

TEACHER LED EXERCISE AND ITS EFFECT ON STUDENT ENGAGEMENT

by

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EXERCISE AFFECTING ENGAGEMENT

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CERTIFICATION OF PROJECT WORK

We, the undersigned, certify that this project entitled TEACHER LED EXERCISE AND ITS EFFECT ON STUDENT ENGAGEMENT, by Rhea T. Nelson, candidate for the Degree of Master of Science in Education, Curriculum and Instruction, is acceptable in form and content and demonstrates a satisfactory knowledge of the field covered by this project.

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Abstract

This study's aim was to identify whether or not teacher led exercise at the beginning of the school day had an effect on second grade students' ability to be engaged during morning math lessons. The participants were second grade students from a rural elementary school in western New York. The study was comprised of an ABAB design and data was collected using observations and checklists. Comparisons were made between student engagement on days following exercise to engagement on days with exercise. Results were investigated based on the entire group, student gender, student education classification, and both gender and educational classification together. Results indicated that within those groups, the exercise increased student ability to remain engaged and on task throughout math lessons.

EXERCISE AFFECTING ENGAGEMENT

Table of Contents

Introduction	1
Literature Review	4
Methodology	22
Findings	29
Discussion	34
References	41
Appendices	45

Introduction

Does participating in teacher led exercise at the beginning of the school day improve second grade students' ability to be actively engaged during morning math lessons? This is the question I have answered using an empirical study within my own classroom. The results provided positive feedback that will have a great effect on my teaching as my career progresses.

As an active person, I have noticed that after exercise I feel more refreshed and focused on any tasks that I am completing. I also notice, as a teacher, that students are very fidgety and off task throughout math lessons. I have researched the possibility that when students exercise, particularly second graders, their ability to stay on task throughout math lessons increases. In most instances, exercise had a positive effect on most students in this classroom. People of all ages exercise and many adults are seen exercising before they start their workday, for the simple reason that it makes them feel refreshed, relaxed and ready for the work place. The results of this study are important to me not only as a teacher looking for ways to enhance learning, but also as I try to instill lifelong learning strategies in my students.

The results of this study can assist the field of elementary education. Since the results show that exercise does effect student engagement in a positive way, it can influence elementary principals and central administrators to decide when throughout the day students should participate in physical education to help them learn better in the classroom. Teachers, in turn, can plan their lessons around any type of physical activity that the students have participated in, whether it is before or after the activity. With evidence that exercise does increase a students ability to be engaged, a teacher may plan

for students to have a time to exercise briefly before an assessment where the student may have to sit for a certain time period.

In a rural school district like the one where the research has taken place, many of the students spend a maximum of 50 minutes on the school bus before they arrive to school. All students in the district rely on the school bus as a primary means of transportation because there are no houses near the school. Students react to the bus ride in different ways. The students who participated in the study were excited on days they knew they were able to exercise after they got off the bus. The research did not identify any differences between the lengths of student commute. However, students were excited as soon as they got off the bus to participate in exercise on days they knew we would be conducting it.

I was especially interested in researching the relationship between physical activity and the ability to be actively engaged because of the rigorous curriculum we are now expecting students to complete effectively. With the addition of the Common Core Learning Standards, students are now facing a more rigorous curriculum that challenges every type of student. From experience, I can say that the math curriculum is taking two to three times longer to complete just one lesson than it was with the Everyday Math program. Almost three hours, with intermittent breaks, of the day is dedicated to completing one math lesson. With the common core standards, we are not only seeing the low-average student struggle and being challenged, but the high functioning students are also being challenged. With the math lessons taking up such a large chunk of the day, teachers are seeing kids become very fidgety and disengaged because they do not have the stamina to work for such long periods of time. After experiencing students'

engagement levels during Common Core math instruction time prior to the study, it is clear that students are able to be engaged longer when exercise had been completed that morning.

Lastly, the study provided varying results on the different types of learners in the class. This class is comprised of five special education students with Individualized Education Plans (IEP) and twelve students who receive general education instruction. Although there are twelve general education students, some of those students have classroom behavior issues that come in the form of anger and aggression. Exercise possibly helped students with these types of issues release stress or tension that is causing them to become so aggressive towards others in the classroom. The results give specific insight on students who are not participating in the general education setting and receive special services and accommodations.

In the media, it can be seen by society as a whole that childhood obesity is increasing at an alarming rate. The Centers for Disease Control and Prevention states that the percentage of children ages 6-11 who are obese has increased from seven percent to 18% from 1980 to 2012. Additionally, children and adolescents whose ages range from 12-19 had obesity levels of five percent in 1980, and by 2012 that statistic had risen to 21%. Teaching students exercise skills at an early age can be crucial to helping address the childhood obesity epidemic.

Results of this study can be useful in multiple ways. They can provide teaching professionals with a new approach to teaching rigorous and challenging lessons. Again, it can help central administrators when looking at student achievement and engagement in relation to physical activity. This study gives insight as to which types of students

exercise effects most. Although it may not appear this way, each classroom is very diverse with a range of students who have varying abilities. Lastly, it can improve and teach new learning strategies to students while increasing their physical and mental stamina. Chip Wood, the author of *Yardsticks*, makes an excellent point in his book as he refers to exercise, “Like food, all children need frequent exercise. Oxygen is food for the brain and nine year olds need it just as much as four year olds. Even a five or ten minute break to run around the school building or to jump rope in the side yard can make a huge difference in the way children feel and perform in the classroom” (p. 17). Although we know children need exercise, someone will not always encourage them to exercise on their own throughout their lives. As teachers we need to instill the idea of exercise in our students so it becomes a habit to them.

Literature Review

Theoretical Framework

The following literature review helps to inform the question of whether or not participating in teacher led exercise at the beginning of the school day will improve second graders ability to be actively engaged during morning math lessons. Furthermore, the research relates to the Self-Determination Theory in different ways. The literature that is studied, directly relates to student engagement, exercise, and second graders and the particular demands of the second grade math curriculum. The literature identifies when engagement is important, what engagement looks like and the ability students have to be engaged. Additionally, the literature describes appropriate exercises for students and the duration of those exercises. Lastly, the literature uncovers what second graders are

expected to learn when using the proper math standards and curriculum, and how they learn effectively.

This study follows the Self-Determination Theory (SDT), which explains a person's ability to become motivated. The Self-Determination Theory is described as a theory that defines intrinsic and varied extrinsic sources of motivation in cognitive and social development and individual differences (Self-Determination Theory, 2014). Within the SDT, there are also five mini-theories. The mini-theory that most closely relates to this topic is the Goal Contents Theory. This mini-theory focuses on intrinsic and extrinsic goals and their impact on motivation and wellness. Ryan and Deci (2000) define intrinsic motivation as doing something because it is inherently interesting or enjoyable, whereas extrinsic motivation is defined by the researchers as doing something because it leads to a separable outcome. The researchers also make the statement that,

“Because extrinsically motivated behaviors are not typically interesting, the primary reason people initially perform such actions is because the behaviors are prompted, modeled, or valued by significant others to whom they feel (or want to feel) attached or related” (p. 73).

