ABSTRACT

MORIS, W. D. A comparison of heart rates among fourth grade students while jumping rope and hula hooping using heart rate monitors. MS in Exercise and Sport Science-Physical Education Teaching, May 1999, 52pp. (J. Steffen)

Heart rates were taken on a sample of 29 (12 males and 17 females) elementary school fourth grade students while participating in rope jumping and hula hooping lessons. Each subject completed the two units consisting of six sessions each. Wearing Polar Vantage XL heart rate monitors (HRM), the subject's heart rate was recorded for 30 minutes at 60 second intervals. The 30 minutes consisted of 3 minutes for the subjects to find their HRMs, a 3 minute warm-up and 15-25 minutes of lesson instruction and activity. A significant difference ($p < .05$) was found between jump rope unit mean heart rates (103.74 bpm) and hula hoop unit mean heart rates (97.41 bpm). Paired t-test determined a significant difference ($p < .05$) between day one; day three and day six of the jump rope unit mean heart rates. The significant difference was found between day one and day three of the jump rope unit. Paired t-test determined no significant difference ($p < .016$) between day one; day three and day six of the hula hoop unit mean heart rates. Differences between groups were from the type of activities presented. Differences within groups were from activities that challenged the subject's skill level. No difference was found within the hula hoop unit, because the activities are not as challenging as the jump rope activities. These days were used to see if there was an increase in heart rate at the beginning, middle, or end of the units. Schools have the ability to teach their students the benefits of physical activity and how to keep their hearts healthy. Teaching lifetime activities will give the students some ideas of activities they can participate in as they age.

A COMPARISON OF HEART RATES AMONG FOURTH GRADE STUDENTS WHILE JUMPING ROPE AND HULA HOOPING USING HEART RATE MONITORS

A THESIS PRESENTED

TO

THE GRADUATE FACULTY

UNIVERSITY OF WISCONSIN-LA CROSSE

IN PARTIAL FULFILLMENT

OF THE REQUIREMENTS FOR THE

MASTER OF SCIENCE DEGREE

BY

WILLIAM D. MORIS

MAY 1999

COLLEGE OF HEALTH, PHYSICAL EDUCATION, AND RECREATION

UNIVERSITY OF WISCONSIN-LA CROSSE

THESIS FINAL ORAL DEFENSE FORM

Candidate: William D. Moris

We recommend acceptance of this thesis in partial fulfillment of this candidate's requirements for the degree:

Master of Science in Physical Education Teaching

The candidate has successfully completed the thesis final oral defense.

Thesis Committee Chairperson Signature — Date: 4-19-99

Thesis Committee Member Signature — Date: 4-19-99

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Associate Dean, College of Health, Physical Education, and Recreation — Date: 5-17-99

Dean of Graduate Studies — Date: 5-17-99

ACKNOWLEDGEMENTS

I would like to thank the following individuals for their insight and support throughout this process. First, I would like to thank Jeff Steffen for chairing the thesis committee and telling me to keep cranking it out. Next, a thank you goes out to my other committee members, Judy Pace and Greg Walsko. Their advice and encouragement made the process easier. For the statistical advice, I would like to thank Abdulaziz Elfessi.

I want to thank Jeanne, Mark and Jeremy for all of your help and encouragement. With friends like you anything can be accomplished. Thank you and I wish you the best of luck.

Lastly, I would like to thank my family, Mom, Dad, Laurie and Troy. It is because of your support and encouragement that I got to where I am today. You have been there for me throughout my life and this busy year.

I would like to dedicate this thesis to my grandparents who are peeking down on me today from above. I know they are very proud and happy to see me fulfill this extraordinary accomplishment.

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CHAPTER I

INTRODUCTION

Does a child's heart rate increase during activity? Increasing a child's heart rate during activity can help children learn about having a healthy heart. Heart attack, stroke, and other cardiovascular diseases are the primary causes of death in the U.S. (Hinson, 1994). Participating in various activities to increase the rate of the heart can help prevent cardiovascular diseases.

With our children being less active than in the past, showing them different activities for a healthy lifestyle will be beneficial in the future. Currently nearly 50% of American children and youth are not vigorously active on a regular basis and approximately 25% report no vigorous physical activity (Strand, Mauch, & Terbizan, 1997). According to Martens (1996), we want our children and youth to be knowledgeable about physical activities, we want them to have the skills to engage in a wide variety of physical activities, and we want them to appreciate the benefits of being active.

In 1996, the Surgeon General reported that additional health benefits can be gained through greater amounts of physical activity. People who can maintain a regular regimen of moderate activity that is of longer duration or more vigorous intensity are likely to derive greater benefit. Health benefits can be derived simply from becoming more physically active, but the greatest benefits come from engaging in planned and

structured exercise (Summerfield, 1998). Educating our children and youth about physical activity and heart rate may prolong the life span of the younger generation.

One way for children to learn which types of activity increase their heart rates is to wear a heart rate monitor (HRM). The use of a HRM can inform children if they have increased their heart rates. In 1993, Strand and Reeder used HRMs to determine baseline data on heart rate intensity levels during physical education activity. This informed the researchers and student what types of activity increases heart rate. HRMs also can inform children if they are in their target heart zone. Strand and Reeder (1993) report people want to exercise in a training zone of 60 to 90% of their maximum heart rate. Today, HRMs are used at all educational levels, from elementary school through college, and an array of models are available (Strand & Mathesius, 1995).

Purpose of the Study

The purpose of this study was to compare the effect of participating in rope jumping and hula hoop lessons on heart rates of fourth grade students. Twenty-nine subjects from the two sections of fourth grade at Blessed Sacrament School participated in the study. The 29 subjects consisted of 17 females and 12 males. The principal and the fourth grade classroom teachers randomly assigned students to the sections prior to the school year.

Need for the Study

Today's children are not as active as they should be. Finding physical activities that increase ones heart rate is important, because cardiovascular exercise enhances ones overall health. Using HRMs will educate children about what type of technology is

available for them to obtain heart rates. Discussing heart rates and target zones will help children determine if an activity is beneficial for their heart or not. Comparing it to other physical activities, the child will understand what intensity increases the rate of the heart.

Hypothesis

There will be no difference in heart rates of fourth grade students while jumping rope and hula hooping.

Assumptions

The following assumptions were necessary for this study:

1. All subjects were apparently healthy and could engage in this activity.
2. All subjects had a basic knowledge of jumping rope and hula hooping.
3. All subjects followed directions on how to start and stop the HRM.
4. All subjects followed directions on how to put the HRM on correctly.
5. All subjects performed to the best of their ability during the testing.

Delimitations

The following delimitations were recognized in this study:

1. All subjects were boys and girls in fourth grade at Blessed Sacrament School, La Crosse, Wisconsin.
2. The data collection was recorded after each class session.
3. Classes met every other day for 6 weeks and were 30 minutes in length.

Limitations

The following limitations were considered:

1. The subjects may practice jumping rope and hula hooping outside of the class during the study.
2. Some subjects may have poor rope jumping and hula hooping skills.
3. The subjects may start or stop the HRM before instructed.
4. The subjects chest strap may fall while performing activities.
5. The subjects may not have HRMs on correctly.

Definition of Terms

Frequency – How often a person has a fitness workout (usually days per week) (Howley & Franks, 1992).

Heart Rate – The number of beats of the heart per minute (Howley & Franks, 1992).

