

EFFECTS OF RHYTHMIC MOVEMENTS ON STUDENTS' BEHAVIORS, EMOTIONS  
AND ACADEMIC GROWTH

A Thesis by

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B.A., Tabor College, May 2007

Submitted to the Department of Curriculum and Instruction  
and the faculty of the Graduate School of  
Wichita State University  
in partial fulfillment of  
the requirements for the degree of  
Masters of Education

May 2010

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The following faculty members have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirement for the degree of Master of Education with a major in Curriculum and Instruction.

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## DEDICATION

To my husband, for his unfailing love and support, I could not have finished without him. To my colleagues who served not only as sounding boards but as supportive friends.

## ACKNOWLEDGEMENTS

I would like to thank Dr. Liu for serving as my thesis chair, and for his assistance in helping me revise and edit my thesis. I would also like to thank Dr. Alagic and Scott Dellinger for their guidance and support during the last two years, and Dr. Glyn Rimmington for serving as a member on my thesis committee.

## ABSTRACT

This study investigated the effects of rhythmic movements on students' behaviors, emotions, and academic growth. The study concentrated on a fourth grade class from a Title 1 building, where the majority of students came from poverty, and were scoring below grade level in reading and mathematics. A series of ball exercises were implemented in the classroom for 15-20 minutes daily for nine weeks. The behavior, emotions and academic growth of the students were monitored and recorded. Academically, reading scores significantly increased as compared with the control group. Results also showed a decrease in negative behaviors from 35 interruptions per hour to 5 and an increase in student engagement by 15%. Throughout this study, students also claimed to feel less stressed and have fewer worries while at school.

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# CHAPTER 1

## INTRODUCTION

### 1.1 Rationale

With the growing diversity in America's classrooms, many new issues have emerged. Students are faced with more challenges and pressures than ever before. Children, especially children from poverty, are coming to school with higher stress rates, and this stress is having a direct effect on students' academic and behavioral success (Evans & English, 2002; Guo & Harris, 2000). According to research, the longer students live in poverty, the lower their academic success will be (Guo & Harris). In addition, children from poverty often have more behavior issues in school because they have difficulty with managing their behavior. Lastly, children who grow up in poverty can suffer from many emotional stressors due to family turmoil, unemployment, violence and many other problems (Evans & English).

These individual problems can turn into a classroom or even a school wide problem, when schools are faced with a high number of students who live in poverty. This is becoming an increasingly large issue for schools, considering about 39% of the nation's children, nearly 29 million in 2007; live in families with low incomes (Cauthen, 2008). To summarize, children from poverty tend to suffer from an increased amount of stress and this stress can have a negative effect on their academic, emotional and behavioral growth. The effects of this can be seen across the nation in schools with low-income students. Almost daily newspapers show the list of urban or low-income schools that are being restructured for not making adequate yearly progress, as set by the No Child Left Behind guidelines.

## 1.2 Purpose

So knowing the hardships that these children and schools face, the question stands: what can teachers do to help students from poverty be successful in school? The answer to this imperative question becomes the foundation of this study. Teachers and schools cannot take away home-life stress, nor can they financially rescue families from poverty. Teachers are limited to what occurs in their schools and classrooms; therefore the potential solution must occur in the classroom. So what is the variable in this problem? The variable, or the aspect of student poverty that can be changed, is stress. Teachers cannot eliminate students coming to school stressed, but they can work on reducing the stress while the students are in school.

The purpose of this study was to find a way to reduce student stress while at school, thus increasing student achievement and behavior. According to many researchers, movement and exercise can improve learning, memory, concentration, and mood (Ratey & Sattelmair, 2009). Through a comprehensive literature review, it was found that movement based exercise can reduce stress in individuals and potentially increase academic growth. Considering children from poverty tend to suffer from more stress and anxiety, this study posed the hypothesis that by implementing rhythmic ball exercises into an individual classroom, the students would achieve higher academic, behavioral, and emotional success.

Research in this area has been done in a couple of different ways, but few have had direct application to the individual classroom. This research study was designed so that teachers could implement the exercises within their own classrooms and schedules. Therefore, the basic premise of the study is the implementation of rhythmic ball exercises on a daily basis for approximately fifteen to twenty minutes in a fourth grade classroom. The classroom primarily consists of African American students who come from a low socio-economic background. The results of

this study will focus on the three aspects of students' success: behavior, emotions, and academic success in reading and mathematics.

## CHAPTER 2

### LITERATURE REVIEW

The effects of poverty and stress on children's behavioral, academic and emotional growth are well documented. Stress in children will be shown to be a major detrimental factor in cognitive and emotional growth. The current research on exercise and movement has been shown to reduce stress and increase concentration in children. In addition, three studies which focused on the effects of movement or exercise will be examined, and the results will be compared. From this review, there will show enough evidence to support implementing movement based activities in the classroom on a daily basis. These movement based activities should reduce the stress in the students, thus increasing their cognitive and emotional growth.

#### **2.1 Effects of Poverty on Children's Growth and Development**

In order to begin to understand the effects of poverty on children, one must first have a basic definition and understanding of what poverty is and who it affects. According to research, poverty is typically defined in terms of pretax income; poverty thresholds reflect expenditures necessary to cover the minimum consumption needs of families (Garrett, Ng'andu & Ferron, 1994). Even though poverty can be defined in terms of income, its effects spread much further than monetary values. Through extensive research, three common effects of poverty in children were found: (1) poverty affects cognitive development, (2) poverty can affect behavior, and (3) poverty can be emotionally detrimental. These trends will be briefly discussed in order to show the impact of poverty and the need for interventions for children from poverty.