This explanation directly relates to the fact that second graders are at an age where they are performing to make parents, teachers, friends, and other role models happy. Second graders value the relationships of others and want to keep the attachment between themselves and others.

Most often, second grade students view exercise as a source of intrinsic motivation. For example, most of the students enjoy going to gym class and exercising because the activity that they are taking part in is fun to them. As lifelong learners, I hope

to expand on that intrinsic motivation and keep exercising personally rewarding to each of the students. I would like for students to see how exercising can help them function in their daily lives in a more positive way. One concept I do not want students to get stuck on is finding exercise to be an extrinsic motivator, I do not want students to exercise to please others or at someone else's request. My hope was to find a relation between exercise and the ability for a student to engage in math lessons. I hope to educate students on how to motivate themselves to do well in school by showing them how well they were able to work after exercise had been completed.

A 2011 study by Gillet, Vellerand, and Lafreniere used students aged 9-12 years to identify intrinsic and extrinsic motivators. The youngest students in this study were about six months to 18 months older than the student participants in my current study. Since this age gap is not significant, I believe intrinsic and extrinsic motivators can still be found and used with second grade students. In six months, the current student participants will be the same age as the youngest students in the 2011 study. The age gap is not considered to be significant because some of the students in the study are as little as six months older than the current students in this study. Six months from now, the students in this study will still be in second grade and in the same classroom so they should produce similar results. Additionally, the results of this study showed “a systematic decrease in intrinsic motivation and self-determined extrinsic motivation from age 9-12 years, a slow stabilization until 15 years old, followed by an increase after that point” (p. 77).

Although the results show conflicting results in comparison to my study, students in my class showed substantial motivation to want to exercise. When students were

unable to participate in the exercise routine for various reasons, students showed that they were disappointed. As students continue to exercise and understand the benefits it is causing, the exercise should become more of an intrinsic motivator rather than an extrinsic motivator. As students grow and understand its benefits, they will not be exercising because they are asked to do so by a teacher, but because they find it enjoyable, challenging, and personally rewarding, and a means of focusing their attention. As students become adjusted to the idea of exercise, teachers can begin to wonder if there is any correlation between the exercise and student engagement.

Student Engagement

Why is student engagement important?

Student engagement is a term that identifies an individual's ability to participate enthusiastically during given tasks, as described by Reeve, Jane, Carrell, Jeon and Barch (2004). In an elementary classroom, this means that students are able to participate and attend to lessons and complete given tasks effectively with enthusiasm. Wellborn (as cited in Appleton, Christenson, Kim & Reschly, 2006) conveys that engagement is important because it directly relates to a behavior pathway, which leads students to be in charge of their education.

There are three different types of engagement that can be found in a classroom. Appleton et al (2006) describe engagement as academic, behavioral, cognitive and psychological. Academic engagement would be described as time on task, and effectiveness of completing assignments. Behavioral engagement could be found by looking at attendance, suspensions and volunteering within the classroom. Cognitive and psychological engagement tend to be more internalized behaviors, such as having

personal goals, applying education to real life interactions, having a feeling of belonging and having relationships with peers and teachers. For the purpose of this study, academic and behavioral engagement will be described heavily. There is a possibility that there is a connection between exercise and physical activity that will directly relate to student engagement.

Exercise/Physical activity

Appropriate student exercises and activities

The National Institute for Health, which is a division of the United States Department of Health and Human Services (2014), defines physical activity as any body movement that works your muscles and requires more energy than resting. Examples of this are walking, jogging, swimming or any physical labor.

The New York State Education Department (2010a) has standards that students in elementary school must meet in order to be proficient in physical education. These standards include personal health and fitness, safe and healthy environments, and resource management. The first standard would apply when discussing what types of activities and exercises would be appropriate for students of elementary age. The Personal Health and Fitness Standard requires that students of elementary age demonstrate numerous skills. This standard requires full participation in teacher led activities such as games, sports and exercises. These activities provide conditioning in each fitness area. Students should also have developed a mastery of fundamental expectations in fundamental, motor, non-locomotor, and manipulative skills. Fundamental skills in physical education refer to the ability to be able to do basic movements such as throwing, running, jumping, hopping or catching. Having motor

skills is when a person is able to use and control their limbs in order to complete fundamental skills. When students complete activities where they stay in place it is referred to as non-locomotor skills. For example, when students do arm circles they are staying in place with their feet planted but are expected to be able to move both arms in uniform circles. Lastly, manipulative skills address how well a student is able to work or operate using their hands. This skill may also be referred to as fine motor skills. A student may need strong gross motor abilities in physical education in order to succeed. These skills include twisting, bending, swaying, stretching, or turning. It is important that students understand the effect that exercise will have on the body and the health related fitness groups which include cardiovascular, muscle strength, muscle endurance, flexibility, and body composition (New York State Education Dept, 2010a). From the explanation of the standard, it seems important to create activities that are teacher led and that are explained so that students understand their health benefits.

Duration of student exercises

The American Alliance for Health, Physical Education, Recreation and Dance (2014) has released state profiles, which identify the amount of physical education that is mandated for students in kindergarten through sixth grade in each state. The physical education profile pertaining to New York State states that, “New York mandates at least 120 minutes of physical education per week in grades K-6, but does not require daily recess. Students in grade K-3 must have daily physical education, and students in grades 4-6 must have physical education at least three times per week” (National Heart Lung and Blood Institute, 2014). Additionally, The National Association for Sport and Physical Education (NASPE) recommends on their website that school aged children accumulate

at least sixty minutes of physical activity everyday (NASPE, 2014). Most often, in New York, students in kindergarten through third grade are receiving thirty minutes of physical education at school everyday. For these students to meet the NASPE's requirement of sixty minutes, they are responsible for participating in thirty minutes of physical activity on their own each day. It is understandable that officials see that it is important for students to exercise on their own daily, however, is it justifiable to ask a second grader to come up with exercises to do on their own? Additionally, it is normal for a second grade student to participate in outdoor play, however many students do not receive time to play outdoors due to living situations.

Connection between exercise and student achievement

A study by Tatsuo & Haruo (2013) was conducted in Japan to try and identify whether a coordination program performed one to three times a week for 26 days would improve seven and eight year old students' agility. The physically appropriate exercises the researchers chose to use were all cardiovascular exercises, which involved hopping in a predetermined direction while also following directions from the instructor. The results showed that this exercise program did help to improve student agility. Additionally, the researchers stated that it is essential to provide a fun, easy and accessible program to the students. If the students have interest in the program it is more likely to fuel positive results. In order to create an accessible program, there must be an understanding of how long the exercises must be in order to be effective.

