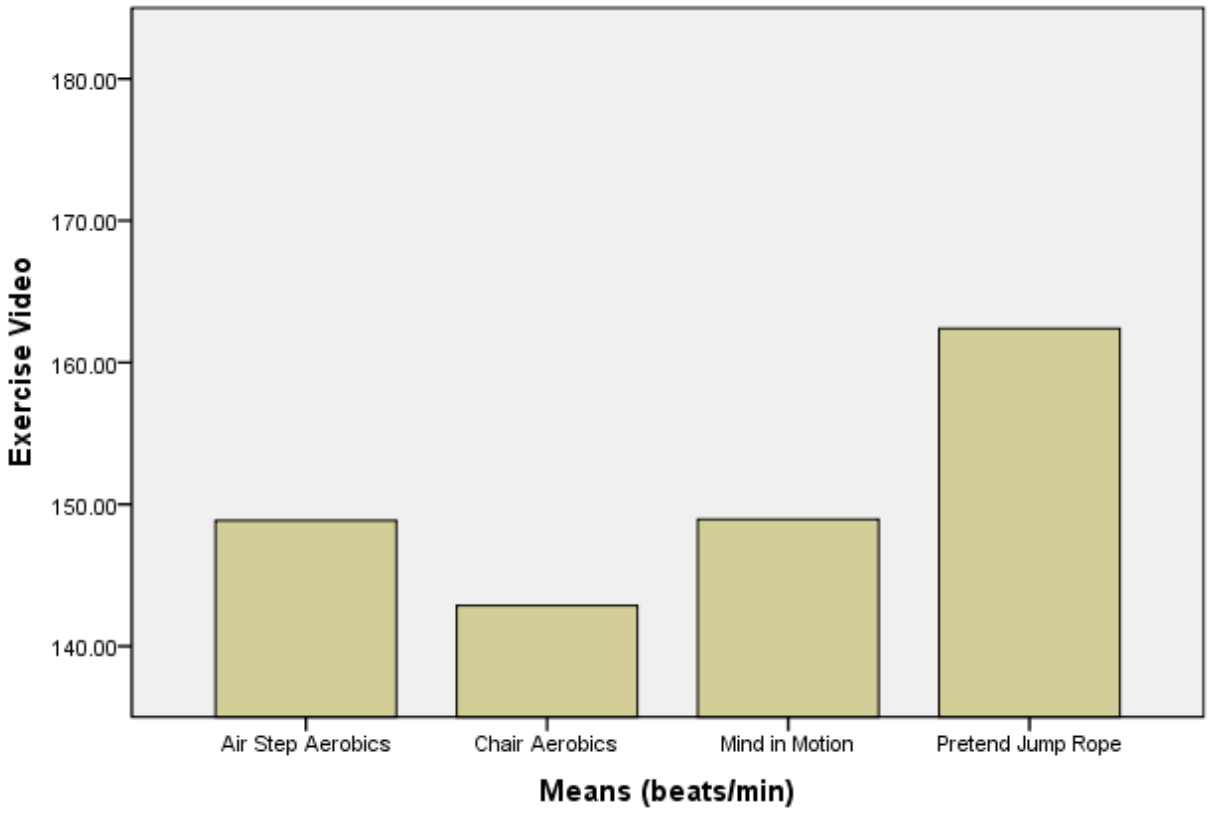

Figure 1. Intensity Levels of Video Exercise Sessions

SD: "Pretend Jump Rope" (SD=6.45), "Mind in Motion" (SD=16.20), "Air Step Aerobics" (SD=24.76), "Chair Aerobics" (SD=23.57). Significant effect between "Pretend Jump Rope" and "Chair Aerobics" at the p<.05 level [F (3,96) = 4.012, p=.010]

The exercise video with the highest mean was "Pretend Jump Rope" (M=162.40, SD =16.45). The lowest average HR was from "Chair Aerobics" (M = 142.86, SD = 23.57). The exercise videos "Air Step Aerobics" (M = 148.86, SD = 24.76)) and "Mind in Motion" (M = 148.94, SD = 16.20) had similar intensity levels. Significant differences were found between the four exercise videos, confirming research hypothesis one.

Research Question Two

Research question one asked what percentage of students would reach their target HR zone while participating in each exercise video programs. Results are shown in Table 3. The resting HR and peak exercise HR are included because these were necessary values used in determining if a student reached his or her target HR zone. The means for resting HR and peak exercise HR

for each version of a video exercise clip are included in Table 3. Each of the versions of the exercises were completed twice, so the numbers in Table 3 are the averages for the two sessions.

Table 3

Exercise HR and Mean Percent of Students Reaching their Target HR Zone for Each Type of Exercise Video Session

	RHR #1 M (b/min)	RHR #2 M (b/min)	PEHR#1 M (b/min)	PEHR#2 M (b/min)	**% Reaching THRZ#1**	**% Reaching THRZ#2**
Air Step Aerobics	92 N =21 SD = 10.48	83 N = 23 SD = 9.52	160 N = 21 SD = 28.41	141 N = 21 SD = 26.77	**90%**	**65%**
Mind in Motion	93 N = 25 SD = 9.49	88 N = 23 SD = 8.50	141 N = 25 SD = 10.68	158 N = 23 SD = 32.10	**90%**	**78%**
Chair Aerobics	87 N = 21 SD = 10.92	89 N = 23 SD = 8.35	138 N = 21 SD = 27.52	143 N = 23 SD = 26.02	**52%**	**43%**
Pretend JumpRope	93 N = 25 SD = 8.52	89 N = 23 SD = 6.64	165 N = 25 SD = 21.22	162 N = 23 SD = 24.57	**90%**	**87%**

Note. RHR=resting HR; PEHR=peak exercise HR; THRZ=target HR zone. #1M and #2M for each video represents the order for each video which data was collected on.

Complete data sheets that include individual values for each exercise video, and the mean, median, range, and standard deviation for each exercise video can be found in Appendix H.

Although all of the students did not reach their target HR zone in any of the video sessions, at least 90% of the students reached their target HR zone in three of the exercise sessions. Intensity was lowest during the "Chair Aerobics" sessions, as expected, and highest during the "Pretend Jump Rope", "Air Step Aerobics", and "Mind in Motion" sessions.