In terms of cognitive development, students from poverty or who have a low socio-economic status typically have poorer school performance and low retention rates (Ahmed, 2005). This means students from poverty will struggle with comprehension in school and with

retaining information learned in school. In addition, children who live longer in poverty will have lower academic achievement and the worse social and emotional functioning (Guo & Harris, 2000). Examples of this can be seen through high dropout rates, low test scores and an increased number of students enrolled in special education or who require special intervention plans. Cognitive development in children is often due to neglect in early years (Bigelow, 2006). In fact, most types of learning disorders are either brought about or actually caused because of long term, early poverty. In addition, the effects of poverty also extend to hyperactivity, poor memory, and slow learning. So through this, it becomes very evident that poverty is a major factor in a child's cognitive development and can lead to apparent learning disabilities and low achievement.

The second major aspect of poverty is that it can cause behavior problems at home and in the classroom. The behavior issues appear to stem from the interactions between the parent and the child. For example, there is evidence that poverty, income loss, and unemployment may reduce parent responsiveness, warmth, and supervision while increasing inconsistent disciplinary practices and harsh punishments. As a result, this use of harsh punishments often leads to child aggression and delinquency (Guo & Harris, 2000). This aggression and delinquency can occur both at home and school. If a parent acts aggressive towards a child, then the child will be more likely to act this aggression out towards others. This can happen when the parent feels a lack of control from a variety of reasons such as financial insecurity or job frustration. These feelings of stress from the parents can lead to an over-emphasis of obedience, and relying on corporal punishment (Garrett & Ferron, 1994). Due to all of these factors, children from poverty can have more difficulty with controlling their behavior (Evans & English, 2002). So it can be concluded

that because of parental stress and dysfunction, children from poverty can often struggle with behavior issues.

The last trend found is that poverty is emotionally detrimental to children. This occurs mostly through stress and parent relationships. It is both the physical and the social, which may lead to socio-emotional difficulties because of childhood poverty (Evans & English, 2002). According to Ahmed (2005, p.3), “economic deprivation leads to depression and stress in the parents and ultimately dysfunction of the family. So parents’ stress directly affects the children as well.” In addition to parent stress, children also experience more psychological stressors such as elevated family turmoil, greater child-family separation, and higher levels of violence. Lastly, economic deprivation increases children’s risks of emotional and behavioral problems (McLeod & Nonnemaker, 2000). In summary, poverty affects children negatively in a number of ways. Children from poverty struggle with cognitive development, potential for behavior issues and higher stress rates due to emotional deprivation.

## **2.2 Effects of Stress on Student Learning**

Now that it has been established that children face many stressors, it is important to know how this stress affects their learning and achievement in school. According Willis (2007), a neurologist, stress can have a negative effect on learning and memory. Willis (2007) goes on to explain how patterned data passes from the sensory response regions through the emotional limbic system filters, this limbic system has a strong influence on the formation of memory. This means that high emotions can directly affect memory and retention. Another doctor and researcher, Hannaford (2005), explains further the “fight or flight” reflex of stress. Hannaford goes on to explain that when the body faces stress, it becomes physically difficult to learn.

In addition, when under stress, people remember less than they normally would because of the increased cortisol in the system (Hannaford, 2005). Another factor to take into consideration regarding stress is family dynamics and long term stress. Hannaford explains that when parents or other guardians live highly stressful lives, their children may imprint that training into their own nervous systems. These stressful situations from youth can often lead to intellectual and behavioral problems in adulthood. In summary, stress has a direct affect on cognitive development- especially long term stress.

After facing all of this grim data regarding children from poverty, one could wonder if there is much hope for these children. When addressing a problem of this magnitude, it is essential as an educator to distinguish between the factors that are not controllable and those that can be controlled. An educator cannot control what environment a child may come from, only what environment they are in at school. In addition, an educator cannot remove stress factors from home; however, they can equip students to learn techniques to help manage stress.

The focus of this study will be how physical movement and play can be an effective stress reducer in children, thus increasing their cognitive growth (Hannaford, 2005). Physical movement and play must be daily, engaging, challenging and enjoyable to children in order to achieve positive results (Ratey & Sattelmair, 2009). There are numerous activities that children can participate in to meet the above standards. These activities range from the traditional recess games to modern games like *Dance, Dance Revolution*. Other researchers and authors like Kagan (2000) have come out with books that have fun games and movement based activities that teachers can play in the classroom. The movement or play needs to get the children out of their seats, moving around and challenging them. The actual activity is not an important focus as long

as it meets the above standards. The importance is to find daily ways to incorporate movement into classrooms, especially in classrooms with children from poverty.

### **2.3 Positive Effects of Movement on Stress**

Brain research has become increasingly advanced, and in a study done by Gray (2008), it was found that instruction is capable of altering student brain functions and that educators have the power to make positive, long term change. Therefore it can be concluded that students who have suffered from developmental delays due to stress, can improve brain function and growth. Teachers can stimulate brain function and growth by using different teaching strategies, a variety of multiple intelligences, and by teach to different learning styles (Madrazo & Motz, 2005; Caulfield, Kidd & Kocher, 2000). The classroom also needs to be a safe, warm environment that focuses on hands-on activities (Madrazo & Motz). Another researcher also wrote that one can reduce stress from the learning environment through activities like slow stretching, laughter and humor, music, games, activities and so on (Vanderbilt, 2005). The implication of this research is that many different forms of movement are effective in reducing stress.