Intensity – The magnitude of energy required for a particular activity, often referred to in terms of percentage of maximum (VO2 or HR) or METs (Howley & Franks, 1992).

Lifestyle – A person's general pattern of living, including healthy and unhealthy behaviors (Howley & Franks, 1992).

Maximum Heart Rate – The highest heart rate attainable (Howley & Franks, 1992).

Obesity – The accumulation and storage of excess body fat (Howley & Franks, 1992).

Polar Computer Interface with Vantage XL Software – Data management program designed to provide maximum utilization of the Polar Sport Tester Heart Monitor's data logging capabilities (Polar Electro OY, Finland).

Polar Vantage XL Heart Rate Monitor (HRM) – Device consisting of a belt, containing electrodes, worn around the chest and a wristwatch (Polar, 1993).

Physical Activity - Any body movement produced by skeletal muscles that results in a substantial increase over the resting energy expenditure (Bouchard, Shepard, & Stephens, 1993).

Target Heart Zone – The heart rate recommended for fitness workouts (Howley & Franks, 1992).

CHAPTER II

REVIEW OF RELATED LITERATURE

Introduction

Today, there are many activities for children to participate in and several ways to measure heart rate. Activities can range from jumping rope to soccer to hula hooping. Lifestyle activities that increase heart rate, such as walking to school or doing housework, should be encouraged. According to the Surgeon General's Report (U.S. Department of Health and Human Services, 1996), approximately one-fourth of young people walk or bicycle (i.e., engage in light to moderate activity) nearly every day. Involvement in such activities should be reinforced so youngsters learn that all moderate activity is beneficial to good health (Pangrazi, Corbin, & Welk, 1996). The number of activities a child can engage in are endless. Using a HRM is just one way to measure heart rate.

An activity such as rope jumping develops four components of fitness: cardiovascular endurance, flexibility, muscular strength, and muscular endurance (Ruskoski, 1977). Also, rope skipping contributes to the development of agility, coordination, rhythm, and endurance (Campbell, 1978). Even though the number of activities is endless, it is essential for a child to participate in some type of activity to improve the aforementioned components. The following review of literature will focus on rope jumping, HRMs, heart rate, physical activity, and physical education standards.

Rope Jumping

According to Solis (1992), the Dutch settlers of New Amsterdam (modern-day New York) introduced rope jumping to America in the 1600s. Initially, it was an activity in which only boys participated. In fact, young girls were warned not to undertake such strenuous activity lest their blood vessels would burst (Solis, 1992)! Over time, girls and boys began to jump rope but for different reasons. Girls did it for fun and games and boys for exercise.

There are many types of jump ropes available. According to Adams and Taylor (1992), the major requirements for a good rope are length, weight, and rigidity. A rope must be heavy enough with good form to carry itself over the jumper. In addition to weight, the rope must be of proper length. This is determined by having the child stand on the center of the rope; its ends should reach the armpits (Adams & Taylor, 1982).

Jumping rope requires one to begin with the rope behind them while holding the handles. Bring the rope around to the front of the body and jump when the rope is almost at the feet. Jump on the balls of the feet about an inch off the ground. Keep the hands next to the body, elbows tucked in and use the wrist and forearms to turn the rope. Continue this process while jumping to music to develop a rhythm.

According to Campbell (1978), rope skipping is an activity that encourages self-management, self-expression, and self-improvement. A high degree of motor ability, excellent timing, precision of movement, cooperation, perseverance, and concentration are required in order to reach efficiency.

Solis and Budris (1991) reported jumping rope has five benefits: total fitness, versatile, variety, safe, and fun. But according to Prentup (1980), jumping rope has four benefits: development of agility, balance, rhythm, and physical condition. No matter what benefit it may bring, one can always find children jumping rope on any playground, backyard, or school ground.

Heart Rate Monitors

The first HRMs were designed to enhance the performance of high-level athletes (Strand & Mathesius, 1995). Why should an athlete spend a lot of money if they can take their own pulse? According to Weller (1997), manually measuring your pulse while exercising is highly inaccurate. Trying to count a pulse while moving is very difficult. With a HRM, a person can just look at the wristwatch that displays the heart rate and know if they are in their target zone.

There are three types of HRMs available on the market: the wired digital pulse-point unit, the wired unit, and the wireless chest wall devices (Maffetone, 1994). Monitors may include these features: alarms, time in target zone, maximum heart rate, water resistance, stopwatch/clock, memory playback, computer interface capability, and cyclecomputer functions (Drake, 1991). The price for a HRM retails between $99 and $389 in sporting goods stores (Griffin, 1996). Prices differ and depend on the type of functions the watch performs. Creative Health (800-742-4478) publishes a free buyer's guide listing many of the brands available (Weller, 1997).

Today, HRMs are worn by people of all ages while running, biking, swimming, walking, and performing other activities. A HRM watch can be programmed and

downloaded into computers. The computer allows a person to graph a workout (time vs. heart rate); generate bar graphs in 10 beats per minute (bpm); list heart rates in tabular form, recorded every 5, 15, or 60 seconds; generate cumulative graphs depicting workout intensity over days, weeks or months and perform a Conconi test to determine anaerobic threshold (Drake, 1991). This type of technology can help improve our fitness. According to Strand and Matheslus (1995), the HRM is one tool that can help with lifetime fitness and activity and evaluate fitness training and achievement.

A disadvantage of HRMs is that they can become uncomfortable at times. For women, if the chest strap is uncomfortable or continuously slips, Polar Electro, (800) 227-1314, sells a sport bra that encloses the chest strap inside a lining (Weller, 1997). Another disadvantage is that the HRM slips down while an individual is swimming. Ways in which this can be avoided is to use waterproof tape to secure the belt around the chest or attach suspenders to the belt from the shoulders. A final disadvantage according to Weller (1997) is that the transmitters may be affected by interference from some motorized exercise equipment, televisions, computers, and high voltage. Manufacturers are working on this problem.

Heart Rate

Heart rate is the basis for most exercises. Heart rate is one of the most reliable indexes of exertion (Drake, 1991). When exercising at a slow pace, a person's heart rate will probably remain at a relatively low level, but later, they may increase their pace and their heart rate will increase (Maffetone, 1994).

Many people check their heart rate while exercising to see if they are in their target heart zone. People want to exercise in a training zone of 60 to 90% according to Strand and Reeder (1993). There are five energy zones according to Weller (1997): Zone One: 50 to 60% of maximum heart rate. This zone is for warm-ups and cool-downs. Zone Two: 60 to 70% of maximum heart rate. This is called the "weight –management zone," a lower intensity workout that burns fat calories. Zone Three: 70 to 80% of maximum heart rate. This is the aerobic training zone. Zone Four: 80 to 90% of maximum heart rate. This is the competitive zone. Working longer periods of time at higher intensities. Finally, Zone Five: 90 to 100% of maximum of heart rate. This is the anaerobic training zone.

The following method of determining target heart rate uses the Karvonen's formula. Begin by subtracting a person's age from 220. Using that number, subtract the person's resting heart rate and multiply the result by one of the intensity percentages from the five zones listed above. Finally, add the person's resting heart rate. To find a resting heart rate, rest for a period of five minutes and take a pulse reading for one minute. Formula: 220 – Age – Resting Heart Rate x Intensity Percentage + Resting Heart Rate = Maximum Heart Rate.