Research Question Three

Research question three asked if there were differences between the first and second data collections for each exercise video. Assumptions about normality and Sphericity were not violated for this test. The two-way repeated measures ANOVA did not demonstrate a significant main effect of time [F (3, 54) = 4.932, p = .004, p < .05]. The interaction effect of time and video was significant, Wiki's Lambda = .511 F (3, 16) = 5.098[a], p = 0.012, n^2 = 0.22

Research Question Four

Research question three asked if there was a relationship between BMI and peak exercise HR. Each student's BMI calculation was correlated with the average peak exercise HR from the eight data collections to find the estimate of the Pearson product-correlation coefficient (r = 0.109), which was not significant (p = 0.603). Less than 1% of the variance was accounted for showing no relationship.

The three students with the highest BMIs were close to all having the same peak exercise HRs. Their peak exercise HRs were 146, 146, and 147 beats/minute. The three students with the lowest BMI's did not have consistent mean peak exercise HR. Their peak exercise HRs were 149, 178, and 131 beats/minutes.

Next the relationship between BMI and student's peak exercise HR within each video was found. Each student's BMI calculation was correlated with their average peak exercise HR from each video to find the estimate of the Pearson product-correlation coefficient: 1) "Air Step Aerobics" (r = - 0.124, p = 0.565), 2) "Chair Aerobics" (r = -0.122, p = 0.562), 3) "Pretend Jump Rope" (r = -0.184, p = 0.379), 4) "Mind in Motion" (r = 0.032, p = 0.879). For each video less than 1% of the variance was accounted for and no relationship was found.

Finally the class was split into groups by their BMI calculation to compare the effects higher or lower BMIs had on peak exercise HR. A one-way between subjects ANOVA was conducted to compare the effects students' BMI had on their peak exercise HR when comparing the two groups of students. There was not a significant effect on peak exercise HR at the p<.05 level for

any of the four exercise videos: 1) "Air Step Aerobics" [F (1, 22) = 0.580, p = 0.454], 2) "Chair Aerobics" [F (1, 23) = 2.121, p = 0.159], 3) "Pretend Jump Rope" [F (1, 23) = 1.089, p = 0.308], 4) "Mind in Motion" [F (1, 23) = 0.082, p = 0.778]. The means and standard deviations for the group of students with the lower BMI calculations were: 1)) "Air Step Aerobics" (N = 12, M= 154.54, SD = 29.74), 2) "Chair Aerobics" (N = 13, M = 149.31, SD = 28.11), 3) "Pretend Jump Rope" (N = 13, M = 165.69, SD = 18.44), 4) "Mind in Motion" (N = 13, M = 149.85, SD = 18.21). The means and standard deviations for the group of students with the higher BMI calculations were: 1) "Air Step Aerobics" (N = 12, M= 147.33, SD = 18.21), 2) "Chair Aerobics" (N = 12, M = 135.88, SD = 15.74), 3) "Pretend Jump Rope" (N = 12, M = 158.83, SD = 13.88, 4) "Mind in Motion" (N = 12, M = 147.96, SD = 14.44).

Research Question Five

Research question four asked if there was a relationship between waist circumference and peak exercise HR. Each student's waist circumference measurement was correlated with the average peak exercise HR from the eight data collections to find the estimate of the Pearson product-correlation coefficient ($r = 0.205$), which was not significant ($p = 0.325$). Less than 1% of the variance was accounted for showing no relationship.

The three students with the highest waist circumferences all had similar mean peak exercise HRs. Their mean peak exercise HRs were 146, 146, and 147 beats/minute. The three students with the lowest waist circumferences had inconsistent and higher mean peak exercise HRs. Their mean peak exercise HRs were 163, 157, and 154 beats/minute.

Next the relationship between waist circumference and student's peak exercise HR within each video was found. Each student's waist circumference measurement was correlated with their average peak exercise HR from each video to find the estimate of the Pearson product-correlation coefficient: 1) "Air Step Aerobics" (r = - 0.022, p = 0.917), 2) "Chair Aerobics" (r = - 0.030, p = 0.885), 3) "Pretend Jump Rope" (r = -0.060, p = 0.774), 4) "Mind in Motion" (r = 0.064, p = 0.762). For each video less than 1% of the variance was accounted for and no relationship was found.

Finally the class was split into groups by their waist circumference measurement to compare the effects higher or lower waist circumferences had on peak exercise HR. A one-way between subjects ANOVA was conducted to compare the effects students' waist circumference had on

their peak exercise HR when comparing the two groups of students. There was not a significant effect on peak exercise HR at the p<.05 level for any of the four exercise videos: 1) "Air Step Aerobics" [F (1, 22) = 0.339, p = 0.566], 2) "Chair Aerobics" [F (1, 23) = 0.014, p = 0.906], 3) "Pretend Jump Rope" [F (1, 23) = 0.684, p = 0.417], 4) "Mind in Motion" [F (1, 23) = 1.578, p = 0.222]. The means and standard deviations for the group of students with the lower waist circumference measurements were: 1)) "Air Step Aerobics" (N = 12, M= 148.17, SD = 28.32), 2) "Chair Aerobics" (N = 13, M = 142.31, SD = 27.77), 3) "Pretend Jump Rope" (N = 13, M = 159.77, SD = 16.85, 4) "Mind in Motion" (N = 13, M = 145.08, SD = 14.48). The means and standard deviations for the group of students with the higher waist circumference measurments were: 1)) "Air Step Aerobics" (N = 12, M= 153.71, SD = 16.84), 2) "Chair Aerobics" (N = 12, M = 143.46, SD = 19.24), 3) "Pretend Jump Rope" (N = 12, M = 165.25, SD = 16.24), 4) "Mind in Motion" (N = 12, M = 153.13, SD = 17.52).

Research Question Six

Research question two asked if there was a relationship between RPE and peak exercise HR. The RPE class means for each video were: 1) "Air Step Aerobics" (M=13.72, SD=3.52, N=24), 2) "Chair Aerobics" (M=14.56, SD=3.97, N=25), 3) "Mind in Motion" (M=13.10, SD=3.92, N=25), 4) "Pretend Jump Rope" (M=16.27, SD=3.60, N=25). Each student's average RPE from the eight data collections was correlated with each student's average peak exercise HR from the eight data collections to find the estimate of the Pearson product-correlation coefficient (r = 0.039), which was not significant (p = 0.852). Less than 1% of the variance was accounted for showing no relationship. Figure 2 displays this relationship.