Dwyer, Sallis, Blizzard, Lazarus, and Dean (2001) explored the relation of academic performance to physical activity and fitness in children. This study had a rather large sample of 7,961 children with ages ranging from seven to fifteen years. The

students' physical ratings were compared to their scholastic ability. The students completed a battery of physical tasks including a distance run, sit-ups, push-ups, a 50-meter spring and a standing long jump. After comparing data, the researchers found that the results were consistent with their hypothesis of exercise and physical activity having a positive effect on student academic performance. The results demonstrated that students with a better ability to complete physical activities were also the students who had higher functioning academic achievement. The researchers did state that all the correlations were low, but that large correlations were not to be expected. The low, but positive, correlations in the reviewed studies are extremely similar to the results of this current study.

Elleberg and St-Louis-Deschenes explored the effect of acute physical exercise on cognitive function during development in 2009. The researchers used 72 boys, half of them were seven years old and the other half ten years old. The subjects were split into two groups. The control group watched television for thirty minutes while the experimental group completed thirty minutes of aerobic exercise. After the thirty minutes, both groups completed a choice response time task, which Elleberg et al. described as, "...a cognitive task involving decision making processes that tap certain aspects of executive functions...(p. 123)." The results indicated that the children in the experimental group (exercise group) were able to answer questions on the choice response time task at a much faster rate than the students in the control group. This empirical study confirmed its hypothesis that exercise and physical activity has a positive effect on cognitive functioning with students of ages seven and ten.

Another group of researchers investigated the effect of acute treadmill walking on cognitive control and academic achievement in preadolescent children. Hillman et al. (2009) assessed exercise-induced changes in performance using treadmill walking and the Wide Range Achievement Test 3 (WRAT3). The study used twenty children as the participants. The data was collected from the children across two days. The children were put into two groups. On the first day half of the students participated in a resting session, while the other half of the students participated in aerobic exercise by walking on a treadmill for twenty minutes at 60% of their maximum heart rate. On day two, the groups participated in the opposite activity as day one. After students had completed the resting session and treadmill walking session they completed the WRAT3. The students completed the WRAT3 both days, after either of their activities. The data provided information showing that children performed significantly better in the area of reading comprehension following the treadmill walking activity. Additionally, the researchers explain that no significant effect was identified for spelling or mathematics. Hillman et al. wrap up their findings by stating,

Collectively, these findings indicate that single, acute bouts of moderately-intense aerobic exercise (i.e. walking) may improve the cognition control of attention in preadolescent children, and further support the use of moderate acute exercise as a contributing factor for increasing attention and academic performance (p. 1044).

An empirical study by Everheart, Dimon, Stone, Desmond and Casilio (2012) identified that student performance increased on days when students were involved in a physical activity following along with an exercise program on a DVD. The DVD was played for students, and they were responsible for mimicking the movements that they

saw the instructor doing on the video. The students in this study reportedly enjoyed these types of physical activities. The researchers indicated that they firmly believe that there is a positive link between physical activity in a school setting and the students improved academic performance. The results indicated that the intermediate elementary students showed an improvement in academics after they had participated in the physical activity. The primary elementary students who participated showed inconsistent results. Additionally, the teachers of both groups of students noted that all students appeared to be more focused and on task after the physical activity. The study seemingly supported the hypothesis of physical activity having a positive effect on student achievement at the elementary level.

In a similar study, Chomitz et al. (2009) attempted to find out whether or not a relationship exists between physical fitness and academic achievement. The age range of participants in this study was from Kindergarten students to eighth grade students. Standardized test scores were collected for each student. To implement the physical fitness aspect, the students each completed a fitness achievement test and researchers looked at the physical activity habits of each student. A calculation was made to determine whether or not the amount of physical activity in a student's life correlated with greater academic achievement as compared to those students with less physical activity. The researchers found a positive correlation between physical activity and student achievement in those grade levels.

In contrast, a 2007 study by Martin and Chalmers found there to be little correlation between exercise during the school day and students academic achievement. This Seattle based study used students in grades three, five, six and eight. The baseline

score was taken from the Iowa Test of Basic Skills. Additionally, these students completed the President's Challenge as a means of physical fitness. When the data was examined, researchers identified that only 3.6% of the variance could be explained by the physical fitness program that the students completed. This study differs in that the research indicated that student achievement was not improved by physical fitness.

A study by Tomporowski, Davis, Miller and Naglieri (2007) researched exercise and its relation to children's intelligence, cognition and academic achievement. These researchers conducted a meta-analysis of the findings of many other researchers whom identified the relationship of exercise to these aspects of school performance. Overall, the researchers identified that the physical activity interventions that are used with students differ remarkably. It is explained that many different types of activities are used based on the outcome the researcher is looking for. The types of exercises that seem to be most popular are balance and coordination training, perceptual-motor training, strength training activities and cardiovascular activities. After describing the exercises, it was found that the vigorous exercise demonstrated gains in cognitive functioning.

The same group of researchers looked at exercise and its ability to help students with intellectual disabilities to increase achievement. When all of the studies were compared, the results varied considerably. Tomporowski et al. recorded that there seems to be no clear data that explains whether or not exercise impacts students with intellectual disabilities.

To add to Tomporowski et al., in 2008 a commentary was made which reviewed the relationship between physical exercise and cognitive function in students with disabilities (Ploughman, 2008). Ploughman reported that in a 37 studies exercise had a

positive effect on cognitive development, however the ratio of students with special needs to students in the general curriculum were not stated. It was also stated that smaller gains in fitness produce larger cognitive gains, which suggests that in order for cognitive functioning to increase, students do not need to participate in overly rigorous exercises and that moderate exercises will still have a large effect on cognition. In the researchers clinical considerations it was noted that for students with disabilities it is a struggle to find ways to increase their physical activity in addition to their motivation and self-discipline to do so. The fact that students are lacking motivation and self-discipline to exercise directly relates to the Self-Determination theory and why students need to be taught at a young age the importance of exercise.

A group of researchers in 2006, wanted to address the relationship between high impact running and improved learning in 30 male subjects. The males in this study were between the ages of 19 and 27, and all of them were students. Although the ages vary drastically from the students in the current study, it still gives insight as to how running affects the overall learning process. Winter et al. (2006) assessed these students with a vocabulary probe prior to and after the intervention. In addition, they also tested neurotrophic factors. When students were tested after the intervention, Winter et al. found that the ability for the subjects to learn vocabulary was twenty times faster than it had been originally, before the running intervention had been put in place. The subjects also found success in being able to retain information for longer periods of time after teaching had been done with the intervention in place (Winter et al., 2006). This study perpetuates the reason the current study is in place, as the researcher will be collecting data both with and without the intervention in place.