In addition, good teachers will rotate learning activities and allow for diverse thinking opportunities (Kolis, 2004). The rotation of activities is “using the full range of auditory, visual and kinesthetic strategies- activity shifting, instructional intelligence, multiple intelligences, and an array of diverse teaching approaches all tap into the best of *brain-compatible learning and provide innovative ways to reach students*” (Lombardi, 2008 italics added, p.219). In fact, through using a variety of activities and experiences it is actually possible to grow our brains, and possible for our brains to be flexible, modifiable and repairable (Lombardi; Caulfield et al., 2000). So the more students can move during learning, the less stressed they will be, so they can learning and retain more information.

Our brains can continue to be molded and grow. They grow best through diverse activities and a warm, low-stress environment. Throughout the diverse activities mentioned earlier, kinesthetic learning, learning by doing and movement, came up repeatedly. Besides being a brain based learning strategy, kinesthetic learning can also be a valuable stress reducer and can even increase academic performance. New research is continually coming out, showing the connections between movement and cognitive activity (Hannaford, 2005). In fact, Hannaford goes on to say that, moving while learning can increase the learning. Research also shows that “muscular activities, particularly coordinated, balanced movements, appear to stimulate the production of neurotrophins, such as dopamine... and as we learn and master movements and skills, our brains require less energy and function more efficiently” (Hannaford, 2005, p114).

Through this we can see how movement increases academic performance and decreases stress (release of dopamine). Ratey and Sattelmair (2009) also expounds upon this through their research and says that learning, memory, concentration, and mood all have a significant impact on a students’ academic performance, and there is increasing evidence that physical activity enhances all of these. Therefore it becomes vitally important for teachers to implement more movement based exercise in their classrooms, especially teachers of impoverished students. Students from poverty suffer from more stress and that stress can have negative effects on learning. Therefore if movement reduces stress, teachers should be implementing movement based activities to help their students focus and retain information.

In order to help assess the effects of movement on academic achievement, three case studies will be examined and compared. All three studies either used or monitored exercise and movement, and their effects on cognitive growth. These studies are important to analyze because they utilized movement in a variety of ways and had a large number of participants. Though the

studies will not be replicated, useful information can be gained from them. The studies used were from Groenendyk (2008), Chomitz et al. (2009) and Tremarche et al (2007).

The participants in all three studies included elementary age students, with the study by Chomitz including middle school students. Groenendyk's (2008) research included first, third and fifth grade students from a moderate (419 students) elementary school that was predominately white. Tremarche's research included 311 students from two fourth grade classes in two different schools. Both schools were large (over 2,000 students) and school 1 had approximately 86.5% Caucasian students and school 2 had 98.4% Caucasian students (2007). The last study by Chomitz (2009) was also conducted in a large school (over 2,000 students); however, 64% of the students were non-white and 43% qualified for the National School Lunch program. The final sample of this research included 1,841 fourth, sixth, seventh and eighth grade students. These studies show a variety of ages, races and school sizes, but they all focus on the effects of movement and exercise.

The methods of Groenendyk's (2008) study included the use of two classrooms of each grade level- one to implement the methods and the other as a control group. The methods used were called "Bal-a-vis-x", an integration of ball activities that focus on balance, auditory and vision exercises created by Bill Hubert. The activities were implemented into the classroom 3-4 times a week for thirty minutes sessions. The study took place from September to May. The instruments used to assess growth were DIBELS (Dynamic Indicators of Basic Early Literacy Skills), a running Record Reading Inventory, Visagraph (an eye movement recording system with analysis software) and the MAP Test (a state- aligned computerized adaptive assessment program). The students were monitored, using these tools, in September, January and May.

Similar to Groenendyk's study, Tremarche (2007) used two main groups- one fourth grade class that had 28 hours of physical education per school year and the other fourth grade class that had 56 hours of physical education per school year. The instrument of use in Tremarche's study was the MCAS standardized English and Language Arts (ELA) and the Mathematics test; these were taken in either April or May.

In Chomitz's (2009) study, a large number of fourth, sixth, seventh and eighth grade students from one school were included. The difference in Chomitz's study is that two assessments were used to compare physical fitness with academic achievement. The academic achievement was measured by the MCAS (an annual test that assesses all public school students across Massachusetts), and the fitness achievement was measured by a Fitness Achievement variable that was constructed as the number of fitness tests passed by an individual student and was used in statistical models as a continuous explanatory variable). This study set out to see if there would be any correlation between students with high fitness levels and high academic levels in reading and mathematics. In summary, all three studies used a variety of tools to monitor the physical movement/exercise and academic growth.

All of the studies showed positive results reflecting the hypothesis that movement, exercises and fitness had a positive correlation to student achievement. First, Groenendyk's (2008) study demonstrated that the first grade DIBELS test showed an increase in the number of students reading at grade level, while the control group actually decreased in the number of students reading at grade level. The MAP reading test scores increased by 19.14%, while the control group only showed a 7.83% increase. Mathematics did not show any significant gains or losses. The third grade reading levels also increased, but showed no significant data in mathematics. Fifth grade showed similar results to first and third grade.