Heart rate can be checked by a person counting the number of beats per minute or by using a HRM. Experiments related to heart rate and exercise performance can teach children the importance of a heart-healthy lifestyle (Hinson, 1994).

Physical Activity

Children constantly engage in physical activity. Do these activities increase their heart rate? In 1992 Kuntzleman and Reiff reported that children have "appeared" to become fatter. Overweight means that an individual weighs more than is recommended for a given height. When this excess weight is in the form of fat, health problems may develop (Summerfield, 1998). Many studies from the American Heart Association (AHA) (1997), show that up to one-third of our children are obese. Children evidently are not getting the proper activity to increase their heart rate. Seventy-five percent of American adolescents and young adults do not engage in daily light to moderate activity (Ignico, 1998). According to the Surgeon General's Report (U.S. Department of Health and Human Services, 1996), a moderate amount of activity can be obtained by a 30 minute brisk walk, 30 minutes of lawn mowing or raking leaves, a 15 minute run or 45 minutes of playing volleyball, and these activities can be varied from day to day. Three studies from the Surgeon General's Report show that cardiorespiratory fitness gains are similar when physical activity occurs in several short sessions (e.g., 10 minutes) as when the same total amount and intensity of activity occurs in one longer session (e.g., 30 minutes).

Schools that promote physical activity may have a significant impact on reducing childhood obesity, chronic disease, and, ultimately, adult mortality (Summerfield, 1998). According to Ignico (1998), physical activity reduces the risks of coronary heart disease, hypertension, diabetes, and premature death. In addition, it reduces feelings of anxiety and depression; helps control body weight; maintains healthy bones, muscles, and joints;

and promotes psychological well-being. It is imperative to address these risk factors and prevention methods within the school setting.

Physical activity has numerous beneficial physiologic effects on the cardiovascular and musculoskeletal systems, but benefits on the functioning of metabolic, endocrine, and immune systems are also considerable (U.S. Department of Health and Human Services, 1996).

It is less important that young people master physical activity skills to a high level or win the game or championship when the long-term objective is to encourage children to be active for a lifetime (Martens, 1996). Children need to develop a positive attitude toward physical activity and fitness during childhood. This may have a positive impact on the level of physical activity during adult life (Ignico, 1998).

Having our children become more physically active today, they will be healthier and fit as they get older. Nearly half of American youth's 12-21 years of age are not vigorously active on a regular basis (U.S. Department of Health and Human Services, 1996).

According to the Surgeon General's Report (U.S. Department of Health and Human Services, 1996), regular physical activity decreases or delays the risk of cardiovascular disease; coronary heart disease; high blood pressure, colon cancer. Existing data is not conclusive regarding a relationship between physical activity and stroke; physical activity and endometrial, ovarian, or testicular cancers, and breast or prostate cancers.

According to Shephard (1995), there are variables that influence physical activity upon health: personal characteristics, type of activity, intensity, frequency, and duration. Personal characteristics include age, gender, and preference in physical activity.

The type of activity selected depends on the individual. Some people enjoy physical activity in a competitive sport for motivation, fitness or health reasons, goal setting, or to improve physical performance. Another type of activity is occupational. The amount of activity is dependent upon the particular job. Common domestic chores or construction work are just some examples. Some unstructured leisure activities as walking, cycling, gardening, and stair climbing are often neglected as physical activity.

The intensity of an activity can be measured by energy expenditure or just how tired and sweaty a person may be. It is really how much energy is required for a particular activity.

Frequency for vigorous physical activity should be one to three days a week. It is difficult to label frequency since every activity is different and people enjoy many activities. Some activities are seasonal and some are done on a weekday or weekend.

Finally, the duration of physical activity depends on the type. If a person is in an exercise class, they may be active for up to an hour. If a person is on the job, they may be involved for their entire shift.

It remains to be determined how the interrelated characteristics of amount, intensity, duration, frequency, type, and pattern of physical activity are related to specific health or disease outcomes (U.S. Department of Health and Human Services, 1996).

Physical Education Standards

The National Standards for Physical Education (National Association for Sport and Physical Education, NASPE) has developed with seven standards that include physical activity, fitness, motor skills, behavior, respect, and movement. The seven standards, from the book Moving Into The Future, National Standards for Physical Education (1995) are: 1) Demonstrates competency in many movement forms and proficiency in a few movement forms. This standard is the development of movement competence and proficiency. This is where a student will develop skills in a related activity. 2) Applies movement concepts and principles to the learning and development of motor skills. This standard is the use of cognitive information to understand and enhance motor skill acquisition and performance. The student is using his/her knowledge of the activity to become better. 3) Exhibits a physically active lifestyle. This standard is designed to establish patterns of regular physical activity outside of physical education. The students are using skills acquired in physical education and applying them to an activity outside of the physical education classroom. 4) Achieves and maintains a health-enhancing level of physical fitness. This standard is helping the student develop a high level of fitness, so he/she can participate in work or leisure activities. This high level of fitness would include having cardiorespiratory endurance, muscular strength and endurance, flexibility, and body composition. 5) Demonstrates responsible personal and social behavior in physical activity settings. This standard discusses personal as well as group success in a physical activity setting. This would include playing by the rules of a game, displaying good sportsmanship, cooperating with, and behaving ethnically in a

game and positive social interaction among others. 6) Demonstrates understanding and respect for differences among people in physical activity settings. This standard develops respect for individual similarities and differences in a physical activity setting. This entails treating others with respect no matter the person's race, culture, performance, gender, physical appearance or ability, and socio-economic status. 7) Understands that physical activity provides opportunities for enjoyment, challenge, self-expression, and social interaction. This standard was developed to facilitate self-motivation and to encourage children to feel good about them.

These seven standards help physical education instructor's design appropriate lessons. Each objective in a lesson can relate to one of the seven standards. These standards guide a physical education instructor in developing a physically educated person.

The purpose of the seven NASPE standards was to establish content standards for a school physical education program and clearly identifying what a student should know and be able to do as a result of a quality physical education program, and, provide guidelines for assessment.

Assessment is the process of gathering evidence about a student's level of achievement in a specified subject area and making inferences based on that evidence for a variety of purposes. Assessment is the process of teacher observation and judgement of a student's performance based on set guidelines. When the information gathered is consistent with learning goals and is used appropriately to guide teaching, it can enhance learning as well as document it. The documented assessment tool can help improve an

area the student is lacking and be used to retest the student. Assessment holds the seven NASPE standards together.

Summary

Only 1 out of 10 Americans participate in 30 minutes or more of physical activity every day (American Heart Association, 1997). Physical activity is essential to the development and growth of a child. Being educated about the importance of a healthy-heart and body, a child can continue to improve their fitness as they get older. The type of physical activity depends on the interest of the child. Any physical activity is good, but enjoying it makes it a lot more fun. Using a HRM will help the child understand if the activity is or is not increasing their heart rate. By knowing this information, the child can adapt the activity to increase or decrease the heart rate to stay within their heart rate zone. HRMs are being used all of the time to monitor the person's fitness level. This information is helping the person stay in their desired fitness zone. With the array of models on the market, a person can select the model that will accommodate the chosen type of activity.

CHAPTER III

METHODS

Introduction

This study was conducted to compare heart rate responses to jumping rope and hula hooping among fourth grade students using HRMs. The purpose of this study was to familiarize children with current technology for obtaining heart rate and using this technology to determine which activity increases the heart rate. The methods and procedures of this study are discussed in this chapter and are divided into the following sections: subject selection, procedures, instrumentation, and statistical treatment of data.