There is ample literature that addresses how different types of exercise affect students' achievement and their ability to learn. However, this study addressed students' ability to remain engaged. There is little to no research that addresses the specificity of engagement and its relation to exercise. This study directly addresses the ability of students to remain engaged throughout math lessons after exercise has been implemented. More specifically, it identifies the ability of second grade students to remain engaged given their learning abilities, expected state standards, and the math curriculum that is being used.

Second Graders

How do they learn?

Research shows that second graders learn in a multitude of ways. Second graders range from seven to eight years old, depending on school entrance age and birthdays. At this stage, second graders are between the Pre-Operational Thought Stage and the Concrete Operations Stage according to Piaget (as cited in Sandwell, 1995). Piaget identified students in the pre-operational stage as very self-orientated in that they only use representation skills to view the world around them from their own perspective. The pre-operational stage ends between six and seven years old, so some second grade students may already be within the concrete operations stage. During this stage Piaget found that students are able to understand concepts from another individual's point of view. This stage is also when Piaget describes that students are able to appropriately demonstrate concrete operations, however abstract operations are still extremely difficult. The ability to think abstractly does not develop until a child reaches the age of 11 or 12 (Sandwell, 1995).

Chip Wood identifies many unique characteristics of second grade students in his book, *Yardsticks*. There are many things that second graders prefer or need when trying to learn. Wood identifies that second graders rely on their daily classroom routine as well as a need for reminders when a transition is about to occur. Additionally, second graders are still at an age where they like to discover new things on their own during centers or project based activities. In his book Wood (1997) makes the statement that, “Seven is an age where children are driven by curiosity and a strong internal desire to discover and invent. As they consolidate logical thinking, they begin to organize their internal mental structures in new ways” (p. 72). In second grade, most students are seven years old, which makes Wood’s statement apply directly to the students of this study. At this age students also have specific social tendencies such as: experiences a rapid change in feelings, needs constant reinforcement, thrives on security and structure and constantly needs to rely on the teacher for help. These characteristics must be kept in mind, as they pertain directly to the participants of the study. The design of this study was carefully planned around the needs and characteristics of all of the students in the classroom.

In the past five years, second grade teachers have seen a multitude of changes in the curriculum with the adoption of the new Common Core math standards. Along with the standards brought a new, and more rigorous curriculum developed by the New York State Education Department.

New York State Common Core Math standards

New York State requires second grade students to be successful and competent in four main areas of math, which include operations and algebraic thinking, number and

operations in base ten, measurement and data, and geometry. Within each of those topics are subtopics, which break the standards down even further.

Within the Operations and Algebraic Thinking (2.O.A) standard, there are three sub-standards. The first is representing and solving problems involving addition and subtraction. This sub-standard focuses on second grade students being able to represent addition and subtraction problems in different ways rather than the standard algorithm. This involves using word problems and identifying proper math vocabulary within word problems. Within this sub-standard, students begin to compare two types of equations to one another. For example a student may see the following problem $56-10 = 55+11$. The student would have to choose whether or not that statement is true or false and show work to support their answer. The next sub-standard requires students to add and subtract fluently within 20 by using mental strategies. It is the goal that by the end of second grade that these addition and subtraction facts should be memorized. The final sub-standard for Operations and Algebraic Thinking is that students should be able to work with equal groups of objects to gain early foundations for multiplication. This involves skip counting by a given number, recognizing whether a number is odd or even, and using addition to find a total number of objects that are given in array form (NYSED, 2014a).

The second standard is Number and Operations in Base Ten (2.N.O) and this standard has two sub-standards. The first sub-standard is understanding place value. New York State expects second graders to be able to understand the concept of place value through one thousand, including ones, tens, hundreds and thousands. The students are also required to know the value of the number in each place. For example, if a given

number is 753, the student must understand that the seven is worth seven hundreds, the five is worth five tens and the three is worth three ones. This leads to the expectancy of understanding all different ways numbers can be shown in different forms. The forms second graders are expected to know are standard form, unit form, expanded form and word form. An example of this would be seeing the number 455 and stating that in unit form it would be read as four hundreds, five tens, five ones, that in expanded form it would look like $400+50+5$, and that in word form it would be read four hundred fifty five. Students are expected to know how to skip count by fives, tens and hundreds. Lastly, for this sub-standard students must understand how to compare two given numbers using greater than, less than or equal to signs. The second sub-standard of Number Operations in Base Ten is using place value understanding and properties of operations to add and subtract. This ensures that students are fluently able to add and subtract with numbers up to 100. This sub-standard also requires that students can show concrete operating skills to compute addition and subtraction problems to 1,000. In addition to these, students must also be able to explain in writing why different addition and subtraction strategies are able to work (NYSED, 2014a).

The next New York State Math Standard for second graders is Measurement and Data (2.MD). This standard is comprised of four sub-standards. The first sub-standard states that students should be able to measure and estimate lengths in standard units. This involves measuring actual objects with a ruler, yardstick, meter stick, and measuring tape. When measuring, students can estimate using centimeters, inches, feet or meters. Students must also be able to compare types of measurement and actual measurements taken. The second sub-standard mandates that students can relate addition and subtraction

to length. For example, when adding students could show how their addition was done by drawing measuring tapes. The third sub-standard explains how students should be able to effectively work with time and money. Second grade students should be able to tell time to the nearest five minutes using an analog clock, and using a.m. and p.m. designations. It also explains how students should be able to solve word problems dealing with money. These word problems should include all coins, dollar bills and the symbols for both dollars and cents. The last sub-standard of Measurement and Data is being able to represent and interpret data. This requires students to draw different types of graphs to represent sets of data and compare data based on the graphs that have been created. This sub-standard also asks for students to generate measurement data by measuring lengths of several objects and showing their measurements by making a line plot (NYSED, 2014a).

The last standard is Geometry (2.G), and this standard only has one sub-standard. The sub-standard explains how students should be able to reason with shapes and their attributes. This means that students should be able to recognize and draw shapes with specific guidelines. The other major aspect of this sub-standard is that students should have the necessary foundations to understand and visualize vocabulary such as halves, thirds, fourths, and equal parts among geometric shapes. All of the described standards are addressed within the curriculum that will be used in the proposed study. The curriculum has moved from a time when many students could ease through assignments and tasks to a time where it seems to be challenging every type of learner. The standards are also now addressed by a new curriculum that many schools are adopting, the EngageNY Core Math Modules.

Math curriculum

For the study, the group of students who participated used a specific curriculum that directly aligns with all New York State Mathematics Standards for second graders. This curriculum is published by EngageNY and has been adopted by the participating school district. It is most commonly referred to as the New York State Common Core Math Curriculum. The second grade curriculum is comprised of eight modules. They are as follows: Module 1 Sums and Differences to 20; Module 2 Addition and Subtraction of Length Units; Module 3 Place Value, Counting and Comparison of numbers to 1,000; Module 4 Addition and Subtraction to 200 with Word Problems to 100; Module 5 Addition and Subtraction within 1,000 with Word Problems to 100; Module 6 Foundations of Multiplication and Division; Module 7 Problem Solving with Length, Money and Data; Module 8 Time, Shapes, and Fractions as Equal Parts of Shapes (NYSED, 2014a).