Like Groenendyk's study, Tremarche's (2007) study showed a significant increase in reading scores, but not in mathematics. In school 1 (with fewer physical education hours), reading scores on the ELA were an average of 43% and in school 2, the ELA average was 61% (the state's average was 51%). This shows that the school with more physical education scored 18% higher on the state's reading ELA test. In mathematics, school 1 scored 33% and school 2 scored 43% (the state's average was 34%). Even though school 2 had higher mathematics scores, there was not a significant difference.

Lastly, Tremarche's (2007) study showed a positive correlation between students with high fitness rates and academic rates. However, this study showed that the students' fitness was more strongly associated with Mathematics achievement than English achievement scores. In fact the logistic regression analysis estimated the odds of passing the Mathematics MCAS increased by 38% for each 1-unit increase in the number of fitness tests passed, holding gender, ethnicity, weight status, grade, and SES constant. In this study, the difference in reading was not significant.

Because of the similarities of results, the three studies had comparable discussions. All three studies felt that the physical activity or movement benefited the students academically. Groenendyk (2008) reports that the implementation of Bal-a-vis-x [movement exercises] has proven to raise academic achievement and improve social behavior. Chomitz (2007) reports that "this study has shown that students who receive more hours of physical education can score higher on certain areas of the MCAS test". Lastly, Tremarche (2009) reports that "our findings contribute to a growing body of evidence indicating a significant relationship between students' academic achievement and physical fitness". Physical exercise and movement can positively increase students' academic performance.

## **2.4 Implications and Rationale**

The implications of these research studies and articles are tremendous, especially for struggling schools. Most schools that are scoring below average on academic assessments are diverse schools with high poverty rates. Through the research mentioned earlier, poverty greatly affects children through multiple stressors. It was then shown that stress can impair learning and cause developmental delays. However, there is hope, the brain can be changed. Exercise and movement have been proven to reduce stress and increase academic achievement. It is essential for educators to teach students (especially students from poverty) stress reduction strategies. This will not only help their students emotionally, but can also help them academically.

I think that there is enough evidence from the research studies to support implementing movement based activities in the classroom on a daily basis. The case studies mentioned earlier all showed positive links between movement and student achievement; however, none of these studies were conducted in individual classrooms on a daily basis. In addition, these strategies required a minimum of 30 to 45 minutes outside of the classroom. This becomes a problem when teachers want to reproduce or try the strategies. Teachers need way to reduce student stress on a daily basis, without cutting into instructional time. This study attempts to implement a strategy that only requires 15-20 minutes of regulated movement activities on a daily basis in the classroom. The exercises implemented in this study focus on getting students to physically move in regulated and enjoyable, yet challenging manner. The main activity in this study will incorporate daily exercises with racquetballs. The exercises will challenge the students with different bouncing patterns, balancing, hand-eye coordination, and cooperate work.

This information and research studied is especially meaningful to the researcher because the school where the current study will take place is a very high poverty school with very low

test scores. At a school like this, it will be even more necessary for teachers to address the effects of stress on their students. Because of this research and information, the very potential effects of implementing movement exercises in a high poverty classroom, is worth the investigation.

## CHAPTER 3

### RESEARCH DESIGN AND METHODOLOGY

#### 3.1 Participants

In this study, two fourth grade classrooms were chosen to participate. There were a total of 29 fourth grade student participants. The two classrooms were chosen because of their similar demographics and academic status. The school in which the classrooms are located is a Title 1 building, set in a low economic neighborhood. In the school, 80% are African American and 90% qualify for free and reduced lunches. In the previous school year, the school chosen had the highest amounts of suspensions out of all the elementary schools in the district. Academically, this school is on “improvement,” meaning they did not make Adequate Yearly Progress in both reading and mathematics for two consecutive years.

The experimental classroom had 14 participants- five girls and nine boys. Out of the 14 students, three qualified for special education services in both reading and mathematics. The experimental group’s teacher was in her third year of teaching and all of those years have been spent at this school teaching fourth grade. The second fourth grade classroom was the control group and had 15 participants- nine girls and six boys. Out of the 15 students, two qualified for special education services in both reading and mathematics. The teacher for the control group was in her tenth year of teaching. This teacher has spent the last nine of her years in this building, and this is the third year she has taught fourth grade.

These two classrooms were chosen because of their demographic and academic similarities. Figure 1 shows how both classrooms had the same number of African American students and the same number of low socio-economic students. Academically both classrooms were within 5% of each other in both reading and mathematics. Both classroom teachers used the

same curriculum in reading and mathematics. In addition, they followed a district pacing guide, ensuring they were teaching the same standards each week.

Table 1  
*Racial and Academic Percentages of Each Classroom*

Classroom	African American	Qualify for Free and Reduces Lunches	Reading on Grade Level	Mathematics on Grade Level
Classroom A (Experimental)	93	93	21	29
Classroom B (Control)	93	93	26	26

### 3.2 Intervention

For the rhythmic exercises used in class, a classroom would first be required. The students should each have three square feet of space. Second, each student needed a hand-size rubber ball (racquet balls were used in this study). A timer was also used to monitor the time spent on the exercises. The exercises were inspired by Bal-a-vis-x, a program created by Bill Hubert, but were not used as a part of his program or methods. All of the exercises were created by this author.

During the first week of the study, the students began learning the fundamental process of the rhythmic ball exercises. The students would come into the classroom, after the restroom and drink break, and get a ball from the basket. The students would then hold onto the ball and wait for the teacher’s instructions. Once every student had a ball and position in the classroom, the teacher would lead the warm-up exercises. The first week’s exercises primarily focused on how to hold the ball and the basic arm movements. The students were expected to hold the ball in the “C” position, meaning their hand was around the ball in such a ways that their hand formed a

“C” whenever they held it and dropped it. The starting position for the ball was termed “the C position” and that was the ball in the students’ hand, with the hand up by the students’ shoulder, ready to be dropped.