Subject Selection

The subjects for this study consisted of 29 apparently healthy fourth grade students. Fourth grade was divided into two sections: section 4-1 (n = 17, 7 males and 10 females) and section 4-2 (n = 12, 5 males and 7 females). The principal and the fourth grade classroom teachers randomly assigned students to the sections prior to the school year. An apparently healthy student was one in good health and could participate in physical education. Prior to the beginning of the study, each subject was required to obtain permission from a parent or guardian. After permission was granted, the subject and parent/guardian signed an informed consent form (see Appendix A) describing their involvement in the study. Permission was granted by the University of Wisconsin-La Crosse Institutional Review Board (IRB) before the study began. Permission from the principal at Blessed Sacrament School was also granted before the study (see Appendix B).

Pilot Study

Prior to the start of the study, the subjects engaged in a 2 day pilot study. During this study, subjects were instructed on how to wear a HRM, adjust the chest straps, and set the wristwatch. Activities were conducted to help the subjects understand the importance of a tight chest strap and to get comfortable with wearing the HRM. Time was allotted for the students to focus on their heart rate and to relieve the excitement of seeing their heart rate. Activities were played included running, dodging, and jumping.

Procedures

The subjects engaged in rope jumping and hula hooping activities in the Blessed Sacrament gymnasium. The jump rope and hula hoop units were three weeks long and consisted of six class sessions. Each class session (see Appendix C for lesson plans) lasted 30 minutes. Each subject was assigned a HRM number (see Appendix D) and allotted 3 minutes to find their HRM and put it on. A 3 minute warm-up was performed prior to the lesson. Subjects were wearing a HRM programmed to record heart rate levels in 60 second intervals for 15-25 minutes. Subjects started and stopped the HRM watches on the researcher's signal. The hula hoops were made of plastic and 30 inches in diameter and the jump ropes were speed ropes six feet in length.

Data were downloaded into the Polar Heart Rate Analysis Software version 4.10 (1993), Polar Electro OY, Finland, using the Polar Vantage XL Software manual pages APP 1-1 to APP 1-5 for downloading data. Next, File/Memory Transfer was chosen from the main menu. Then, cycle the HRM through the selections using the SELECT button until the word RECALL appears on the selection status line at the bottom of the

display. The letters MA should also be at the top. Press the SET button on the HRM, and the letters COM will appear. Select the file you want to download by pressing the STORE/RECALL button to access the files and then move up or down with the SIGNAL and/or SELECT button until the appropriate file numbers appears. Place the HRM in the Polar Computer Interface. Returning to the computer keyboard, press ENTER or click at OK to continue with data transfer. Next, press the STORE/RECALL button on the HRM. The letters COM on the face of the monitor will flash, and the computer screen will display: "Receiving data...please wait..." When data transmission has ended the screen will display: "Memory Transfer Successfull" Finally, press the ENTER key and return to the main menu. Repeat these steps for other files.

Instrumentation

Subjects were familiarized with the Polar Vantage XL HRM by the researcher during two class periods. The Polar Vantage XL HRM is a belt, containing electrodes, worn around the chest. This belt transmitted the heart rate to a watch worn on the wrist of the subject. The heart rate was displayed on the watch. All subjects wore the HRM during class for the entire study. The HRMs were programmed to record heart rate at 60 second intervals. After the class was over, the researcher collected the HRMs and downloaded the information into the computer. The computer was a Zenith Data System Z – 433D +.

Statistical Treatment of Data

From the raw data (see Appendix E), standard descriptive statistics were applied to all collected data. A t-test was run on the mean heart rate of jump rope students and

hula hoop students. The .05 alpha level of confidence was used for all tests of statistical significance. A paired t-test was run on the comparison of mean heart rates of both groups between days one, three and six. The Boneformi Correction of .016 level was used on this test, since it compensates for reducing the number of subjects for each day chosen.

CHAPTER IV

RESULTS AND DISCUSSION

Introduction

The purpose of this study was to compare the effect of participating in rope jumping and hula hoop lessons on heart rates of fourth grade students. Twenty-nine apparently healthy fourth graders from Blessed Sacrament School in La Crosse, Wisconsin participated in this study (12 males and 17 females). Presented in this chapter are descriptive statistics, test of hypothesis, and a discussion of the results.

Subject Descriptive Statistics

Descriptive statistics for the jump rope and hula hoop heart rates are presented in Table 1. Twenty-nine apparently healthy subjects participated in this study (12 males and 17 females). All subjects were in fourth grade at Blessed Sacrament School in La Crosse, Wisconsin. Units were six sessions long lasting 30 minutes in length.

The subjects jumping rope had a mean heart of 103.7379. The subjects hula hooping had a mean heart rate of 97.4092. The standard deviation for jumping rope was 13.7090 and 11.8538 for hula hooping.

Table 1. Mean Heart Rates and Standard Deviations of Jump Ropes and Hula Hoops

Group	N	Mean	Standard Deviation
Jump Rope	29	103.7379	13.7090
Hula Hoop	29	97.4092	11.8538

Mean times and standard deviation are presented in Table 2. The subjects mean times while jumping rope was 16.2393 with a standard deviation of 3.7673. The subjects mean times while hula hooping was 17.9592 with a standard deviation 3.6790.

Table 2. Means and Standard Deviation Times (min.) for Jump Ropes and Hula Hoops

Group	N	Mean	Standard Deviation
Jump Rope	29	16.2393	3.7673
Hula Hoop	29	17.9592	3.6790

T-tests were used to determine significant differences between jumping rope and hula hooping. T-test results for jump ropes and hula hoops are presented in Table 3. A significant ($p < .05$) difference was found between jumping rope and hula hooping. These units had a difference of 28 a t-value of 3.434 and a p-value of .002.

Table 3. T-test Results for Jump Ropes vs. Hula Hoops

Group	df	T-Value	P-Value
Jump Ropes vs Hula Hoops	28	3.434	.002*

* Indicates a significant difference between the groups ($p < .05$)

Paired t-test was used to determine if there was a significant difference between day one, day three and day six of the jump rope unit. A significant ($p < .05$) difference was found between day one, day three and day six of the jump rope unit. The biggest difference was found between day one and day three of the jump rope unit. Paired t-test results for jump rope day one and day three is shown in Table 4. These units had a difference of 11 a t-value of –3.608 and p-value of .004.

Table 4. Paired T-test Results for Jump Rope Day 1 vs. Jump Rope Day 3 (N = 12)

Group	df	T-Value	P-Value
Jump Rope Day 1 vs Jump Rope Day 3	11	-3.608	.004*

* Indicates a significant difference between the groups ($p < .05$)

Another paired t-test was used to determine if there was a significant difference between day one, day three and day six of the hula hoop unit. A significant difference ($p < .016$) was not found between day one, day three and day six of the jump rope unit. To find ($p < .016$), a Boneforni Correction was used. The Boneforni Correction was calculated by dividing alpha (.05) by the number of variables, which was three. Hula hoop day one vs day three had a difference of 10, a t-value of 1.214, and a p-value of .253. Hula hoop day three vs day six had a difference of 10, a t-value of –2.493, and a p-value of .032. Hula hoop day three vs day six had a difference of 10, a t-value of –2.493,

and a p-value of .021. Paired t-test results for hula hoop day one vs day three, hula hoop day one vs day six and hula hoop day three vs day six are shown in Table 5.