As one can see, the modules that will be covered as part of the second grade curriculum directly correlate with the New York State Mathematics Standards for second graders that have previously been described. When the study began, students were in the middle of Module 2, and by the time the study finished the students were in Module 3. Currently, this is the first complete school year where all of the modules have been available for implementation. During the 2012-2013 school year, the only available module was Module 3. Students who enter second grade during the 2014-2015 school year should have a better foundational understanding of what is being covered in the modules.

The described literature has provided a base for research to be done, as none of the research completely answers the research question of whether or not teacher led

exercise at the beginning of the day affects second grade students' ability to be engaged during morning math lessons.

Methodology

Does participating in teacher led exercise at the beginning of the school day improve second grade students' ability to be actively engaged during morning math lessons? This question was answered by following a series of detailed and sequenced steps within an educational setting.

Setting

The study took place at a rural elementary school in Western New York within a second grade classroom. This elementary school houses students in grades pre-kindergarten through fifth grade. During the study school year (2014-2015), the enrollment was approximately 430 students. The population of students is ethnically homogeneous with a dominant white population. There are currently three sections at each grade level. Grades two through five have two general education classrooms and one integrated co-taught classroom. The integrated co-taught classroom has a general education teacher and a special education teacher. There is also a classroom aide present. An integrated co-taught classroom is defined by the Department of Education in New York City as

a classroom containing students both with and without disabilities having two teachers, a general education teacher and a special education teacher. The teachers' work together throughout the day to adapt and modify instruction for your child and make sure the entire class has access to the general education

curriculum. Students may be in an ICT classroom all day or for a portion of the day (New York City Dept. of Education, 2014).

In this school there is one self-contained classroom, which contains only students with disabilities in grades Kindergarten and first grade. The average class size in this school is approximately 20 students. During the 2011-2012 school year, the NYS school report card identified this school as having 42% of students eligible to receive free lunch.

Additionally, ten percent of students were eligible for reduced lunch prices. This means that over 50% of the students are from a low socio-economic status (SES) level.

This particular school is set in a rural area with very few houses surrounding the school itself. All students are required to ride a bus to school. The bus rides can range from ten to fifty minutes for students. The time spent on the bus may have a direct influence on how well students are able to perform academic tasks in the morning. This fact, along with the even split of low SES to average SES students is why this school was chosen for participation in the proposed study which took place in September and October of 2014.

Participants

The participants of the study are in the second grade ranging in age from seven to eight years old. Three students are eight years old and will be nine during the academic year, due to retention in previous grade levels. There are eleven girls and six boys participating in the study with a total of 17 students. Within the participant pool, there is a set of identical female twins. Additionally, there is another pair of siblings who are a year apart but ended up in the same class due to retention and student classification. About 70% of students in this class come from a home of low SES status. This statistic is based

on the percentage of students who are eligible to receive lunch at a free or reduced price. This statistic comes from information provided from the families based on income levels.

The participating classroom is an integrated co-taught classroom. This means that special education students and general education students are participating in the same classroom. This type of classroom has one general education teacher, a special education teacher and a classroom aide. The special education teacher works to implement the Individualized Education Program (IEP) for special education students. This special education program creates goals for students to reach during a specific amount of time. There are thirteen disabilities, which students must fall under in order to receive an IEP. These disabilities include having autism, having a learning disability, having an intellectual disability (previously known as mental retardation), having a visual impairment, having a hearing impairment, having a traumatic brain injury, being emotionally disturbed, having multiple disabilities, having a speech or language impairment, having another health impairment, having an orthopedic impairment, having a developmental delay, or being blind or deaf. Students with 504 plans are also included in this classroom. A 504 plan creates accommodations for students within certain aspects of the curriculum. For example, a student with a 504 plan may be able to receive extra time when completing assignments or tests. A 504 plan does not alter the type of curriculum that the students are required to learn. A student with a 504 plan is considered to be a general education student. For a child to be eligible for a 504 plan, a teacher or parent must identify a specific need that is not being addressed for the child, yet is not cognitively significant enough to warrant eligibility for an IEP. Section 504 of

IDEA (Individuals with Disabilities Education Act) is a federal law that requires accommodations be made for students with a particular educational need.

In this study, the class had five students with IEP's receiving special education, and three students with 504 plans who are a part of the general curriculum. A table was used to track student demographics and the number of students receiving different types of supports within the curriculum. The table will include a de-identified student identification number, any medical issues the student may have, weight, educational classification, physical education status, and gender (See appendix, Table 1).

Design

This study used a quantitative ABAB design. For the baseline data, which was the first five days of data collection, students were observed in the morning during math instruction. Students are participating in the EngageNY core modules. To observe the students, a seating chart time-lapse observation sheet was used (See appendix, Table 2.) This chart identified how many times throughout a lesson a student is engaged in the given tasks. On days when baseline data was collected, after students arrived they did not participate in any rigorous activities. They were responsible for completing their lunch count, placing their belongings in appropriate places, and getting their homework and agenda checked. When these transitional activities had been completed, they had the option to practice spelling words, review math facts, or use educational applications on the classroom iPads. Data was not collected during preliminary morning activities. For the next five days of data collection, students were again observed during morning math instruction using the same chart. However, this is when the exercise interventions began. When students arrived in the morning, they completed morning routines such as

organizing their belongings, handing in homework and completing their lunch count. When all students had arrived, the teacher took the students outside (weather permitting) for 15 minutes of teacher led physical activities. If the weather was inclement, the exercise activities were conducted in the gymnasium. The researcher kept track of all exercises and stretches with an exercise log for each day of intervention data collection (See appendix, Table 3).

For the first minutes of the teacher led exercise, students participated in a brief stretching routine. Stretches varied day to day so students did not become uninterested in the activities. Stretches targeted the muscle groups students would be using during the exercise session to prevent injury. For the next eight minutes, students participated in cardiovascular exercise. This varied from session to session. The types of cardiovascular exercise included: jogging, jumping jacks, jumping joshes (crossing arms and running in place), burpies (jumping in air and landing to do a push up), running backwards, and jogging in place with high knees. The teacher broke the eight-minute cardio session by doing different types of activities within the allotted eight minutes. This portion of the teacher led exercise was the most important as it increased students' heart rates and had the biggest impact on their energy levels. As students finished the cardiovascular portion, the teacher moved on to strength and resistance exercises. This portion of the session took about four minutes. The teacher lead students in exercises that strengthened large muscles groups such as the quadriceps, biceps, triceps and core muscles. These types of exercises included push-ups, sit-ups, planks, lunges, and squats. Again, these exercises varied from session to session to keep student interest. For the strength and resistance portion students completed three sets of the same exercise with 20 repetitions, in between

each set students received a 45 second rest period. The remaining three minutes of the session were dedicated to dynamic stretching which is stretching the targeted muscles with movement. Examples of this are walking quadriceps, arm circles, alternating hamstring stretch, and arm swings.