Once everyone was in position, the teacher would say which exercise they would be doing (example: drop with right hand, catch in left hand) and then call out “down” and the students would bring their arms down and drop the ball, catch it with one hand and bring that hand back up to the “C position”. The students are to only drop the ball when the teacher commands. This is the basic movements, and once the students mastered the correct posture and the basic ability to drop and catch the ball with one hand, then the exercises would increase in difficulty. Below is a typical exercise lesson that would be incorporated in class:

1. Teacher: “Ready... right hand drop, right hand catch” (repeat 10 times)
2. Teacher: “Ready... right hand drop, left hand catch on one foot” (repeat 10 time)
3. Teacher: “Switch feet, same hand movement, down” (repeat 10 times)
4. Teacher: “Pattern: down, catch, pass hands (repeat 10 time)
5. Partner Work: two balls, various exercises
6. Teacher: cool down activities

When the students were completing the exercises, they were not talking and were focusing on dropping and catching the ball. During this time, the balls should be dropped in a synchronized manner and the sound is very distinct. During the partner exercises, balls are not synchronized, but the students should still have low voices and remain focused. Usually during the partner exercises, the students use two balls and perform the exercise while the other student counts. Then they switch roles, making sure to encourage and remind each other of technique. Once each student has a turn, the pair faces each other and bounces the balls back and forth in a

rhythmic fashion. Once partner work is down, the students are gathered back into a group to complete the cool down activities. The cool down activities are usually easier and the rhythm of the balls is very distinct as to help the students regain focus. Once the exercises are done, then the students put their balls away one at a time and return to their seats for mathematics. At the end of the ball exercises, the teacher records how well the students did in the exercise and the duration of the exercise (see appendix for recording sheet). The exercises were scheduled to be completed every day, and the entire study lasted for nine weeks.

### **3.3 Instruments**

Assessment instruments were used to assess the students academically, behaviorally, and emotionally. The Northwest Evaluation Association was used to assess the students in reading and mathematics. The test was designed to get harder as the students answer questions right. When a student misses several questions, the test adapts by getting easier. By the end of the test, which is approximately 53 questions, the difficulty will have leveled out leaving the students with their RIT score. The RIT score is a unit of measure that uses individual item difficulty values to estimate student achievement. There are certain RIT levels that fourth grade students should obtain by the beginning, middle, and end of the school year. For example, a fourth grade student given the test in the fall should score a RIT score of 201 in reading and a 203 in mathematics. In this study, the RIT scores from the beginning, middle, and end of the school year were used to analyze the reading and mathematics data.

In order to assess the students behaviorally, an observation form was created and implemented eight times throughout the nine week study. Three observations were done the first week and third week, and two during the ninth week. This observation form was used to record the number of student interruptions and the number of students on task for the duration of one

hour. The term “on task” means the students were actively participating in class and completing the appropriate activities in a timely manner. The same observer recorded this information, tallying the number of student interruptions during the hour. These interruptions range from calling out, making distracting noises; and so on. This form was always completed at the same time of day and by the same observer throughout the nine weeks.

A student survey was also conducted at the beginning of the study and at the end of the study for the experimental group. Since the purpose of the ball exercises was to not only help students focus, but also to help students de-stress, it was pertinent that the survey include questions about how often students experienced feelings of worry or nervousness. The survey also included questions about how successful the students felt in reading and mathematics, and how often they felt they got into trouble at school. The survey was completed individually, but the teacher read aloud the questions to ensure student understanding.

Lastly, a teacher survey and reflection log was used during the study. The teacher survey was given to the experimental teacher at the beginning and end of the nine weeks. This survey included questions about how successful the teacher thought her students were in reading and mathematics and how often she thinks her classroom is disrupted with student interruptions. The teacher reflection log was used on a daily basis and included a record of when the ball exercises were done and for how long. The reflection also included how well the students did the activities and any other observations the teacher made.

### **3.4 Procedures**

After Classroom A was chosen to be the experimental group, preliminary data on the emotional and behavioral status of the experimental group was recorded. This was done through the student surveys and behavioral observations. In order to record the behavior data, a volunteer

(a retired teacher) came three days during the first week and recorded the number of interruptions and the number of students on task for one hour (during mathematics time). In addition, the teacher survey was given this first week.

Next, specific times to have the students participate in the exercises needed to be established. Since the exercises were designed with the intent of increasing student focus, it seemed advantageous to have the exercises in the morning, during which reading and mathematics both took place. So the routine was established in the classroom that the rhythmic ball exercises would come after reading and a restroom break, and right before mathematics time. The duration of the exercise was approximately 15 to 20 minutes each day. The exercises were to be completed every day, unless unexpected circumstances arose.

Halfway through the nine weeks, the behavior was monitored again by the volunteer. She observed their behavior, time on task, and interruptions for another three days, all for an hour during mathematics. This also occurred during week nine, although data was only recorded for two days due to the Winter Break. Also during this time, the students took the post tests in reading and mathematics. The students and teacher also took the final survey during week nine.