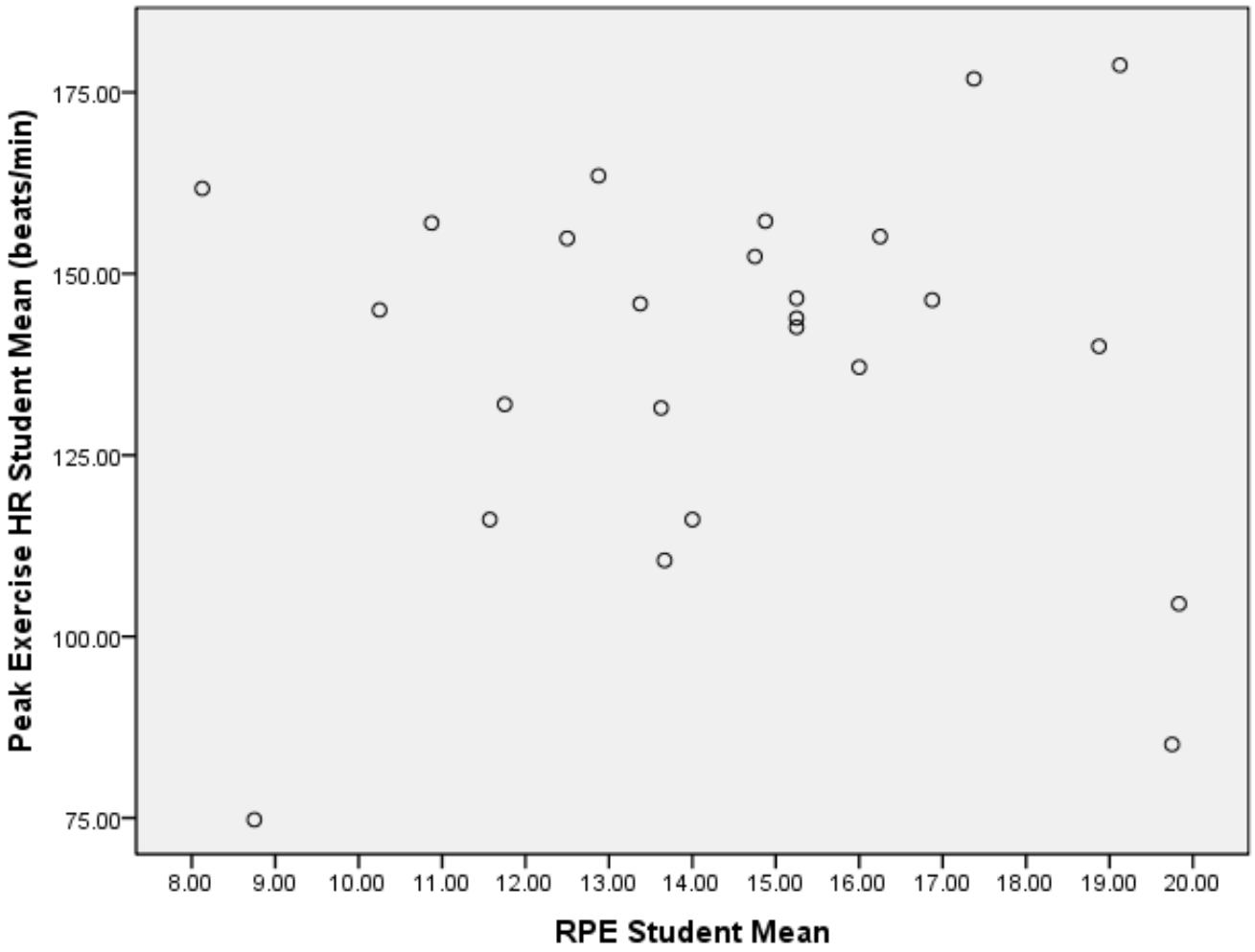

Figure 2. RPE and Peak Exercise HR Relationship

A one-way between subjects ANOVA was conducted to compare the effects each HealthMPowers exercise video had on students' RPE response. There was a significant effect on RPE at the $p<.05$ level for the four exercise videos [$F(3, 95) = 3.724$, $p = 0.014$]. Post hoc comparisons using a Tukey correction test revealed that the mean score for "Pretend Jump Rope" ($M = 16.32$, $SD = 3.91$) was significantly higher than "Mind in Motion" ($M = 13.10$, $SD = 3.81$). Conversely, "Air Step Aerobics ($M = 13.85$, $SD = 3.40$) and "Chair Aerobics" ($M = 14.22$, $SD =$ 3+82) did not significantly differ from any of the videos. These results show that there were significant differences in intensity levels between "Pretend Jump Rope" and "Mind in Motion", when measured by peak exercise HR.

Student Social Validity Questionnaire

On the last day of the study every student completed a social validity questionnaire. This included four questions on a five point Likert Scale, and one free response question. A student circling a five represented a positive connotation towards the Health M. Powers videos. A student circling a one represented a negative connotation. Two students were absent the last day of data collection so there are a total of 23 questionnaires completed. The five questions included in the survey were:

1) Do you think it is important to have exercise breaks during the school day?
2) Do you like doing the HealthMPowers video exercise breaks?
3) Do you think the exercise breaks helped you to focus better on your work?
4) Would you like to continue doing the video exercise breaks?
5) Which exercise video programs did you like the best? (open ended).

Table 4 summarizes the results from the first four questions.

Table 4

Student's Social Validity Questionnaire Responses (N=23)

	Mean	Mode	Range	SD
Question 1	4.43	5	2-5	0.84
Question 2	3.70	5	1-5	1.49
Question 3	2.91	5	1-5	1.59
Question 4	4.22	5	1-5	1.31

Note. A complete list of student responses is located in Appendix I.

Table 5 summarizes the results to question five which asked students what video exercise program they liked best. Four students wrote down more than one video but not all four. The video that was most popular was "Mind in Motion".

Table 5

Student Questionnaire – Question Five

MM	PJR	All 4	AS	CA	PJR/ASA/MM	PJR/ASA/CA	PJR/MM	PJR/CA
8	4	4	2	1	1	1	1	1

Note. MM = Mind in Motion; PJR = Pretend Jump Rope; AS = Air Step Aerobics; CA = Chair Aerobics; CA = Chair Aerobics

The following are responses to the open ended section of question five on the questionnaire. The following comments were referring to all videos: "they were fun", "because you can dance", and "because they were fun". The next comments were referring to "Pretend Jump Rope": "I like it because I like jump roping", "so we can get (our) fitness on", and "because I like jump roping". The next comment was referring to "Mind in Motion": "because you can dance". The next comment was referring to "Air Step Aerobics": "because it's easy and fun". This last comment was referring to all videos except "Chair Aerobics": "they don't make you lose a lot of breath".