After five days of baseline data and five days of intervention data had been collected, the researcher repeated the process with an additional two sets of five days of non-intervention data collection and two sets of five days of intervention data to ensure reliable results. The entire study lasted six weeks, three weeks with the exercise intervention and two weeks with no intervention.

Data Collection

For baseline, intervention, and non-intervention data collection, the researcher used both observations and checklists for all students in the classroom. Students were observed for the type of behavior that they were exhibiting during the math lessons, particularly their level of engagement. The researcher observed how many of the students were actively engaged throughout the lesson by using the seating chart time-lapse observation (See appendix, Table 2). The observation sheet allowed the researcher to record times and how many students were engaged and how many were unengaged. The researcher aimed to gather data from at least 20 times throughout the lesson. Engaged behavior included being on task, which looked like following along with the teachers examples, participating in discussion when questions were asked, self-advocating by asking for help when needed, and following classroom instructions. Students who were not engaged exhibited off task behaviors such as talking out during the lesson, not

following directions, having outside conversation unrelated to the curriculum, or not following general classroom rules.

Data Analysis

When analyzing the data, many comparisons were made between the student results. After data collection, the researcher was able to make comparisons of student engagement based on gender. The researcher was able to see if exercise impacted girls or boys more and how it affected their ability to be engaged in math lessons. Typically, boys seem to have a higher overall energy level, so looking at how exercise impacts their engagement levels gave teachers ideas as to how to address specific genders when teaching a rigorous curriculum.

The researcher also looked at the data and compared how well students with disabilities were able to be engaged compared to those students participating in the general education curriculum. Lastly, the most important and obvious comparison was looking at the ABAB design and comparing the baseline data, intervention data, and non-intervention data. It was important to see what type of change there was when comparing the intervention and non-intervention side by side. The researcher aimed to see if there was a negative or positive change between the intervention and non-intervention data, and if exercise had any impact on engagement levels of students during math lessons. Based on the seating chart time-lapse observation sheet, the researcher calculated the percentage of times on task for each student each day.

Findings

The results of this study provide positive indications that the exercise did increase the amount of engagement for the students who participated. The purpose of the study was to identify whether or not teacher led exercise at the beginning of the school day had an effect on second grade students ability to be engaged during morning math lessons. The data was disaggregated, and all groupings with the exception of one identified that the morning exercise routines helped most students' ability to remain engaged throughout math lessons.

Whole Group Results

Before disaggregating the data into diverse groups, there is a general consistency when looking at the results from the entire group of participants. By using the data collected, many determinations can be made when comparing the percentage of engagement from intervention days to days when the intervention was not used. Out of the seventeen students who participated in the study, thirteen of the students showed an increase in their ability to remain engaged throughout second grade math lessons on days in which they participated in teacher led exercise prior to math instruction. As an entire group, the class showed an overall engagement increase of 3.2% Additionally, three students had no increase or decrease and remained constant with their original percentage of engagement. These three students recorded rather high percentages (88%-95%) during the initial week of data collection when no intervention was implemented, and consequently, had little room for improvement. These students (Student 14, Student 16, Student 17 – see Table 4) all had initial non-intervention averages between 88% and 94% Of all students, only one showed a decrease in the amount of time that was spent engaged

during the lessons. This particular student (Student 7, see Table 4) started to show indicators of extreme negative behaviors in the classroom, which affected his percentage of engagement drastically. Overall, the exercise intervention seemed to have a positive impact on students' ability to remain engaged and on task throughout the math modules provided by EngageNY.

Table 4**Student Averages by Week**

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Student 1	93%	94%	97%	100%	93%	97%
Student 2	90%	95%	95%	100%	94%	98%
Student 3	70%	87%	92%	94%	89%	95%
<u>Student 4</u>	<u>70%</u>	<u>78%</u>	<u>84%</u>	<u>91%</u>	<u>83%</u>	<u>88%</u>
<u>Student 5</u>	<u>85%</u>	<u>84%</u>	<u>95%</u>	<u>93%</u>	<u>91%</u>	<u>93%</u>
<u>Student 6</u>	<u>72%</u>	<u>80%</u>	<u>88%</u>	<u>88%</u>	<u>81%</u>	<u>85%</u>
<u>Student 7</u>	<u>73%</u>	<u>82%</u>	<u>74%</u>	<u>76%</u>	<u>51%</u>	<u>55%</u>
Student 8	77%	94%	97%	96%	91%	93%
Student 9	87%	91%	96%	96%	95%	97%
Student 10	77%	91%	98%	98%	94%	98%
<u>Student 11</u>	<u>28%</u>	<u>50%</u>	<u>63%</u>	<u>71%</u>	<u>50%</u>	<u>68%</u>
Student 12	64%	79%	96%	96%	93%	88%
Student 13	73%	80%	89%	91%	83%	83%
Student 14	93%	92%	99%	99%	96%	97%
Student 15	94%	93%	97%	98%	94%	97%
Student 16	93%	94%	99%	95%	90%	93%
Student 17	88%	86%	92%	91%	88%	90%
Weekly Class Avg.	78%	85%	91%	92%	87%	89%

*Bold indicated weeks when intervention was used

*Underline indicates students with disabilities

Gender Results

By disaggregating the data based on gender, the goal was to identify if the exercise intervention affected males and females differently. The group of female participants was able to remain engaged throughout the math lessons for an average 85%

of the time when no intervention was in place. When the intervention was implemented the females were able to be engaged for 89% of the time, which is a four percent increase when comparing non-intervention weeks to intervention weeks.

The male participants began the study by being able to remain engaged during the math lessons 84% of the time when no exercise intervention was being used. As the exercises were introduced to the students and used as an intervention, the male students increased their time spent engaged to 85%. The males displayed a 1% increase when the intervention was in place.

When comparing females to males, the data shows females increasing engagement by 4%, while males only increased by 1%. However, many factors can contribute to the larger increase by females than males with a major factor being the ratio of females to males in the participant pool. The results were taken from a class with eleven girls and six boys. Therefore, the percent averages taken from the boys carry a larger weight when taking the average for the entire gender.

Educational Classification Results

In addition to gender, another important disaggregation of data is the students' educational classification. This is important because the participating classroom is an integrated co-teach setting which contains both general education and special education students. The general education students showed during non-intervention data collection that they were able to remain engaged in math lessons for 90% of the time. As the intervention was put in place the group of general education students then showed an increase of being engaged for 93% of the time.

The data revealed that the students who are classified as being special education students were able to be engaged throughout 72% of the time during math lessons without the exercise intervention. After the intervention was introduced and in place, these students also showed growth and were able to engaged for 75% of the time.