### **3.5 Data Analysis**

In order to analyze the academic data, the reading and mathematics data was first compiled by classes and individuals. This was done by recording the individuals' pre and post test scores and finding the averages for each class. Then, the number of points each student increased were calculated. This allowed the teachers to compare post test scores along with the total number of points that were gained by each classroom. The data that were compiled therefore included the average pre test score for each class, the average post test score for each class, and the average number of points increased per class.

The behavioral data was also recorded so that the averages could be compared accurately. The observations had been conducted a total of eight times (three days during the first week, three days during the fifth week, and two days during the ninth week). The number of interruptions per session each week were recorded and averaged. In addition, the number of students on task per session each week were recorded and averaged. The data that was compiled will be compared as an average number of interruptions and number of students on task from week 1, week 5 and week 9.

Lastly, the student and teacher surveys were analyzed by comparing pre and post test answers. The student surveys were anonymous, and the numbers of each response were recorded. This information was then transferred to an Excel sheet which listed the question and the number of “low, equal, and high” responses to each question on the pre test. This was also done with the post test responses, so the answers could be compared and analyzed. The purpose of this format is to show whether or not the students had changed in attitude and by what percent.

The teacher survey was more subjective and the answers were recorded as free response. To analyze the data, each question was typed up and the pre and post test answers were labeled and recorded beneath the question. This was done so that immediate comparisons could be made.

## CHAPTER 4

### RESULTS

In order to fully assess the effects of the study, the results were measured in three ways: behavior, emotions, and academic. All three of these factors must be assessed in order to truly measure whether the effects of the exercises were positive or negative. The following data is a compilation of observations, surveys and test scores.

#### 4.1 Behavior

Two aspects of the behavioral data were recorded, the number of students on task and the number of interruptions. During the first week, an average of 83% of students were working on task. Midway through the unit (week five), an average of 97% of students were working on task. During the last week of the unit (week nine), an average of 98% of students were working on task. This data shows an increase of students working on task and participating throughout the unit. An average of 15% of students paid more attention and spent more time on task by the end of the unit.

The second half of the behavioral data recorded was the number of interruptions per hour. During the first week of observation, an average of thirty-five interruptions occurred during the hour. Midway through the study (week 5), an average of fourteen interruptions occurred during the hour. During the last week (week 9), there was an average of five interruptions during the hour. Overall, the number of interruptions steadily and drastically drops throughout the study, decreasing by a total of thirty interruptions by the last observations.

#### 4.2 Emotions

The second piece of data recorded was a student survey created to gauge the students' emotional responses regarding school and the rhythmic ball exercises. One of the questions was

“how often do you worry about things while in school”. On the pre-survey, 33% of the students selected a low response (meaning they are not often worried in school), 20% selected a medium response (sometimes they are, sometimes they are not), and 47% of the students selected a high response (they are often worried about things while in school). These early results show that a large portion of the class was often worried during the school day. On the post-survey, 65% of the students selected a low response (little worry), 21% selected medium response, and only 14% selected a high response. In Table 2, it is apparent how at the beginning of the study, the majority of students had a high sense of worry at school. However, by the end of the study, the majority of students felt they worried less in school; this was a 33% decrease in feelings of worry. In summary, by the end of the study fewer students worried on a regular basis in school.

Table 2

*Question: How often do you worry about things in school?*

Survey	Low (not often worried)	Medium	High (often worried)
Pre-survey	33%	20%	47%
Post-survey	65%	21%	14%

In addition to decreasing student stress, the activities were designed to help students focus. Another question on the survey was “do you think you focus well in class?” At the beginning of the study, none of the students selected a low response (poor at focusing), 40% selected a medium response (sometimes focus well, sometimes not), and 60% selected a high response (focusing well most of the time). By the end of the study, no students selected a low response, 14% selected a medium response, and 86% chose a high response. As seen in Table 3, the percentage of students who felt that they focused well in class increased by 26%.

Table 3

*Question: Do you think you focus well in class?*

Survey	Low (poor focusing)	Medium	High (well focused)
Pre-survey	0%	40%	60%
Post-survey	0%	14%	86%

One of the last questions on the survey addressed how the students evaluated their own behavior. On the question from the pre-survey “do you feel like you get into trouble a lot?” 53% reported a low response (not getting into trouble often), 33% selected a medium response (sometimes getting into trouble, sometimes not), and 14% selected a high response (getting into trouble often). On the post survey, 71% of students reported a low response, 29% of students reported a medium response, and no students reported a high response. Looking at Table 4 it is evident that by the end of the study the majority of students felt that they do not get into trouble often. This was an 18% increase in positive behavior felt by students and a 14% decrease in negative behavior felt by students.

Table 4

*Question: Do you feel like you get into trouble a lot?*

Survey	Low (not often)	Medium	High (very often)
Pre-survey	53%	33%	14%
Post-survey	71%	29%	0%

### 4.3 Academic

The last piece of data that was recorded was the academic growth of the students in reading and mathematics. This data was recorded for both the experimental group and the control group. All of the students took the Northwest Evaluation Association test (NWEA), a nationwide test that evaluates in both reading and mathematics in two separate tests. All of the students took this test prior to the study, and their individual scores and their class average was recorded. While there are set scores expected for each grade level, the purpose of this study is to measure improvement and growth. Therefore, this study will focus on the average number of points increased for each class and the national average of increase.

