Bethel University

Spark

All Electronic Theses and Dissertations

2017

Increased Movement and Physical Activity and Its Impact on Academic Performance on Students With and Without Disabilities

Jaclyn A. Uithoven Neerhof
Bethel University

Follow this and additional works at: https://spark.bethel.edu/etd

 Part of the Special Education and Teaching Commons

Recommended Citation

Uithoven Neerhof, J. A. (2017). *Increased Movement and Physical Activity and Its Impact on Academic Performance on Students With and Without Disabilities* [Master's thesis, Bethel University]. Spark Repository. https://spark.bethel.edu/etd/631

This Master's thesis is brought to you for free and open access by Spark. It has been accepted for inclusion in All Electronic Theses and Dissertations by an authorized administrator of Spark.

INCREASED MOVEMENT AND PHYSICAL ACTIVITY AND ITS IMPACT ON ACADEMIC PERFORMANCE OF STUDENTS WITH AND WITHOUT DISABILITIES

A MASTER'S THESIS

SUBMITTED TO THE FACULTY

OF BETHEL UNIVERSITY

BY

JACLYN A. UITHOVEN

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

MASTER OF ARTS

DECEMBER 2017

BETHEL UNIVERSITY

INCREASED MOVEMENT AND PHYSICAL ACTIVITY AND ITS IMPACT ON ACADEMIC PERFORMANCE OF STUDENTS WITH AND WITHOUT DISABILITIES

Jaclyn A. Uithoven Neerhof

December 2017

APPROVED

Advisor's Name: _____

Advisor's Signature: _____

Program Director's Signature: _____

Abstract

Brain-based teaching is an evidence based teaching philosophy that is widely accepted as successful practice. This philosophy revolves around teaching to how the brain functions. One aspect of this practice is relating movement to increasing brain function. This literature review examines studies where students were assessed on their academic performance after having engaged in different forms of movement, including physical education classes, organized programs, and specific movement sequences. While it is concluded that there are many factors that impact a student's performance, research shows that there is an established positive correlation between movement and exercise, and an increase in academic performance. This positive correlation initiated suggestions of ways of which teachers and parents can incorporate physical movement into their student's day to increase the child's academic performance. These suggestions include simple movements that are easy to implement, a concept titled 'active-social learning', and organized programs requiring training and time to implement.

Table of Contents

CHAPTER I: INTRODUCTION

The human brain needs a variety of outside factors in order to stay regulated and learn and grow at an optimal level. One of these regulating factors is movement and exercise. Movement and exercise increase the amount of oxygen that is going to the

brain. This helps the brain retain more information and function ~~and~~ at a deeper level. Teachers, schools, and parents can use this information to help increase the academic performances of their classrooms, schools, and children. There are many ways that exercise and movement can be incorporated into a child's day to assist them in increasing oxygen levels and resulting academic performance. This paper will review the literature on how movement and exercise can positively impact student academic performance. Then it will provide examples and suggestions to teachers on how to incorporate movement in their classrooms.

Overview of Brain-Based Teaching

Being able to teach to the diverse needs of every student in the classroom is a difficult task. Given this, much research has been conducted to determine which instructional practices increase student achievement. Current research has given professionals in education a number of recommendations. One of those recommendations is to teach to manner in which the brain works. This is called Brain-based Teaching. Brain-based Teaching relates to many areas of focus including age, gender, and hormonal differences, along with a student's ability to obtain the proper amount of sleep, proper nutrition, and physical activity. Learning, cognitive, or behavioral differences may also be considered when implementing Brain-based Teaching methods.

In the book, *Teaching with the Brain in Mind 2nd Edition*, author Eric Jenson explains the brain-based differences that can affect any person's learning. A person's age is one brain-based difference that may affect learning through their capacity to understand. Jenson discusses the different growth spurts that a child goes through, around

ages 6-7 and around 11-12 (Jensen, 2005). With an increase in age, a child can be expected to understand concepts that are more complex. When the child starts to become a teenager, the brain develops in ways that occur at this age that can affect their learning. For an example, the frontal lobe of the brain, which is responsible for reasoning and problem solving, is the last part of the brain to develop. This part of the brain matures faster in females than males, and may not fully develop until a person is about 25 years old. Knowing this, a teacher and/or parent, can be more reflective and patient about what they are asking of their students when it comes to reasoning and problem solving.