Overall, the data indicates a 3% increase for both general education students, as well as students with disabilities. With this specific population, the data reveals that there was no significant difference in growth that would identify whether or not the exercise intervention affects general education students or special education students more. However, after the intervention was in place the difference between the two groups and their abilities still differed by 18%, which indicates students of the general education classification are more likely to stay engaged throughout math lessons.

Gender and Educational Classification Results

The most specific and in depth disaggregation was when the results were inspected based on both gender and educational classification together. This disaggregation created four distinct groupings, which were identified as follows: female general education, male general education, female special education, and male special education. The purpose of disaggregating based on these groups was to identify if the exercise affects males and females of different educational classifications differently. Since there was no significant difference in the increase of engagement when comparing general education students to special education students, this disaggregation is the next appropriate step in breaking down the data.

The first group of female general education showed the ability to remain on task and engaged during math lessons 91% of the time, and after the intervention had been

introduced the percentage increase to 95%. This group of students showed an overall increase of 4%. Additionally, the male general education population started the study by staying engaged for 88% of the time. After the introduction of the intervention this group of students increased their time spent engaged to 91%. This group of students was able to show an engagement increase of 3%. When comparing the general education populations, the percent increases are rather similar, and only differ by 1%. The exercise intervention seems to have a very similar effect on general education males and females.

Females with a special education classification started the study with the ability to be engaged 69% of the time during teacher directed math lessons. Once the intervention was in place, this population of students showed a rather large increase of engagement to an average of 87%. Out of all of the permutations of disaggregation in this study, this group shows the largest increase with a total increase of 18%. Males who have a special education classification showed an average of 77% of the time was spent engaged during math lessons. When the intervention was in place, this group of students showed an average time of engagement at 72%. This is the only grouping out of all the disaggregations, which displayed a decrease in the amount of time spent, engaged during math lessons. The decrease was directly related to one student's behavioral problems within the classroom.

The general education groupings showed rather consistent results, while the special education groups were quite varied. The special education groupings showed the females had the largest increase after the intervention and the male special education group showed the only decrease in the entire study. There are special considerations for the male special education group, as only two students are in that group and the

behavioral actions of a single student (Student 11 – see Table 4) had a major affect on the overall averages. This final disaggregation gives insight as to which types of students the exercises affected the most, and on which students it had the adverse effect. Out of all groups in this dissection of data, the special education groups provide the most insight on the effect exercise has on a student's ability to remain engaged throughout Common Core mathematics lessons created by EngageNY.

Discussion

As explained in the results, most students and groups showed an increase in their ability to be engaged during morning math lessons following participation in teacher led exercise. However, the results showed a single student and a single grouping whose percent of time spent engaged decreased. Student 11 showed a 12% decrease in engagement. This is due to extreme behaviors that started occurring in the classroom between weeks four and five of the study. This particular student showed the ability to be engaged during the math lessons, but his socio-emotional state impaired him from doing so. This child is currently being monitored by psychiatrists and behavioral specialists to identify antecedents to the behavior. Student 11 was also a part of the male special education group, which also saw a decrease in engagement. Since the male special education group only had a population of two students, Student 11 had a rather large negative impact on the outcome of that group. The only other male in the group with a special education classification showed a 2% increase. If the results were taken from only one week of intervention and non-intervention before this student's drastic behaviors started to occur, all students and groups would have shown an increase of engagement.

It was also noted in the results that the female special education group made a drastic gain of 18%. This is largely due to Student 15's 16% increase of engagement. This particular student has a diagnosis of Autism Spectrum Disorder (ASD), and more specifically Pervasive Developmental Disorder – Not Otherwise Specified (PDD-NOS). This student lacks the ability to make eye contact when spoken to as well as has significant attention deficits. She is only able to hold eye contact for an average of four seconds when prompted. When attempting to understand the gains she has made, it is hard to determine if it is solely due to the intervention that was being used. This is because of the fact that she is receiving numerous accommodations, modifications and supports in the classroom. Some of them include a 1:3 aide who is with her all day and gives her up to three visual or verbal cues a minute to stay on task, a behavioral specialist who monitors progress three days a week, and a specially designed behavior modification program created to help her increase her attention skills. If Student 15 were not calculated in the female special education average, this group would have shown a 5.5% increase rather than an 18% increase. Although Student 15 made an increase, it is hard to determine which support helped increase her time spent engaged the most.

When looking at average percentages for each student as the study progressed, the student percentages did not spike between non-intervention and intervention weeks. The percentages showed steady increases even during weeks when the intervention was withdrawn. After students had been introduced to the exercise intervention and showed the ability to increase their time spent engaged during math lessons, it seems that the engaged behavior did not disappear when the intervention was withdrawn. It appears as if the engaged behavior became a learned behavior for the students when math lessons

began each day. Students may have begun to understand what attentive and engaged learning looks like and carried it throughout other lessons. Additionally, the study was started during the third week of school, and as the weeks went on students could also have been getting more and more familiar with expected classroom routines. Students were praised for being engaged during lessons, which also could be a determining factor as to why there were steady increases from week to week.

Relationship to Literature

In the research that was reviewed, the results of the studies varied. Most of the studies showed an increase in student scores and achievement after the implementation of exercise. Only one study identified that there was no increase in student scores or behaviors after the exercise. The research of this study would agree with the studies that state physical activity has a positive effect on students' subsequent engagement in teacher led instruction. The reviewed literature showed more drastic increases, while the results of this study only showed small percentage increases, with the largest increase being the special education females who increased their time being engaged by 18%. The greatest increase by a single individual was 18% increase of time spent engaged. This particular student was a female with a special education classification of Autism. One study by Tomporowski et al. focused primarily on students with disabilities. This study found no significant evidence that exercise helps students with intellectual disabilities. However, the greatest increase in the current student was a student with a significant educational disability.

Implications for Practice

Educators can take the results of this study to make changes in their classroom. The data reveals an overall increase of time spent engaged during math lessons when students were actively engaged before the lesson took place. If teachers were to plan exercise around times of the day when students were required to focus and be engaged for a longer period of time, there is good evidence that students would be able to attend and focus on the material longer than if they did not exercise.

Currently, I am continuing the practice of implementing exercises within my own classroom. However, the exercises are not to the extent that they were throughout the study. Within the EngageNY math lessons there are fluency practices that are referred to as sprints. Students are asked to answer as many math facts as they can in a minute on side A, then on the back, students complete side B to see if they can beat their first score. Students are called on to select one physical exercise they would like to do in between completing side A and B. Exercises vary from the “hokey pokey”, “head, shoulders, knees, and toes”, “Simon says”, and jumping jacks. Students enjoy the exercises and an increase is usually seen on the amount of problems students are able to complete on side B of the sprint. As the year progresses, I plan to continue the use of exercises as I plan my instruction.