The first set of results in mathematics acquired in the fall for the experimental group yielded an average of 190 points. The control group yielded an average of 192 points in mathematics. The fall national standard score is 203 points. This initial test shows that both the experimental and control groups were scoring below the national score, and that is why this study is focusing on the increase of each class as compared with the national increase average. The winter test results for the experimental group in mathematics yielded an average of 200 points. The winter results for the control group in mathematics were an average of 202 points. The winter national standard score for fourth grade was 208. Figure 4 shows the average increase for the experimental group was 10 points, an average increase for the control group was 10 points, and the national standard increases by 5 points.

There was no significant difference in mathematics scores between either groups; however both classes improved twice as much as the national score. The national scores are based on where specific grade levels should be and how much a student should improve each semester. According to NWEA, students should improve about four to five points each semester

to stay on grade level. So from this mathematics data, both the experimental group and the control group not only improved the adequate amount as based on NWEAs standards, but they exceeded expectations by almost two times. The students grew approximately two semesters worth of scores, in one semester.

Table 5

*NWEA Mathematics Scores*

Group	Fall	Winter	Gain
Experimental	190	200	10
Control	192	202	10
National Average	203	208	5

In the fall, the students also took the NWEA test in reading. The fall results for the experimental group in reading was 187 points. The fall results for the control group in reading was 193. The fall national standard score in reading was 201. This initial reading test also shows that Class A and B are scoring below the national score. The winter result for the experimental group was an average of 198 points. The winter result for the control group was an average of 197 points. The winter national score for fourth grade is 205. Figure 7 shows the increase of points for each group. The students of the experimental group increased by an average of 11 points, the students of the control group increased by 5 points and the national score increased by 4 points. As mentioned earlier, the national scores set a guideline as to how much students should be improving each semester. In reading, students should increase three to four points each semester. The winter data shows that the experimental group improved by almost three times the

national suggested average. The control group improved the adequate semester amount, slightly above the national average.

Table 6

*NWEA Reading Scores*

Group	Fall	Winter	Gain
Experimental	187	198	11
Control	193	197	4
National Average	201	205	4

In summary, the results of the data showed that the rhythmic ball exercises had a positive impact on student behavior, emotions, and academic growth. The number of student interruptions decreased by an average of 30 interruptions per hour and more students spent time on task. In addition, students reported that they worry less in school, focus more, and get into trouble less. Lastly, students increased ten points on the NWEA test in mathematics and eleven points in reading.

## CHAPTER 5

### DISCUSSION

This study posed the hypothesis that by implementing rhythmic ball exercises into an individual classroom, the students would achieve higher academic, behavioral, and emotional success. The results of this study positively affirmed this hypothesis in all three ways: behavioral, emotional, and academic.

#### **5.1 Academic**

Students' academic growth in reading and mathematics was determined by the Northwest Evaluation Association (NWEA). The mathematics scores showed a definite increase above the national standard of growth, but it was equal with that of the control class. The reading scores, however, showed a definite increase over the national standard of growth and over the control group by at least 6 points. To put this in perspective, the national average of growth per semester is about 3 points in reading. The control group increased by about 4 points, with parallels the national average. However, the experimental group increased by 10 points total, which is more than three times the national average growth. This equates to over a year's worth of academic learning completed in one semester.

These results are similar to the studies done by Groenendyk and Tremarche. In both of their studies the students' mathematics scores did not change significantly with the increase in exercise or movement. However, their two studies did show students' reading scores increased by a considerable amount as compared with the control group. This supports the researcher's original hypothesis that movement in the classroom can increase student achievement. It is particularly interesting that in three out of the four studies students achieved significantly higher in reading.

The significance of this increase in reading is particularly important to this school and classroom because the majority of students were scoring below grade level. In schools with high poverty it is common to have classrooms full of students below grade level and it becomes even more imperative to find strategies to increase student achievement.

It is also important to note that both teachers participating in the research, taught in very similar ways. The reading and mathematics curriculum is a district adopted curriculum, and a pacing guide is issued to every teacher. This means the same amount of reading and mathematics material were taught to both classes and for the same amount of time. In addition, both curriculums use a basal (teaching guide) which means the lessons would have been taught in a very similar manner. In addition, the experimental group's teacher has had three years of teaching experience and the control group's teacher has had ten years of experience.

Because both teachers taught it similar ways, it becomes significant that the experimental group had such an increase in reading scores. The most obvious difference in the classrooms was the incorporation of the exercises. This shows the importance of the movement and exercise in the classroom, and its effect on cognitive growth.

## **5.2 Behavioral**

First, in terms of behavior, student interruptions were cut down drastically from 35 interruptions per hour to five. Furthermore, 15% more of the students were on task in the lesson during that hour. This 15% increase brought class A up to 98% of its students being engaged and participating in the lesson. These findings are important because they offer teachers a viable way of decreasing student interruptions and increasing positive student behavior. By doing this, students will learn and retain more information.

There are a few reasons for why the exercises may have decreased student interruptions and increased class participation. First, the students enjoyed the ball exercises and looked forward to them. In addition, if students did not remain in control during or after the exercises, they would lose the privilege of participating. Though inevitably a student would lose the privilege for the day, it typically wouldn't happen again. Second, the ball exercises gave students the ability to move around in the morning, during a time in which they would usually sit for about three and half hours with few breaks. Recess and physical education did not occur for the students until the afternoon, so the morning could become very long for the students. The ball exercises gave the students an opportunity to move and exercise for fifteen to twenty minutes in the middle of the morning. This could definitely explain why the students were able to be more on task after the exercises, and why they had fewer disturbances and interruptions.