Teacher Social Validity Questionnaire

On the last day of the study the cooperating classroom teacher completed a social validity questionnaire. This included four questions on a five point Likert Scale, and one free response question. Circling a five represented a positive connotation towards the HealthMPowers videos. Circling a one represented a negative connotation. The five questions included in the survey are:

1) How important do you believe it is for children to have exercise breaks during the school day?

2) Do you believe the HealthMPowers video exercise clips provided appropriate exercise breaks?

3) Do you feel the benefits of the HealthMPowers video exercise clips were worth the time and effort required to conduct them?

4) How likely is it that you will continue the video exercise sessions when this study is finished?

5) Which exercise video programs seemed to work the best for your class? Why?

Table 6 summarizes the responses from the teacher.

Table 6

Teacher Social Validity Questionnaire Responses

Question	Response
1	(5)
2	(4)
3	(4) "To make it more meaningful, I would be sure the kids knew why they were doing them".
4	(5) "Action research to see how the videos help unwanted behavior".
5	(open ended) "'Mind in Motion'. They have to think and move".

Note. A copy of the Teacher Social Validity Questionnaire is in Appendix D.

The teacher reported the need for more activity breaks. In addition she reported that this class had many students that were restless in class and could benefit from more exercise. The teacher thought that the "Mind in Motion" video seemed to work best. Her reasoning was that the students were required to think before they moved. Although the teacher's responses to the video exercise sessions were positive, there was no way to make the teacher's responses to the questionnaire anonymous. Therefore there was no way to prevent bias in her answers to the questions, despite the researcher's assurance that the questions should be answered honestly and without fear of consequences.

CHAPTER FIVE
DISCUSSION

The purpose of this study was to investigate the intensity levels of fourth grade students using a video exercise program entitled "Classroom Exercises for the Body and Brain" in a regular classroom setting. To answer each of the seven research questions data were collected from fourth grade students (N = 25) over the course of three weeks. Intensity was measured using HR monitors and the RPE scale. Attitudes towards the exercise sessions were measured using social validity questionnaires. This chapter provides a discussion of the results and implications for future research.

Results (see Figure 1) indicated clear differences in intensity between the four videos. There was a range of 23 beats / minute between the class mean values of lowest video "Chair Aerobics", 141 beats / minute; and highest "Pretend Jump Rope", 164 beats / minute. It was expected that the "Pretend Jump Rope" session would have the highest intensity based on the pilot study. This video was easy for students to follow, fast paced, involved repeated movements using body weight, and did not have any type of breaks. Out of the two data collections there were only five cases when an individual student did not reach their target HR zone. "Chair Aerobics" was also expected to have the lowest intensity based on the pilot study. Students were sitting down, movements did not involve the entire body leaving the ground, and the pace was slower than the other video sessions. Out of the two data collections there were twenty-three cases when an individual student did not reach their target HR zone. One of the necessities of a short classroom energizer is for the exercises to be completed in a small personal space without moving desks or tables. All four video exercise programs met these requirements , but "Pretend Jump Rope" was especially effective in raising students' HR.

Although this study was limited to one elementary school class of 25 students and data were only collected twice on each video session, the study provided worthwhile information on intensity of exercise for these fourth grade students. Results (see Table 3) indicated that a high percentage of the students reached their target HR zone while performing the exercise video sessions. It was expected that more students would reach their target HR zone for each video, however, every student reached their target HR zone in at least one video. The accuracy of the target HR zone formula is confirmed by Gilbert (2005). It was interesting that for each exercise

video the second data collection resulted in a lower percentage of the class reaching their target HR zone. There is a strong possibility this is due to the novelty effect. Students may have been more energetic and focused during the first data collection of each video compared to the second. Lotan, Yalon-Chamovitz, and Weiss (2010) measured the effectiveness of short virtual reality video exercise programs on children's fitness levels. The outcome measure used was resting HRs. This study supported their results that short video sessions can raise HRs to have a training effect. Although these results show short exercise video sessions can successfully raise student HRs to reach their target HR zones, variety and consistent encouragement should be employed to motivate students to participate fully in repeated sessions.

After analyzing the results of research question one, which found that there were significant differences between the intensity of the four exercise videos, there was a question of the possible novelty effect occurring between the first and second data collection of each video. It was thought that it was possible that students would have different intensity levels between the first and second data collections. However results did not show that there were significant differences between the first and second data collections for each video. A study that analyzes intensity levels of students while participating in exercise videos is needed to find if students have lower intensity levels over time while participating in the same videos.

Results (see Figure 2) did not show a significant relationship between peak exercise HR and the RPE. This was expected because it was anticipated that students would not be able to accurately and consistently respond to the RPE scale. The results of this study supported this assumption. Results showed significant differences between the two videos with the highest mean peak exercise HRs, "Pretend Jump Rope" and "Mind in Motion". If students could accurately respond to the RPE scale their responses should have matched their heart rates, and they did not. The videos which were significantly different when measured by peak exercise HR, "Pretend Jump and Rope" and "Chair Aerobics", were not significantly different when measured by the RPE scale. Doering (2002) described how this instrument can be used as an instructional tool. She emphasized that it was difficult to teach students how to pace themselves during exercise, and then describe the intensity of that exercise session. In this study student responses to the RPE scale did not show a relationship between the intensity levels of student HRs. This is consistent with Doering research, since these students did not have extensive

training in using the RPE scale. However both the subjective RPE scale and objective HR measure showed that the intensity of the exercise sessions was high. More research is needed to confirm that the use of the RPE scale can accurately be used as a measure of intensity for children. The use of RPE scales to measure intensity could possibly be accurate with students this age if extensive training and practice is provided.

Results did not show a noticeable relationship between students' BMI and peak exercise HR during exercise sessions. After reviewing the literature it was unknown if there would be a connection between these two variables. When comparing students with the three highest and three lowest BMI measurements there were no consistent differences. The students with the highest BMI, which were classified obese by the CDC, had average peak exercise HRs of 146, 146, and 147 beats / minute. The students with the lowest BMI, which were classified healthy weight by the CDC, had average peak exercise HRs of 131, 149, and 178 beats / minute. From this study it cannot be determined if this inconsistency resembles a pattern or not. A larger sample size is needed to analyze if the correlation between BMI and HR intensity exists.