Table 5. Paired T-test for Hula Hoop Day 1 vs Day 3, Hula Hoop Day 1 vs Day 6, and Hula Hoop Day 3 vs Day 6 (N = 11)

Group	df	T-Value	P-Value
Hula Hoop Day 1 vs Day 3	10	1.214	.253
Hula Hoop Day 1 vs Day 6	10	-2.439	.032
Hula Hoop Day 3 vs Day 6	10	-2.730	.021

* Indicates a significant difference between the groups ($p < .016$)

Test of Hypothesis

Based on the results of this study, the following null hypothesis was rejected:

1. There will be no difference in heart rates of fourth grade students while jumping rope and hula hooping was rejected.

Discussion

The purpose of this study was to compare the effect of participating in rope jumping and hula hoop lessons on heart rates of fourth grade students. The data provides information on heart rate averages and that rope jumping lessons will increase the heart rate over hula hoops lessons.

Comparing the first day to the third day to the sixth day of the jump rope unit was done to determine if the subject's heart rate increased or decrease during the unit. These days were chosen, because the researcher wanted to observe the beginning of the unit, the middle of the unit, and the end of the unit heart rates. By observing these days, the researcher can determine if a student's heart rates are increasing or decreasing because of the lessons presented or from the student's skill development. The significant difference existed between day one and day three. This difference is due to the level of difficulty between the red club and white club (see Appendix D) of the jump rope unit. The subjects were working harder to achieve each trick in the white club. Each trick in the white club progresses to a more difficult trick. The subjects were determined and driven to accomplish as many tricks as they could if time allowed. There was no significant difference between day one and day six or day three and day six. The reason for this would be that the subjects have acquired many jump rope skills and had the opportunity to master them. Long jump ropes were added at the end of the unit and less arm action while jumping was used.

Comparison of the first, third, and sixth days of the hula hoop unit was done to determine if the subjects' heart rates increased or decreased during the unit. A significant difference was not determined. This may indicate that twirling a hula hoop is not as strenuous as jumping rope. Comparing the first day to the third day to the sixth day was chosen to determine if practice and skill development increased or decreased the subject's heart rates. Is the subject's heart rate increasing or decreasing when his/her skill level

increases? According to the data, the subject's heart rate showed no significant difference during these three days.

The lessons in the jump rope unit and hula hoop unit were different. The jump rope unit involved progression and levels of difficulty when moving through the assigned tricks. If the first trick was accomplished, the student moved to the next trick and tried to complete it. Once the student accomplished all tricks, a new level of tricks and activities were assigned. The rope jumping tricks increased in difficulty from one trick to the next. The hula hoop activities involved no progression of difficulty compared to the jump rope activities. Each activity was presented and practiced by the student. The tricks did not have any progression or levels of difficulty. After the tricks were presented and practiced, modified games and activities were presented and played.

The Surgeon General's Report (U.S. Department of Health and Human Services, 1996) tells us that children are inactive and this could lead to problems in their future. The data shows us that jumping rope is an activity that raises the rate of the heart more than hula hooping. Even for an average time of just 16 minutes, the child's heart rate was very high. Being active for a short amount of time is more beneficial to a person rather than being inactive. The Surgeon General (1996) reported that just a 15 minute run is beneficial to being inactive. A short burst of physical activity is just as beneficial as a long burst. Ignico (1998) reported that 75% of American adolescents and young adults do not engage in daily to light moderate activity. Children need to stay physically active to stay healthy and to encourage their older peers to participate with them. Children can educate their family and friends to stay physically active.

Schools have the ability to teach their students the benefits of physical activity and how to keep their heart healthy. Schools that promote physical activity may have a significant impact on reducing childhood obesity, chronic disease, and, ultimately, adult mortality (Summerfield, 1998). The teaching of lifetime activities will give the students some ideas of activities they can participate in as they age. Activity levels have great implications for the aging process.

This information can help physical educators assess lesson plans and look at activity levels of their lessons. The instructor will be able to develop lessons that promote physical activity. Are their activities raising the student's heart rate? Currently nearly 50% of American children and youth are not vigorously active on a regular basis and approximately 25% report no vigorous physical activity (Strand, et al., 1997). The information can help the instructor develop knowledge of the use of technology for assessment. The use of HRMs will help physical educators teach their students about uses of HRM and activity levels.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to compare the effect of participating in rope jumping and hula hoop lessons on heart rates of fourth grade students. Twenty-nine apparently healthy fourth graders (12 males and 17 females) from Blessed Sacrament School in La Crosse, Wisconsin participated in the study. Heart rate was taken using a Polar Vantage XL HRM for 60 second intervals for the 30 minute class session. Jump rope and hula hoop units were both six sessions long. A significant ($p < .05$) interaction between the two units were found.

Conclusions

According to the statistical analysis of the data of this study, the following conclusions were reached:

1. The six-session jump rope unit resulted in a higher heart rate over the six-session hula hoop unit. The activities involved in the jump rope unit increased in difficulty as the subjects progressed through them. With the increase in difficulty, the subjects may have to practice more and work harder to accomplish the task and resulting in a high heart rate. The hula hoop unit's activities involved the feet and arms to be stationary and only continuous movement of the hips. With this type of movement, the heart rate remained lower than the jump rope unit.

1. The six-session jump rope unit provided a significantly greater benefit compared to the six-session hula hoop unit. The use of large muscle groups and the constant movement of the arms while jumping rope increases the rate of the heart. Even though hula hooping raises the heart rate, it is less beneficial compared to jumping rope.

Recommendations

Additional research is recommended by the researcher to provide more concrete information on the heart rates attained while jumping rope and hula hooping. There are several suggestions the researcher would make to anyone desiring to conduct further research in this area.

1. Use physical activities other than rope jumping and hula hooping.
2. Calculate maximum heart rate and find out if children reach their maximum heart rate while performing the activity.
3. Choose a different population from other grade levels.

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APPENDIX A

INFORMED CONSENT

INFORMED CONSENT FORM

A COMPARISON OF HEART RATES AMONG FOURTH GRADE STUDENTS WHILE JUMPING ROPE AND HULA HOOPING USING HEART RATE MONITORS

I give my informed consent to have my child participate in this study of the comparison of heart rates among fourth grade students while jumping rope and hula hooping using heart rate monitors. These activities are a part of the regular physical education curriculum and heart rates will be discussed to understand which activity is most beneficial to the student. I consent to presentation and publication or other dissemination of study results so long as the information is confidential and disguised so that no identification can be made. I further understand that although a record will be kept of my child having participated in the experiment, all experimental data collected from my child's participation will be identified by number only.

1) I have been informed that my child's participation in this experiment will involve jumping rope and using hula hoops. I understand that the experiment is to study heart rates during rope jumping and hula hoop activities and discussion will follow about which activity is most beneficial to my child.

2) I have been informed that there are risks which may include tripping and falling over the jump rope or having the jump rope hit any part of your child's body. This judgement is based upon relatively large body of research with people jumping rope and hula hooping.

3) I have been informed that there are no "disguised" procedures in this experiment. All procedures can be taken at face value.

4) I have been informed that the investigator will answer any question regarding the procedures of this study before, during and after the experiment.