A person's gender also makes for differences in learning. Jensen (2005) speaks to the differences in the brain's structure between the two genders and explains how this information may affect the function as well as learning of individuals. One major stipulation in the testing is that male and female brains develop on very different timelines, making it difficult to get accurate results from comparison studies. Jensen (2005) lists some general differences of male and female brains. According to Jensen, females have better verbal recall, better verbal memory and better verbal fluency. Additionally, females are better at remembering visual landmarks and people, than they are at remembering distances and/or objects. Males can throw and hit targets more accurately, demonstrate strengths with gross motor tasks, and demonstrate a strong reasoning ability when applying skills in math problems (Jensen, 2005). These differences can also lead to learning differences in the classroom. In Teaching with the Brain in Mind, Jensen gives ideas on what teachers may see in the classroom due to sex differences. These ideas include boys are generally more physical and active when

communicating a need or frustrated and more impulsive. Girls are more likely to use language and more discrete behaviors when inclined, and girls are more likely to work collaboratively and be more social (Jensen, 2005).

There are many kinds of hormones in the brain that can affect learning, including insulin, testosterone, and estrogen. These hormones fluctuate as a child is growing and going through puberty. The different levels of each can definitely affect a child's learning. Some research indicates that the right-hemisphere is activated when there are lower levels of estrogen and the left-hemisphere is activated when there are low levels of testosterone (Jensen, 2005). The right-hemisphere is typically associated with more creativity, intuition, and language, and the left-hemisphere is associated with logic, sequence, and mathematics (Jensen, 2005). The research on hormone differences coincides with the research on biological differences in learning, by restating the fact that males are typically more logical and mathematical and females typically use language more than actions and are more intuitive.

The brain also needs the body's basic needs to be fulfilled in order to learn best. One of these basic needs is sleep. Sleep is time for the brain to recharge and organize and store new learning (Jensen, 2005). Jensen shares a statistic stating that more than 50% of students over the age of 13 do not get enough sleep. A lack of sleep is known to lead to inattention and a lack of information retention. Parents should assist their children in establishing sleep habits, so they are able to focus and be alert during the school day.

Having a proper nutrition is not only beneficial to a child's long-term health and habits, but also their learning. Certain foods can affect brain function, encourage repair,

and growth. One beneficial nutrient is Vitamin A. Found in orange colored vegetables, it has been known to support brain function and learning (Jensen, 2005). Other nutrients beneficial to the brain are protein, iron, and selenium, which help build and repair brain cells (Jensen, 2005).

It is also recommended that children get at least 8-12 glasses of water a day to help with brain function (Jensen, 2005). Water keeps one hydrated and alert, and water should be readily available for children during the school day. Parents can help with giving their child the proper nutrition at home and by teaching them healthy eating habits at home. This will help children be more alert and focused in school as well as enable healthy brain function for future learning.

Jenson also addresses the body's need for physical activity and exercise, linking physical activity to higher academic achievement. There is a lot of research stating the relationship between physical activity and higher academic performance. Much of this research will be included in the following literature review, however, Eric Jensen (2005) has some statements about this topic as well in his book. He references other studies that have been done to show the relationship between movement and increased academic performance. With exercise, there is an increase in blood flow, which brings more oxygen to the brain, which then increases the functions of the brain. There is evidence that movement is related to learning and brain development in newborns and infants, however it does not stop (Jensen, 2005). This fact leads to the idea that people of all ages can gain a deeper understanding of a new subject or task if there is some movement involved within the learning process.