Many teachers reward their students by letting them have free time or recess at the end of the day when all of the academic work has been completed. Typically, this is seen as an incentive for students to stay on task and get their work done throughout the day. However, if teachers rearranged the schedule and let students have their recess at the beginning of the day they may see an increase in how well and how long students are able to stay engaged in lessons. Although recess does not consist of teacher led exercise,

students are still being active outside whether they are walking, playing with a ball, or using playground equipment. I have modified my classroom behavior plan to include that if nightly homework is done, students earn the privilege to have their free time outside in the morning as weather permits. Currently I am allowing for approximately twenty minutes of each morning to be dedicated to free play in hopes that students are able to burn energy and in turn gain focus as we begin our day.

Additionally, this could effect how administration plans physical education sessions for classrooms throughout the day. When schedules are being made, principals may want to consider the effect of exercise early in the day before a large chunk of instruction takes place. Physical education is a routine very similar to what was done in this study. It is a teacher led routine with cardiovascular training, resistance training, balance and coordination training, and stretching. If students participate in physical education earlier in the day rather than later in the day, it could affect their overall performance in the classroom and essentially set the precedence for how the rest of the day unfolds for students.

Implications for Future Research

Future studies which will aim at acquiring knowledge of exercise affecting engagement or achievement will have the ability to answer many unknowns that this study was unable to identify. In this research, there were a few groupings of students who had rather large increases or decreases after the intervention was put into place. It was explained that single students within those groups caused those significant gaps. Future research that focuses on single populations of students would help the field to understand which types of students benefit the most from exercise. For example, in this study, the

results showed the greatest increase with a female special education student. If a study were done consisting of only females with special needs or more specifically females with ASD, data could identify whether or not all students who are like Student 15 would have similar percent increases.

If similar studies were done in smaller sub groups, more accurate results would be presented. In an ideal setting, there would be an equal number of students in each sub group, so when averages are taken there would be no single student whose score would be weighted more.

As studies related to this topic become more in depth, it would be interesting to then create studies which identify which type of exercise is most beneficial to students. The current study was compromised of resistance, cardiovascular, and stretching exercise. If research were to identify which of those types of exercise were the most or least beneficial, educators would then be able to use the most effective type of exercise in order for their students to perform successfully.

Limitations

The study did have limitations. This study was only conducted within one classroom. Future studies will need to be conducted across an entire grade level, across multiple grade levels, or even across multiple schools of similar student populations to provide more comprehensive results. The fact that only one classroom participated resulted in a small participant pool; data was only collected from 17 individuals.

An additional limitation was the fact that the person who collected data varied from day-to-day. The classroom special education teacher collected the most data, but at times the classroom aide or a substitute teacher also completed this task. This was largely

due to the teacher being out of the room for meetings, dealing with behavioral problems, or being out of the building attending required trainings.

Overall, this study has accurate data that clearly identifies that teacher led exercise at the beginning of the school day improves students' ability to remain engaged and on task. An increase or constant state of engagement was seen in 16 out of the 17 students who participated, which is a 94% success rate with this group of students. When students have the ability to remain engaged and on task for a longer period of time, an instructor has a better chance of delivering accurate information that students need to succeed in their academic career. The results of this study, and studies similar to this one, should urge teachers and school administrators to really look at the amount of time that is being required by the new standards and curriculum, and how that has negatively affected the time that children are receiving during their school day to be active. Schools should feel empowered to reinstate recess, and be more aware as to when during the day recess is occurring. Everyday the amount of obese children increases, which is upsetting as schools continue to decrease the amount of active time due to the rigors of the curriculum. As children are able to learn how to focus their energy and attention, they will become better students who in turn will develop into lifelong learners. In this situation, exercise had a positive impact on these second grade students and undoubtedly increased their ability to learn the new, more challenging required curriculum.

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Appendices

Appendix A.
Table 1 – Student Demographics

Student I.D.	Gender	Known Medical Issues	Weight (lb)	Educational Classification	Physical Education Status
Student 1	Female	Low-Avg Hearing	52	General	General
Student 2	Female	Low-Avg Hearing	60	General	General
Student 3	Female	N/A	63	General	General
Student 4	Female	ADHD, Glasses	65	Special Education - OHI	General
Student 5	Male	ADHD, Glasses	65	Special Education – OHI	General
Student 6	Female	Glasses	127	Special Education – Learning Disabled	General
Student 7	Male	ADHD	50	Special Education – Speech Language Impairment	General
Student 8	Female	Glasses	42	General	General
Student 9	Female	Glasses	69	General	General
Student 10	Male	None	47	General	General
Student 11	Female	None	47	Special Education – Autism (PDD-NOS)	General (with modifications)
Student 12	Male	Glasses	84	General	General
Student 13	Male	None	99	General	General
Student 14	Female	Gluten Sensitivity	60	General	General
Student 15	Male	None	70	General	General
Student 16	Female	None	43	General	General
Student 17	Female	None	65	General	General

Appendix C.
Table 2 – Seating Chart Time Lapse Observation

Time Key:

- | | |
|------------|------------|
| 1. | 16. |
| 2. | 17. |
| 3. | 18. |
| 4. | 19. |
| 5. | 20. |
| 6. | 21. |
| 7. | 22. |
| 8. | 23. |
| 9. | 24. |
| 10. | 25. |
| 11. | |
| 12. | |
| 13. | |
| 14. | |
| 15. | |

Appendix D.
Table 4 – Student Averages by Week

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Student 1	93%	94%	97%	100%	93%	97%
Student 2	90%	95%	95%	100%	94%	98%
Student 3	70%	87%	92%	94%	89%	95%
<u>Student 4</u>	<u>70%</u>	<u>78%</u>	<u>84%</u>	<u>91%</u>	<u>83%</u>	<u>88%</u>
<u>Student 5</u>	<u>85%</u>	<u>84%</u>	<u>95%</u>	<u>93%</u>	<u>91%</u>	<u>93%</u>
<u>Student 6</u>	<u>72%</u>	<u>80%</u>	<u>88%</u>	<u>88%</u>	<u>81%</u>	<u>85%</u>
<u>Student 7</u>	<u>73%</u>	<u>82%</u>	<u>74%</u>	<u>76%</u>	<u>51%</u>	<u>55%</u>
Student 8	77%	94%	97%	96%	91%	93%
Student 9	87%	91%	96%	96%	95%	97%
Student 10	77%	91%	98%	98%	94%	98%
<u>Student 11</u>	<u>28%</u>	<u>50%</u>	<u>63%</u>	<u>71%</u>	<u>50%</u>	<u>68%</u>
Student 12	64%	79%	96%	96%	93%	88%
Student 13	73%	80%	89%	91%	83%	83%
Student 14	93%	92%	99%	99%	96%	97%
Student 15	94%	93%	97%	98%	94%	97%
Student 16	93%	94%	99%	95%	90%	93%
Student 17	88%	86%	92%	91%	88%	90%

*Bold indicated weeks when intervention was used

*Underline indicates students with disabilities