5) I have been informed that I am free to withdraw my child from the experiment at any time without penalty.

Concerns about any aspects of this study or project may be referred to the principal researcher (Bill Moris-(608) 782-1964) and thesis advisor (Jeff Steffen-(608) 785-6535). Question regarding the protection of human subjects may be addressed to Dr. Garth Tymeson (608) 785-8155, Chair, University of Wisconsin-La Crosse-Internal Review Board to the protection of human subjects.

_____ _____

Investigator or Researcher (Date) Parent/Guardian (Date)

Mr. Moris has informed me of the procedures involved in this experiment during a regular physical education class.

_____

Participant (Date)

APPENDIX B

LETTER FROM PRINCIPAL

BLESSED SACRAMENT SCHOOL

2404 King Street • La Crosse, Wisconsin 54601
Phone (608) 782-5564
Fax (608) 782-7765

November 24, 1998

Dear Board Members,

My letter is to inform you that Mr. Bill Moris has the full cooperation of the Blessed Sacrament School administration in carrying out the research necessary for his thesis project. Mr. Moris has met with me to explain his project and has shown me the heart monitors that the students will wear in class in order that he collect necessary data. We will secure the permission of the school parents and will open the class time to those who wish to observe. I look forward to the results of Mr. Moris' research. If you have any further questions or concerns, please let me know.

Sincerely,

Kay E. Berra

Kay E. Berra, School Principal

APPENDIX C

LESSON PLANS

Jump Rope Unit Lesson Plans (six days)

Equipment: A six foot speed jump rope for each student, four long jump ropes, pogo stick, basketball and bean bag.

Resource: Carnes, C., Awesome Elementary Activities.

DAY I

(3 min.)	Pick up heart rate monitors, go to the locker room and put them on.
(3 min.)	Warm up: Exercises- 10 jumping jacks, 10 sit-ups and 10 push-ups.
(3 min.)	INPUT Introduce lesson of jump ropes. Discuss the goals of the unit and what will be involved. Explain the rules of the unit: 1) when jumping face the side walls, so no one will get hit by the ropes, 2) follow the directions for safety and fun.
(12-15 min.)	Practice jumping slowly by bringing the rope around forward and jumping over it. Practice red club tricks (p24)
(6min.)	Play monkeys and baboons: Explain that monkeys have tails (jump ropes tucked in the back of their pants) and baboons do not. The baboons get tails by pulling the jumping ropes away from the monkeys. Monkeys who lose their tails become baboons and the baboons become monkeys.
(3 min.)	Closing: Review the day's lesson and have the class put jump ropes away and take off heart rate monitors.

Day 2 of Jump Rope Unit

(3 min.)	Pick up heart rate monitors, go to the locker room and put them on.
(2 min.)	Warm up: Students free jump. Work on Red Club tricks.
(1-2 min.)	Explain Red Club: 12 tricks in the club and you must complete 10 jumps without missing before you can move to the next trick. Find

	a partner and check each other off using the check off sheet. Sign the Red Club Board when finished.
(20 min.)	Students work on Red Club. Partners worked together. One jumped and the other checked them off. They switched after one was finished.
(3 min.)	Closing: Review the day's lesson and have the class put jump ropes away and take off heart rate monitors.

DAY 3 of Jump Rope Unit

(3 min.)	Pick up heart rate monitors, go to the locker room and put them on.
(1-2 min.)	Warm up: Practice on your own reviewing the Red Club tricks.
(20-25 min.)	Divided into the Red or White Club (p25 & 26). Partners continued to work on the Red Club and White Club people work with the teacher. Teacher explains and demonstrates the 10 tricks in the club. Teacher checks off the students. Sign Red Club Board when finished.
(3 min.)	Closing: Review the day's lesson and have the class put jump ropes away and take off heart rate monitors.

DAY 4 of Jump Rope Unit

(3 min.)	Pick up heart rate monitors, go to the locker room and put them on.
(1-2 min.)	Warm up: Practice on your own reviewing the Red and White Club tricks.
(20 min.)	Break into Red or White Club groups and continue to pass the tricks. Sign Red or White Club Board when finished.
(3 min.)	Closing: Review the day's lesson, show the class who has signed the Red and White Club Boards, put jump ropes away and take off heart rate monitors.

DAY 5 of Jump Rope Unit

(3 min.)	Pick up heart rate monitors, go to the locker room and put them on.
(2 min.)	Warm up: Everybody's It Tag: Everybody is it and anyone can tag anyone else. Students will spread out around the gymnasium. On GO! Students will start to tag each other. When tagged, stop, put your hands on top of your head and spread legs apart. To get back into the game, someone must go through your legs. After this has happened, you are back into the game. Students may run and use safe tags.
(3-5 min.)	Discussed Long Jump Ropes. Explain that two people must twirl the rope, one on each end. Make sure the two have a slow twirl, so everyone can get in. Take turns twirling and jumping.
(15-20 min.)	Put class into four groups by counting them off by 4's. Each group will have a long jump rope and their own area on the gym floor. Each person can decide on what type of jump he/she will do when jumping. Students can attempt their own tricks or use the ones in the Red and White Club.
(3 min.)	Closing: Review the day's lesson, put long jump ropes away and take off heart rate monitors.

DAY 6 of Jump Rope Unit

(3 min.)	Pick up heart rate monitors, go to the locker room and put them on.
(3 min.)	Review Day 5 and add new equipment for today. Add a pogo stick basketball, speed jump rope and beanbag. This additional equipment can be used while jumping in the long rope. Think of new tricks using the equipment and work on partner tricks. You have a choice to use the equipment or not.
(20-25 min.)	Work with the same group as yesterday and continue to work.
(3 min.)	Closing: Review the day's lesson, tell them we will be starting Hula Hoops next time, put long jump ropes away and take off heart rate monitors.

RED CLUB

NAME _____

DIRECTIONS: Put an "X" in the box when the person has successfully demonstrated the jumps 10 times without missing. You must complete each level before moving to the next.

#1 Single bounce forward jump. ☐

#2 Single bounce right foot forward jump. ☐

#3 Single bounce left foot forward jump. ☐

#4 Single bounce right foot backward jump. ☐

#5 Single bounce backward jump. ☐

#6 Single bounce left foot backward jump. ☐

#7 Double bounce left foot forward jump. ☐

#8 Double bounce right foot forward jump. ☐

#9 Double bounce forward jump. ☐

#10 Double bounce backward jump. ☐

#11 Double bounce right foot backward jump. ☐

#12 Double bounce left foot backward jump. ☐

AFTER COMPLETEING ALL 12 TRICKS, SIGN THE RED CLUB BOARD AND MOVE ONTO THE WHITE CLUB!

WHITE CLUB

DIRECTIONS: Put an "X" in the box when the person has successfully demonstrated the jumps 10 times without missing. You must complete each level before moving to the next trick.

#1 Single side swing. ☐

#2 Double side swing. ☐

#3 Forward straddles. ☐

#4 Forward swing kicks. ☐

#5 Side swing kicks. ☐

#6 Side Straddles. ☐

#7 Double side steps. ☐

#8 Skier. ☐

#9 Double side steps. ☐

#10 Side steps. ☐

AFTER COMPLETING ALL 10 TRICKS, SIGN THE WHITE CLUB BOARD!