Results did not show a correlation between the size of students' waist circumference and their peak exercise HR during exercise sessions. After reviewing the literature it was unknown if there would be a connection between these two variables. As found in the review of literature there have been differences found between activity patterns of obese and nonobese children, but not differences of intensity during exercise. However when looking at the students with the three highest and three lowest waist circumferences there are noticeable differences in average peak exercise HR. The students with the three lowest waist circumferences had average peak exercise HRs of 163, 157, and 154 beats / minute. The students with the three highest waist circumferences had average peak exercise HRs of 146, 146, and 147 beats / minute. Page, Cooper, Stamatakis, Foster, Crowne, Sabin, and Shield (2005) found differences in the activity patterns of obese and nonobese children when they were given freedom to choose their activity. In their study, accelerometers were used to measure intensity. They found that obese children were less active. In the current study the three students with the highest waist circumferences and BMI were the same three students. This study found that the students that were obese did not exercise with as much intensity as nonobese students. Although the 2005 study was more interested in physical activity time than intensity, there seems to be a difference between obese

children's choice to be as active or engaged in activity when compared with nonobese children. A larger sample size, or statistical power, is needed to analyze if the correlation between waist circumference and intensity during exercise exists.

Students had positive responses to the video exercise sessions as measured by the student social validity questionnaire. Many of the positive responses included comments about being enjoyable, such as "it is fun". It was apparent that during the majority of the video sessions students were smiling, laughing, and enjoying themselves. However, as anticipated, some videos were more enjoyable than others. Students rated the video "Mind in Motion" as the most enjoyable (Table 4). Open responses to why this was the favorite included that it was like dancing. HealthMPowers has other videos, at least one of which is completely dedicated to "Mind in Motion". As previously mentioned "Pretend Jump Rope" had the highest intensity. It would be expected that some of the more difficult "Mind in Motion" videos could reach or exceed the intensity of "Pretend Jump Rope". Also, as anticipated, "Chair Aerobics" was the least enjoyable. This may have been due to the fact that students were not able to get out of their chairs and move as much. Students seemed to get bored during this video. Students were smiling and laughing most often when they were out of their chairs and moving; "Mind in Motion" and "Pretend Jump Rope" involved this. A few students mentioned in their open responses that they liked the videos because they were easy or they didn't make them lose their breath. Although this was only from a few students, it was inconsistent with the high HR data and most of the reports of high intensity on the RPE scale. The positive student response to the video sessions is encouraging for the continued use of the HealthMPowers videos.

The classroom teacher was eager to assist in this project. She thought these video exercise sessions provided brief breaks in classroom routine, provided some physical activity, and had potential to reduce unwanted student behaviors. This teacher felt it was important for children to have exercise breaks during the day, that these exercise sessions were appropriate, and that the benefits of these exercise sessions were worth the time and effort that they required. The School Health Policies and Programs Study (CDC, 2006) found that only 3.8% of elementary schools in the United States provided physical education totaling 150 minutes per week. This school is unique in that the students receive daily physical education totaling 30 minutes per day and 150 minutes per week. An assumption can be made that the teacher still desired her children to have

more activity time during the day because she thinks the students could focus or perform more proficiently in the classroom. After hearing the teacher's comment that it would have been more meaningful to ensure that the students knew why they were participating in these exercises, it was realized that more could have been done to explain the benefits of the exercise clips. For example, a thirty minute classroom lesson on the benefits of exercise could have increased their understanding of the purpose of the intervention, or, brief messages about the benefits of regular exercise could be used in addition to performing the exercises. This is recommended for research and regular classroom use. It was possible that her reasoning behind liking "Mind in Motion" best was that her students could potentially receive cognitive benefits from the exercise. The teacher anticipated continuing using these videos after the research was completed.

Future Research

The following suggestions are provided for further research on this topic:

1. Continued verification of the intensity of short classroom energizers as they are used over longer periods of time is recommended. An extended investigation is necessary to see if the novelty effect takes place. Also it would be helpful to analyze these videos again over longer periods of time, as well as other short video sessions that are used in the classroom. Accelerometers could be used as an additional or alternate measure of intensity.
2. Investigation of the connection between BMI, waist circumference, and the intensity of exercise is recommended. A larger sample is needed to analyze these factors. This study was not effective in finding this connection because it was limited to 25 students.
3. The cognitive or affective benefits of the "Mind in Motion" video could be explored. Short term effects could be measured using brain teasers, puzzles, or logic problems, to see if students are more successful after participating in the video exercise breaks. Only one version of the "Mind in Motion" video series was used in this study—other versions should be investigated.
4. The effect of exercise breaks to reduce off-task behaviors in the classroom should be explored. Recording off-task behaviors before or after the exercise sessions take place could be a method to measure the effects on the video exercise breaks on classroom behavior.

Conclusions

This study found that "Classroom Exercises for the Body and Brain" raised students' HRs to a target HR zone level. This was verified by measuring student HR's with HR monitors. Some

videos, “Mind in Motion” and “Pretend Jump Rope”, were more effective than others. This was confirmed by analyzing the mean peak exercise HRs from each video. These video exercise sessions were a simple and quick way to encourage physical activity in a regular classroom setting. A study by Campbell, Wallman, and Green (2010) found that intermittent high intensity exercise can be more beneficial for obese children than large chunks of exercise. The HealthMPowers videos were shown to have high intensity in this study, and they can be used in short bouts throughout the day for all children, including overweight children. Maeda and Murata (2004), Beaulieu, Butterfield, and Pratt (2009), and Evenson, Ballard, Lee, and Ammerman (2009) highlighted the limited and reduced amount of physical activity time elementary school students are receiving. These videos are an efficient and practical way to provide a short break in the classroom routine that adds to the total moderate to vigorous physical activity time students receive throughout the school day.

APPENDIX A

HUMAN SUBJECT COMMITTEE APPROVAL

Office of the Vice President For Research
Human Subjects Committee
Tallahassee, Florida xxxxx
xxx-xxx-xxxx· FAX xxx-xxx-xxxx

APPROVAL MEMORANDUM

Date: 5/17/2010

To: Thad Caldwell

Address: xxxx XXXXXXX XXX, Apt.#XXX
Dept.: SPORT MANAGEMENT/PHYSICAL ED.

From: Thomas L. Jacobson, Chair

Re: Use of Human Subjects in Research
Verification of intensity levels of a classroom based activity program

The application that you submitted to this office in regard to the use of human subjects in the research proposal referenced above has been reviewed by the Human Subjects Committee at its meeting on 05/12/2010. Your project was approved by the Committee.