This information supports the studies and research conducted by Ratey, Sattelmair and Hannaford. Both researchers encouraged movement and exercise as a release for stress and increased concentration (Ratey & Sattelmair, 2009; Hannaford, 2005). It was evident that the students appeared less stressed after the exercises and were able to concentrate and participate in class even better.

These results are significant to this researcher and her classroom, because of the number of behavior problems the school experiences. Last year this school had the highest number of suspensions in elementary scores from the district. Behavior issues and poor classroom management is the primary cause for learning interruptions and early teacher burn out. Through this study, it showed that the ball exercises greatly helped reduce classroom incidents, thus increasing learning time.

### 5.3 Emotional

The second aspect of the study was the emotional well being of the students. As mentioned earlier, stress accompanies many students from poverty. However, since every school and classroom is different, finding a school-wide solution to stress reduction would be nearly impossible. However, teachers have the ability and the responsibility to form the culture and environment of their classrooms. This study was designed to find out what individual teachers could do within their classrooms. The exercises needed to be something the teachers could contain within their rooms and within their schedules.

The results of this study showed that the rhythmic ball exercises could be a viable method for teachers to use in classroom with stressed students. According to the pre and post test surveys, the students felt that they were worried less in school .At the beginning of the study, 47% of the student responded that they often worried in school; by the end of the study only 14% felt that they still worried frequently during school. This decrease supports the earlier mentioned research by Hannaford, Ratey and Sattelmair that suggests movement can reduce stress and improve moods through the release of dopamine in the brain (2005, 2009). In addition, at the beginning of the study 60% of the students thought they focused well in class. By the end, 86% of students reported that they focused well (a 26% increase). This also supports the research of Hannaford (2005), Ratey and Sattelmair (2007) in that movement can help the brain function and work more efficiently.

At the beginning of the study, 53% of students said they did not get into trouble much, but 14% said they got into trouble often. By the end of the study, 71% of the students reported that they do not get into trouble much and 0% reported getting into trouble often. This data pairs

well with the behavior data reported earlier. Students are not only more focused and in control, but they themselves can tell the difference in their own behavior.

One main reason that could have contributed to students' positive responses to the exercises could stem from their behavior. Appropriate behavior increased tremendously, which would mean the students would get into trouble less, thus making them respond to the survey in a positive way. In addition, if a student is staying out of trouble, their concentration and focus would increase. The feelings of not being as stressed or worried may be attributed to the before-mentioned research by Hannaford, Ramey and Sattelmair in that movement and exercise can effectively reduce stress (2005, 2009).

## **CHAPTER 6**

### **CONCLUSION**

#### **6.1 Limitations**

Even though both classroom teachers used the same curriculum and pacing, it could still be said that enough differences occurred in the classrooms to account for difference of scores in reading. The students could have had different levels of motivation the day they took the test, and other behavior issues could have caused the discrepancy. It is also important to note that the researcher of this study was also the teacher in the experimental classroom.

#### **6.2 Implications for further research and practice**

I believe the importance of these findings is that rhythmic movement in general produced the positive results. Analysis of the actual exercise is not as important as the act of doing something that generates movement and concentration. Further research can and should be done with other modes of exercises to see if similar results could be reached. The previously mentioned studies by Groenendyk, Tremarche, and Chomitz all focused on activities done outside of the classroom and for more than fifteen minutes. Although all received positive results, it is not something that teachers could implement easily into their classrooms. More research should be done on how exercise or movement could be implemented into individual classrooms.

#### **6.3 Conclusion**

In conclusion, it would be advantageous of teachers and researchers alike to continue to study the effects of movement and exercise on student achievement. Through this study, it was shown that movement did positively affect students' behavior, emotions and academic growth. More methods should be discovered and adopted that would increase the use of movement

strategies in classrooms by individual teachers. It would be very interesting to conduct this study on much wider scales, perhaps incorporating a school, so that various grade levels could be studied and examined. The ideas are becoming increasingly clear on how movement does actually increase student achievement. Therefore it would be beneficial for teachers and schools to find more ways to implement movement based exercises into classrooms.

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## REFERENCES

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## APPENDICES

**APPENDIX A**  
**Student Survey**

**Circle when this survey was taken:            beginning            end**

Please answer the following questions on a scale of 1-5  
(1 being low and 5 being high)

1. How much do you enjoy school?

1      2      3      4      5

2. How often do you feel nervous in school?

1      2      3      4      5

3. Do you think you focus well during class?

1      2      3      4      5

4. Do you like to move?

1      2      3      4      5

5. Do you feel like you have to move around in class?

1      2      3      4      5

6. How often do you worry about things while at school?

1      2      3      4      5

7. Do you feel successful in reading?

1    2    3    4    5

8. Do you feel successful in mathematics?

1    2    3    4    5

9. Do you feel like you get into trouble a lot?

1    2    3    4    5

10. How often do you participate well in class?

1    2    3    4    5

**APPENDIX B**

**Teacher Reflection Log**

Date	Time/Duration	# of students	Ranking*

**\*Ranking\***

- Great-** all students participating and doing exercises correctly
- Good-** most students participating and doing exercises correctly
- Fair-** half of students are participating or doing exercises correctly
- Poor-** few students are participating or doing exercises correctly

APPENDIX C

Observation Sheet

Date: \_\_\_\_\_ Time: \_\_\_\_\_ Subject: \_\_\_\_\_

Time	# of students on task

Number of Interruptions or Behavior Issues	
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\_\_\_\_\_  
Signature of Observer