Hula Hoop Unit Lesson Plans (six days)

Equipment: One plastic 30 inches in diameter hula hoop, rubber kickball and three feet foam tubes.

Resources: Carnes, C., Awesome Elementary Activities (1983).

Day 1 of Hula Hoop Unit

(3 min.) Pick up heart rate monitors, go to the locker room and put them on.

(3 min.) Warm up: Exercises- 10 jumping jacks, 10 sit-ups and 10 push-ups.

(1 min.) Explain rules: 1) Keep the hula hoop in front of you when I am giving instructions. 2) Follow the directions for safety and fun.

(20 min.) Skill work: 1) Twirl the hoop around right arm and then left arm. Try to switch arms without the hula hoop stopping or coming off of your arm. 2) Twirl around right hand and then left hand. Try to switch arms without the hula hoop stopping or coming off of your arm. 3) Twirl around neck. 4) Twirl around waist. Discuss body motion before twirling around neck and waist.

Game: Switch (p5)- Hula hoops are put into one large circle on the gymnasium floor and one hoop in the center of the large circle. Students have to go from one hoop to an other when the teacher says "Switch." Students may not use the center hoop as an option. Last person without a hula hoop goes to the center.
Add rules: 1) You can not go to the hula hoop next to you. 2) Try to go to a different colored hula hoop than the one you're in.

(3 min.) Closing: Review the day's lesson, put hula hoops away by color and take off heart rate monitors.

(3 min.) Closing: Review the day's lesson, put hula hoops away by color and take off heart rate monitors.

Day 2 of Hula Hoop Unit

(3 min.) Pick up heart rate monitors, go to the locker room and put them on.

(3-5 min.) Warm up: Exercises- 15 jumping jacks, 15 sit-ups, 15 twisties and 15 push ups.

(10 min.) Skill work: Review Day 1. Twirl hula hoop around right arm. Twirl hula hoop around left arm. Twirl hula hoop around neck. Twirl hula hoop around waist.

(5-7 min.) Spin Contest: Each student will start twirling the hula hoop around a part of the body that the teacher says. Students will start at the same time and when your hula hoop falls to the floor you are out. Watch the rest of the contest and see who is left. Do four contest around the waist and three contest around the neck.

(5 min.) Game: Switch- Same as Day 1.

(3 min.) Closing: Review the day's lesson, put hula hoops away by color and take off heart rate monitors.

Day 3 of Hula Hoop Unit

(3 min.) Pick up heart rate monitors, go to the locker room and put them on.

(3 min.) Warm up: Students will hula hoop on their own and practice what we have done so far in class.

(3 min.) Spin Contest: Two contest twirling the hula hoop around waist. Same rules as Day 2.

(5-7 min.) Shoot the Hoop (p7)- Roll the hula hoop across the gymnasium floor and go through it while the hula hoop is moving. See how many times you can do it before the hula hoop falls to the floor.

(5-10 min.) Game: Ghostbusters- Make a large rectangle with the hula hoops on the gymnasium floor and a foam mat in the middle with three hula hoops at one end outside of the rectangle (containment unit). Pick three people to be ghost busters and give each one of them a foam tube. The rest of the class is standing in his/her own hula hoop. Ghost busters call out colors of hula hoops. Ghost, students standing in their hoops, hearing their color must run to another hoop of the same color. If they make it safely (without getting tagged) ghosts can remain in their new home. If a ghost buster tags them before they get to their new home, they move to the containment unit and remain there for the "3 out rotation system."

When someone new comes into the containment unit, you slide over one hoop. After you have moved three times, you are back into the game. If more than one color is called, both colors go to either color hoop. Variations: 1) Ghost busters are tagging for the back end. 2) Teacher may have to call colors to speed things up. 3) Ghost busters may call "Rainbow" and all ghost may go to a new home.

(3 min.) Closing: Review the day's lesson, put hula hoops away by color and take off heart rate monitors.

Day 4 of Hula Hoop Unit

(3 min.) Pick up heart rate monitors, go to the locker room and put them on.

(3min.) Warm up: Divide into small groups and have your own contest and challenges.

(5 min.) Shoot the Hoop- Same as Day 3.

(15-20 min.) Game: Musical Hoops (p5)- Scatter the hula hoops inside the volleyball court. The students are going to be walking around the volleyball court lines while the music is playing. When the music stops, the students will find a hoop and stand in it. Once everyone has had the opportunity to find a hoop a couple of times, start to take hula hoops out. When the music stops and someone does not have a hula hoop, he/she is eliminated and watches and cheers from the sideline. Continue this until one person is left. (The game is just like musical chairs.)

(3 min.) Closing: Review the day's lesson, put hula hoops away by color and take off heart rate monitors.

Day 5 of Hula Hoop Unit

(3 min.) Pick up heart rate monitors, go to the locker room and put them on.

(3min.) Warm up: Divide into small groups and have your own contest and challenges.

(5-7 min.)	Discuss and demonstrate jumping rope with the hula hoop. Work on jumping forward, backward, single bounce and double bounce. Try the tricks from the Red and White Club of the jump rope unit.
(10-15 min.)	Game: Ghostbusters- Same as Day 3.
(3 min.)	Closing: Review the day's lesson, put hula hoops away by color and take off heart rate monitors.

Day 6 of Hula Hoop Unit

(3 min.)	Pick up heart rate monitors, go to the locker room and put them on.
(3min.)	Warm up: Divide into small groups and have your own contest and challenges.
(5-7 min.)	Skill work: Jumping rope and shooting the hoop.
(15 min.)	Game: Hoopla Kickball- Divide into two teams. Rules are the same as regular kickball but use three hula hoops side by side as second base. The kickers may run the bases the regular way or go straight to second base. If a kicker decides to go straight to second base, he/she must run right straight back home. The kicker may not stop or stay at second. A team can have up to three people on second base, one in each hoop. Play three outs or kick everyone and switch.
(3 min.)	Closing: Review the day's lesson, put hula hoops away by color and take off heart rate monitors. Last Day!

APPENDIX D

HEART RATE MONITOR NUMBERS

HEART RATE MONITOR NUMBERS

GRADE 4-1		GRADE 4-2	
#		#	
3	Paul	3	Peter
4	Ryan	4	Matt
5	Katy	5	Katie
7	Liz		
8	Nick	8	JJ
9	Peter		
10	Beth		
11	Kristen	11	Ainsley
12	Chelsey	12	Airra
13	Stephen	13	Aaron
15	Chelsea		
16	Bobbie	16	Zack
17	Ashley	17	Colleen
18	Tim		
19	Abby	19	Erin
20	Anna	20	Emily
21	Jackie	21	Allison