The Human Subjects Committee has not evaluated your proposal for scientific merit, except to weigh the risk to the human participants and the aspects of the proposal related to potential risk and benefit. This approval does not replace any departmental or other approvals, which may be required.

If you submitted a proposed consent form with your application, the approved stamped consent form is attached to this approval notice. Only the stamped version of the consent form may be used in recruiting research subjects.

If the project has not been completed by 5/11/2011 you must request a renewal of approval for continuation of the project. As a courtesy, a renewal notice will be sent to you prior to your expiration date; however, it is your responsibility as the Principal Investigator to timely request renewal of your approval from the Committee.

You are advised that any change in protocol for this project must be reviewed and approved by the Committee prior to implementation of the proposed change in the protocol. A protocol change/amendment form is required to be submitted for approval by the Committee. In addition, federal regulations require that the Principal Investigator promptly report, in writing any unanticipated problems or adverse events involving risks to research subjects or others.

By copy of this memorandum, the Chair of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Human Research Protection. The Assurance Number is IRB00000446.

Cc: Tom Ratliffe, Advisor
HSC No. 2010.4405

APPENDIX B

PHYSICAL CHARACTERISTICS

Abbreviation Key

***WT Range=Healthy Weight Ranges (CDC)**

***WC=Waist Circumference**

***HW=Healthy Weight**

***OT=Overweight**

***O=Obese**

Student #	Sex	Age	HT (cm)	WT (kg)	BMI	WT Range	WC (cm)
1	F	10	147.32	36.38	16.8	HW	59.69
2	F	9	133.35	30.66	17.2	HW	59.69
3	M	10	142.24	46.08	22.8	O	81.28
4	M	10	140.97	31.75	16	HW	65.41
5	F	9	142.24	45.63	22.5	O	73.66
6	M	10	135.89	35.83	19.4	OT	67.95
7	M	9	146.05	54.98	25.8	O	81.28
8	M	10	125.73	27.76	17.6	HW	63.5
9	F	9	148.59	63.14	28.6	O	86.36
10	M	9	138.43	39.01	20.4	OT	68.58
11	F	10	144.78	33.93	16.2	HW	54.61
12	F	9	139.7	34.47	17.7	HW	54.61
13	M	9	134.62	26.85	14.8	HW	70.49

14	M	9	142.24	41.82	20.7	OT	75.57
15	F	9	129.54	27.94	16.6	HW	52.07
16	F	10	153.67	38.46	16.3	HW	59.69
17	M	10	151.13	40.37	17.7	HW	66.68
18	F	10	139.7	36.2	18.2	HW	62.23
19	M	10	146.05	43.45	20.4	OT	73.66
20	M	9	135.89	28.76	15.6	HW	62.87
21	M	10	142.24	40.64	20.1	OT	67.95
22	F	10	149.86	40.46	18	HW	59.69
23	M	9	128.27	24.4	14.8	HW	55.25
24	M	10	132.08	29.85	17.1	HW	63.5
25	M	9	139.7	35.74	18.3	HW	61.6
			Ht.	**WT**	**BMI**		**WC**
Mean			**140.41**	**37.38**	**18.78**		**65.91**
Median			**140.97**	**36.20**	**17.70**		**63.50**
Max			**153.67**	**63.14**	**28.6**		**86.36**
Min			**125.73**	**24.4**	**14.8**		**52.07**
Range			**27.94**	**38.74**	**13.8**		**34.29**
SD			**7.277887**	**8.905197**	**3.341616**		**8.920199**

APPENDIX C

RPE SCALE

STUDENT #____ Date_____ Video_____

6	**No Exertion**
7	**Very Very Easy**
8	
9	**Very Light**
10	
11	**Light**
12	
13	**Medium**
14	
15	**Hard**
16	
17	**Very Hard**
18	
19	**Very Very Hard**
20	**Hardest Possible**

RHR____ PEHR ____

APPENDIX D

STUDENT'S SOCIAL VALIDITY QUESTIONNAIRE

Student's Social Validity Questionnaire

Please circle a number to indicate your rating & add any comments that may clarify your ratings.

1. Do you think it is important to have exercise breaks during the school day?

   Extremely important 5 4 3 2 1 Not important at all

   Comments ?

2. Do you like doing the HealthMPowers video exercise breaks?

   Yes, loved them! 5 4 3 2 1 No, hated them!

   Why ?

3. Do you think the exercise breaks helped you to focus better on your work?

   Helped a lot 5 4 3 2 1 Did not help at all

   Why?

4. Would you like to continue doing the video exercise breaks?

   Yes 5 4 3 2 1 No

   Why?

(open-ended)

5. Which exercise video programs did you like the best? Why?

APPENDIX E

TEACHER'S SOCIAL VALIDITY QUESTIONNAIRE

Teacher's Social Validity Questionnaire

Please circle a number to indicate your rating & add any comments that may clarify your ratings.

1. How important do you believe it is for children to have exercise breaks during the school day?

   Extremely important 5 4 3 2 1 Not important at all

   Comments?

2. Do you believe the HealthMPowers video exercise clips provided appropriate exercise breaks?

   Very appropriate 5 4 3 2 1 Very inappropriate

   Comments?

3. Do you feel the benefits of the HealthMPowers video exercise clips were worth the time and effort required to conduct them?

   Could not have 5 4 3 2 1 Wasted

   used my time my time

   more productively

   Comments?

4. How likely is it that you will continue the video exercise sessions when this study is finished?

   Very likely 5 4 3 2 1 Not at all

   Why?

(open-ended)

5. Which exercise video programs seemed to work the best for your class? Why?

APPENDIX F

INFORMED CONSENT FORM

Dear Parents,

Thad Caldwell, who is a physical education graduate student at Florida State University, is requesting your child's participation in a research study. The title of the research is ***Verification of Intensity Levels of a Classroom Based Activity Program.***

The purpose of the research is to investigate the intensity levels of an exercise program titled "Classroom Exercises for the Body and Brain". This exercise video program consists of four videos used by the classroom teachers in your child's school. The length of each video is 2 minutes and 15 seconds (air step aerobics), 1 minute and 45 seconds (pretend jump roping), 2 minutes and 30 seconds (chair aerobics), and 1 minute and 50 seconds (mind in motion), for a total of 8 minutes of moderate to vigorous exercise. Your child's class will participate in these exercise sessions in the classroom on four separate days.

Heart rate will be recorded for your child on a watch that they will wear during the exercise session. Your child will also write down a number indicating how hard they think the exercise feels to them**.** Your child will be shown how to properly put on the heart rate monitor and chest strap.

Your child's waist circumference, height and weight will be measured to use as an estimate of body composition and body mass index (BMI).

There is no foreseeable risk or discomfort involved in this research.

The possible benefits of your child's participation in the research are (1) to learn how to properly use a heart rate monitor to assess the intensity of activity, (2) to determine the intensity of this exercise program that can help plan future programs, (3) and to increase alertness and focus in class by having a short exercise period.

All information collected in this study will be recorded and stored in a secure location so that your child cannot be identified in any way. Your child's information will not be connected to his or her name at any time. Information will be collected and stored in this discrete manner in order to ensure your child's privacy.

The results of the research study may be published, but your child's name or identity will not be revealed. The researchers will use a code for your child's name and will only allow members of the Florida State University research team to see the information.

If you have any questions concerning the research study or your child's participation in it, before or after your consent, these questions will be answered by Thad Caldwell (xxx-xxx-xxxx). You may also contact Dr. Tom Ratliffe (xxx-xxx-xxxx) at Florida State University, Results from this project can be sent to you upon request when they become available.

In case of injury to your child, or if you have questions about your child's rights as a participant in this research, or if you feel your child has been placed at risk, you can contact the Human Subject Research Review Committee (xxx-xxx-xxxx).

I understand that my consent may be withdrawn at anytime without prejudice, or penalty. I have been given the right to ask questions and have answered any inquiry concerning this project. Questions, if any, have been answered to my satisfaction.

I have read and understand this consent form and am willing for my child to be a participant in this project.

Child's Name: _____

Parent's or Guardian's Name_____

Parent's or Guardian's Signature: _____ Date: _____

APPENDIX G

CHILD ASSENT FORM

CHILD ASSENT FORM

My parent(s) have given the okay for me to take part in this project. I do not have to take part in this project if I don't want to. I will be dancing to music. I will be wearing a heart rate monitor. A heart rate monitor tells me how fast my heart beats. I will tell how hard I worked after the activity. I can stop taking part in this study any time. If I choose not to take part, it will not change my grade in any way.

Child's Name_____ Date_____

APPENDIX H

HEART RATE DATA FOR INDIVIDUAL STUDENTS

Air Step Aerobics

#	RHR #1 b/m	RHR #2 b/m	PEHR #1 b/m	PEHR #2 b/m	THRZ #1?	THRZ #2	RPE #1	RPE #2
1	95	86	137	142	Yes	Yes	12	10
2	84	70	143	134	Yes	Yes	13	9
3	n/a	95	n/a	149	n/a	Yes	n/a	10
4	89	73	192	121	Yes	No	14	10
5	95	88	156	151	Yes	Yes	13	15
6	96	72	197	127	Yes	Yes	13	15
7	75	72	138	135	Yes	Yes	17	20
8	80	n/a	215	n/a	Yes	n/a	19	n/a
9	99	64	148	147	Yes	Yes	15	14
10	99	86	153	117	Yes	No	15	11
11	90	84	203	149	Yes	Yes	12	13
12	82	85	134	119	Yes	No	12	14
13	113	90	149	206	Yes	Yes	19	20
14	91	86	142	112	Yes	No	16	15
15	90	98	149	176	Yes	Yes	15	10
16	90	84	126	93	No	No	12	13
17	96	88	159	201	Yes	Yes	15	19
18	120	88	163	150	Yes	Yes	13	13
19	85	95	148	148	Yes	Yes	7	9
20	83	66	129	115	No	No	14	8
21	95	80	222	122	Yes	No	9	9
22	n/a	94	n/a	127	n/a	No	n/a	20
23	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

24	n/a	78	n/a	151	n/a	Yes	n/a	13
25	84	80	157	151	Yes	Yes	18	20
	RHR #1	**RHR #2**	**PEHR #1**	**PEHR #2**	**19 of 21**	**15 of 23**	**RPE #1**	**RPE #2**
M	92	83	160	141	90%	65%	13.95	13.48
Mdn	90	85	149	142			14	13
Max	120	98	222	206			19	20
Min	75	64	126	93			7	8
Range	45	34	96	113			12	12
SD	10.48	9.52	28.41	26.77			2.97	4.01

Note. RHR = resting heart rate; PEHR = peak exercise heart rate; RPE = rating of perceived exertion; THRZ = target heart rate zone; b/m = beats per minute; # = student number; n/a = student not present in class.

Mind in Motion

#	RHR #1 b/m	RHR #2 b/m	PEHR #1 b/m	PEHR #2 b/m	THRZ #1?	THRZ #2	RPE #1	RPE #2
1	91	91	134	133	No	No	14	13
2	98	95	130	132	No	No	10	12
3	85	100	126	203	No	Yes	11	14
4	84	94	147	152	Yes	Yes	10	16
5	106	91	156	204	Yes	Yes	13	11
6	93	75	122	182	No	Yes	11	14
7	80	82	147	131	Yes	yes	18	11
8	87	n/a	134	n/a	yes	n/a	20	n/a
9	95	85	153	145	Yes	Yes	14	13
10	86	74	126	152	No	Yes	7	13
11	87	98	135	139	Yes	Yes	9	7

12	87	88	141	212	Yes	Yes	13	15
13	83	92	129	214	No	Yes	20	19
14	94	95	145	118	Yes	No	10	16
15	120	103	152	182	Yes	Yes	11	10
16	83	81	142	141	Yes	Yes	10	9
17	115	95	150	216	Yes	Yes	16	19
18	93	84	166	158	Yes	Yes	17	15
19	91	92	134	149	No	Yes	6	7
20	97	84	153	116	Yes	No	14	13
21	91	93	139	135	Yes	No	11	10
22	99	83	139	130	No	Yes	19	20
23	91	n/a	143	n/a	Yes	n/a	7	n/a
24	91	73	140	152	Yes	Yes	10	12
25	90	77	147	144	Yes	Yes	19	19

	RHR #1	**RHR #2**	**PEHR #1**	**PEHR #2**	**19 of 21**	**18 of 23**	**RPE #1**	**RPE #2**
M	93	88	141	158	90%	78%	12.80	13.39
Mdn	91	91	141	149			11	13
Max	120	103	166	216			20	20
Min	80	73	122	116			6	7
Range	40	30	44	100			14	13
SD	9.49	8.50	10.68	32.06			4.18	3.68

Note. RHR = resting heart rate; PEHR = peak exercise heart rate; RPE = rating of perceived exertion; THRZ = target heart rate zone; b/m = beats per minute; # = student number; n/a = student not present in class.