APPENDIX E

RAW DATA

Jump Rope Heart Rate Raw Data

	Gender	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
1	M	89.00	79.00	.00	114.00	102.00	83.00
2	M	102.00	.00	.00	.00	108.00	.00
3	M	86.00	65.00	152.00	105.00	.00	80.00
4	M	84.00	.00	130.00	.00	74.00	.00
5	F	93.00	99.00	111.00	94.00	113.00	.00
6	F	.00	98.00	110.00	109.00	98.00	104.00
7	F	101.00	83.00	125.00	95.00	125.00	95.00
8	M	111.00	158.00	139.00	120.00	99.00	93.00
9	M	98.00	.00	93.00	105.00	92.00	183.00
10	M	115.00	.00	134.00	135.00	139.00	125.00
11	F	72.00	66.00	104.00	107.00	130.00	107.00
12	F	95.00	84.00	120.00	88.00	.00	115.00
13	F	.00	.00	.00	.00	92.00	.00
14	F	98.00	.00	.00	89.00	107.00	96.00
15	F	90.00	107.00	98.00	89.00	85.00	90.00
16	M	91.00	.00	.00	93.00	211.00	.00
17	M	121.00	.00	.00	.00	.00	.00
18	F	134.00	117.00	.00	105.00	121.00	111.00
19	M	67.00	84.00	161.00	98.00	.00	86.00
20	M	.00	86.00	91.00	109.00	.00	.00
21	F	109.00	123.00	116.00	96.00	122.00	124.00
22	F	86.00	76.00	75.00	.00	83.00	.00
23	M	70.00	88.00	.00	85.00	88.00	92.00
24	F	120.00	105.00	.00	112.00	133.00	110.00
25	F	88.00	96.00	85.00	.00	.00	.00
26	F	108.00	122.00	128.00	110.00	123.00	126.00
27	F	27.00	.00	.00	127.00	87.00	.00
28	F	106.00	116.00	125.00	106.00	122.00	104.00
29	F	.00	107.00	.00	99.00	89.00	101.00

Hula Hoop Heart Rate Raw Data

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	AveJr
1	72.00	135.00	82.00	108.00	93.00	92.00	93.40
2	.00	.00	95.00	89.00	.00	.00	105.00
3	62.00	97.00	70.00	66.00	79.00	76.00	97.60
4	91.00	75.00	83.00	.00	.00	107.00	96.00
5	91.00	90.00	90.00	.00	.00	108.00	102.00
6	119.00	93.00	95.00	105.00	101.00	181.00	103.80
7	.00	94.00	81.00	.00	107.00	112.00	104.00
8	89.00	121.00	.00	157.00	.00	120.00	120.00
9	101.00	98.00	86.00	87.00	95.00	92.00	114.20
10	104.00	114.00	110.00	109.00	97.00	106.00	129.60
11	87.00	106.00	68.00	.00	128.00	.00	97.67
12	74.00	100.00	.00	93.00	124.00	.00	100.40
13	.00	104.00	.00	.00	80.00	.00	92.00
14	80.00	90.00	.00	99.00	123.00	.00	97.50
15	91.00	.00	.00	.00	107.00	.00	93.17
16	.00	120.00	.00	93.00	88.00	99.00	131.67
17	107.00	.00	.00	.00	.00	.00	121.00
18	122.00	102.00	103.00	117.00	127.00	.00	117.60
19	79.00	103.00	77.00	83.00	67.00	74.00	99.20
20	84.00	89.00	.00	.00	.00	.00	95.33
21	110.00	107.00	127.00	101.00	.00	.00	115.00
22	82.00	83.00	84.00	86.00	77.00	115.00	80.00
23	68.00	80.00	.00	.00	105.00	.00	84.60
24	98.00	74.00	98.00	.00	133.00	137.00	116.00
25	.00	.00	85.00	.00	.00	.00	89.67
26	124.00	106.00	108.00	114.00	.00	.00	119.50
27	.00	76.00	78.00	.00	.00	.00	80.33
28	120.00	.00	95.00	108.00	.00	112.00	113.17
29	.00	.00	91.00	94.00	103.00	.00	99.00

Jump Rope Time Raw Data

	AveHh	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
1	97.00	8.37	25.24	18.07	19.16	20.00	20.27
2	92.00	12.37	.00	.00	.00	22.30	.00
3	75.00	5.29	18.19	16.01	19.08	19.12	18.54
4	89.00	12.32	.00	.29	.00	22.26	19.42
5	94.75	12.31	24.00	15.50	17.11	19.40	20.06
6	115.67	.00	19.35	19.41	19.11	22.25	16.04
7	98.50	8.33	25.13	16.44	16.22	22.14	18.56
8	121.75	8.29	20.27	16.35	18.22	19.10	20.21
9	93.17	12.32	18.21	19.38	19.13	22.27	10.18
10	106.67	5.37	18.41	15.54	18.07	19.13	20.21
11	97.25	18.24	30.13	30.58	29.43	.04	.04
12	97.75	8.33	25.27	16.31	20.12	20.13	20.22
13	92.00	17.27	26.28	16.27	7.16	22.30	19.29
14	98.00	5.27	23.51	15.25	.17	16.59	18.38
15	99.00	.31	18.19	19.40	.17	6.45	19.56
16	100.00	8.31	35.24	15.24	19.06	18.50	30.06
17	105.00	12.40	.00	19.38	.00	21.07	19.13
18	114.20	8.34	25.22	.00	20.32	19.17	20.24
19	80.50	5.25	23.49	15.25	16.33	.00	18.07
20	86.50	23.22	18.20	19.41	19.10	.00	.00
21	111.25	8.32	26.23	.20	19.08	19.10	20.23
22	87.83	12.34	18.20	19.40	19.09	22.24	19.30
23	84.33	5.27	23.50	18.20	16.47	17.47	18.04
24	108.00	8.32	23.70	16.31	19.08	26.08	39.49
25	85.00	12.29	17.40	19.53	18.51	33.32	.00
26	113.00	8.35	25.29	16.35	19.11	19.07	30.29
27	77.00	4.24	29.37	18.36	7.13	22.33	19.00
28	108.75	5.18	23.51	29.53	16.22	.05	23.28
29	96.00	12.38	18.15	15.49	19.11	39.30	39.28

Hula Hoop Time Raw Data

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
1	25.19	20.17	23.00	20.21	36.22	.00
2	.00	.00	19.26	19.14	14.14	18.27
3	21.52	21.12	22.00	31.20	19.54	19.39
4	18.56	14.59	11.12	15.04	.00	17.28
5	25.00	20.20	20.48	17.58	20.37	22.45
6	18.58	14.55	19.23	19.13	20.06	.02
7	.00	20.14	28.18	19.43	21.01	20.12
8	24.11	17.07	14.16	19.49	21.04	22.56
9	19.00	14.48	19.24	19.15	19.54	17.27
10	21.53	17.04	22.42	19.43	21.01	22.43
11	22.05	40.02	.04	.00	21.03	31.46
12	24.09	19.57	.00	19.46	18.42	20.44
13	30.49	25.39	21.36	7.56	19.02	15.54
14	21.54	21.34	20.41	19.14	20.59	22.55
15	21.52	.03	4.54	37.24	21.32	.00
16	24.08	20.30	22.12	19.52	31.30	19.36
17	18.57	.00	18.01	35.25	19.14	16.56
18	21.49	17.03	21.57	19.45	20.58	.00
19	24.12	20.18	35.07	19.50	20.58	22.06
20	18.56	14.57	17.52	19.15	18.13	17.27
21	24.10	20.13	20.42	29.52	21.02	17.27
22	18.58	14.47	19.27	19.14	19.53	22.49
23	21.51	17.14	20.42	.00	7.50	.00
24	24.10	20.22	21.59	.00	18.55	20.24
25	19.10	14.48	19.23	.00	19.55	.00
26	24.37	.00	22.22	31.49	19.35	19.43
27	16.54	14.40	19.25	15.38	18.02	.00
28	24.12	19.53	22.01	29.10	20.54	22.42
29	19.54	.00	.04	19.14	19.54	17.33