Chair Aerobics

#	**RHR #1 b/m**	**RHR #2 b/m**	**PEHR #1**	**PEHR #2**	**THRZ #1?**	**THRZ #2**	**RPE #1**	**RPE #2**

			b/m	b/m				
1	91	97	123	120	No	No	20	13
2	79	102	138	134	Yes	No	14	13
3	n/a	83	n/a	133	n/a	Yes	n/a	15
4	77	70	104	177	No	Yes	11	19
5	98	97	138	130	No	No	15	17
6	117	86	123	177	No	Yes	9	12
7	77	96	137	132	Yes	No	15	15
8	82	n/a	194	n/a	Yes	n/a	20	n/a
9	90	94	150	124	Yes	No	15	17
10	88	78	120	126	No	No	19	18
11	89	90	136	132	Yes	No	9	11
12	82	n/a	190	n/a	Yes	n/a	14	n/a
13	89	90	137	203	Yes	Yes	20	20
14	92	90	129	129	No	No	20	19
15	68	95	138	139	Yes	Yes	16	13
16	75	76	102	121	No	No	13	12
17	83	103	141	203	Yes	Yes	15	19
18	107	87	151	140	Yes	Yes	17	15
19	86	96	203	150	Yes	Yes	7	7
20	93	92	112	122	No	No	12	12
21	90	88	121	123	No	No	10	10
22	n/a	92	n/a	127	n/a	No	n/a	20
23	n/a	81	n/a	137	n/a	Yes	n/a	7
24	n/a	85	n/a	179	n/a	Yes	12	10
25	82	80	116	122	No	No	19	19
	RHR #1	**RHR#2**	**PEHR #1**	**PEHR #2**	**11 of 21**	**10 of 23**	**RPE #1**	**RPE #2**
M	87	89	138	143	52%	43%	14.64	14.48
Mdn	88	90	137	132			15	15

Max	117	103	203	203		20	20
Min	68	70	102	120		7	7
Range	49	33	101	83		13	13
SD	10.92	8.35	27.52	26.03		3.99	4.03

Note. RHR = resting heart rate; PEHR = peak exercise heart rate; RPE = rating of perceived exertion; THRZ = target heart rate zone; b/m = beats per minute; # = student number; n/a = student not present in class.

Pretend Jump Rope

#	RHR #1 b/m	RHR #2 b/m	PEHR #1 b/m	PEHR #2 b/m	THRZ #1?	THRZ #2	RPE #1	RPE #2
1	93	93	205	147	Yes	Yes	20	20
2	94	92	180	176	Yes	Yes	20	16
3	93	99	161	112	Yes	No	12	20
4	81	93	166	160	Yes	Yes	18	20
5	92	88	164	159	Yes	Yes	16	19
6	93	88	151	160	Yes	Yes	10	16
7	99	83	177	174	Yes	Yes	19	20
8	89	n/a	138	n/a	Yes	n/a	20	n/a
9	93	77	154	152	Yes	Yes	15	19
10	83	94	177	180	Yes	Yes	20	19
11	84	89	192	170	Yes	Yes	13	13
12	109	n/a	133	n/a	No	n/a	16	n/a
13	112	79	172	220	Yes	Yes	16	19
14	92	92	190	132	Yes	No	19	13
15	97	101	189	183	Yes	Yes	14	14
16	84	83	131	200	Yes	Yes	12	13
17	109	95	173	172	Yes	Yes	17	19

18	100	88	131	182	No	Yes	20	20
19	95	93	190	172	Yes	Yes	9	13
20	91	81	154	151	Yes	Yes	16	20
21	102	83	127	171	No	Yes	10	13
22	93	81	167	146	Yes	Yes	20	20
23	87	93	171	147	Yes	Yes	13	8
24	82	91	161	146	Yes	Yes	13	11
25	83	99	166	117	Yes	No	19	18

	RHR #1	**RHR #2**	**PEHR #1**	**PEHR #2**	**19 of 21**	**20 of 23**	**RPE #1**	**RPE #2**
M	93	89	165	162	90%	87%	15.88	16.65
Mdn	93	91	166	160			16	19
Max	112	101	205	220			20	20
Min	81	77	127	112			9	8
Range	31	24	78	108			11	12
SD	8.52	6.64	21.22	24.57			3.61	3.63

Note. RHR = resting heart rate; PEHR = peak exercise heart rate; RPE = rating of perceived exertion; THRZ = target heart rate zone; b/m = beats per minute; # = student number; n/a = student not present in class.

APPENDIX I

STUDENT SOCIAL VALIDITY QUESTIONNAIRE RESPONSES

	Q 1	Q 2	Q 3	Q 4
	5	1	3	3
	5	4	3	5
	5	5	5	1
	5	3	2	2
	5	5	5	5
	5	4	3	5
	4	5	3	5
	4	1	1	1
	4	5	2	5
	5	5	5	5
	4	4	5	5
	5	1	1	5
	3	5	1	5
	2	2	2	3
	5	4	3	5
	5	5	1	5
	3	5	1	4
	5	2	5	5
	5	5	5	5
	4	4	2	4
	5	5	5	5
	4	3	3	4
	5	2	1	5
Mean	4.434783	3.695652	2.913043	4.217391
Mode	5	5	5	5
Max	5	5	5	5

Min	**2**	**1**	**1**	**1**
Range	**3**	**4**	**4**	**4**
SD	**0.843482**	**1.486105**	**1.592969**	**1.312753**

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BIOGRAPHICAL SKETCH

Thad Caldwell was born and raised near Asheville, NC, in Candler. Growing up he enjoyed the outdoors and physical activity. He played varsity soccer, and ran track and field; earning all conference and region honors in soccer, and reaching the state track meet three times. He earned his Eagle Scout when he was seventeen. He chose to go to Western Carolina University after earning the North Carolina Teaching Fellows Scholarship. In the spring of 2009 he earned his Bachelor of Science degree from Western Carolina University in physical education with a concentration in health and human performance. While at Western Carolina University he received the Alice Benton award for the outstanding physical education major from professors and student teaching supervisors. He was also awarded the outstanding prospective teaching award from the College of Education. Thad majored in physical education while in graduate school at The Florida State University. He earned his Master's of Science degree in the spring of 2011.