Movement as it Relates to Academic Performance

The following literature review will focus on the brain's and body's need for movement and its relation to learning and academic performance. A consideration of different types of studies has shown this to be true across multiple categories. A collection of reviewed studies examined students of varying abilities, ages, and demographics. Incorporating movement in the classroom and encouraging Physical Education classes and exercise by all students, has been found to have a positive effect on academic performance of students regardless of disability status, socioeconomic status, ethnicity and/or cultural heritage, nor age (Coe, D., Peterson, T., Blair, C., Schutten, M., & Peddie, H., 2013; Duman, 2010; Everhart, B., Dimon, C., Stone, D., Desmond, D., & Casilio, M., 2012; Mullender-Wijnsma, M., Hartman, E., Greeff, J., Bosker, R., Doolaard, S., & Visscher, C., 2015; Shoval, E., & Shulruf, B., 2011; So, W., 2012; Watson, A., & Kelso, G., 2014).

This literature review will show the positive effect of movement and exercise as it relates to an increase in academic performance. This review will answer the guiding question of this paper: does increased movement and physical activity increase academic performance in school aged students with and without disabilities? The application chapter will then explore the follow up question: what is the best way to include physical activity or movement into a student's day to reach his or her potential maximum academic output?

CHAPTER II: LITERATURE REVIEW

General Studies on the Relationship Between Physical Activity and Academic Performance

A number of studies have been conducted, establishing a relationship between physical movement and academic performance. The following will examine a selection of studies, discussing further the use of physical education, programs called Brain Gym and the ASK program, and kinesthetic movements in class, to increase student achievement. This group of studies examined how physical education (PE) hours in a week, the number of PE classes in a week, a program called Brain Gym, and physically active educational lessons impacted the academic performance of the students in the study. This section will look to answer the question of: does increased movement and physical activity increase academic performance in school aged students with and without disabilities? This section of studies will also focus on students without

disabilities and show how exercise and movement increases academic performance for a general population.

Termarche, Robinson, and Graham conducted a study in 2007, looking to support the hypothesis: if exercise increases cognitive functioning, then it should increase academic performance (Tremarche et. al., 2007). In their 2007 study, Tremarche, et. al., compared the standardized test scores of all fourth-grade students, 311 students total, in two different schools, while considering the Physical Education programs implemented within those schools. The schools and students being analyzed were within the same geographical area of Southeast Massachusetts and have similar Physical Education curricula. However, the schools require a very different number of required Physical Education (PE) hours for their students. The first school (School One) required the students to have 28 hours of PE per week and the second school (School Two) required 56 hours per week (Tremarche et. al., 2007). The 4th grade standardized test scores in English Language Arts (ELA) and Math in each school were analyzed to gain data on the academic performance of the participants (Tremarche et. al., 2007). The results showed School Two, requiring 56 hours of PE, scoring significantly higher on the ELA test and higher, but not significantly, on the Math test. Students attending School Two also performed higher than the state average on both the ELA test and Math test (Tremarche et. al., 2007). It was reported within the study that physical exercise and movement increases brain function through increased oxygen-rich blood flow. Increased brain function leads to increased learning and academic performance. Tremarche et. al. encouraged school administrations to not decrease the weekly number of Physical

Education hours for this very reason. The study found a clear correlation between time spent in physical education and increased academic performance for all students.

However, there are significant differences in the student demographics between the schools. There is also a lot of research that has been done in the area of the socioeconomic status of students and their academic achievement levels. In this study, Tremarche et. al. identifies that School One is 86.5% Caucasian, has a 3.3% dropout rate, and has approximately 30% more expenditures per student than School Two. School Two is 98.4% Caucasian, has a 1.2% dropout rate, and higher paid teachers. It is important to consider these factors when analyzing student academic performance.

Another study also looked at the impact of participation in multiple physical education classes per week on student academic achievement. Kim (2012) surveyed over 75,000 Korean adolescents, ages 13-18, on their amount of PE classes per week and their academic performance, their socioeconomic status (SES) by means of their parent's education level and salaries, and Body Mass Index (BMI). All of this information was self-reported and no other information was provided by the students in the study. After considering other variables in the study such as gender, age, SES, BMI, and level of exercise done individually, it was concluded that students who participated in three or more PE classes per week, academically outperformed students who participated in two or fewer PE classes per week (Kim, 2012). Researchers claimed the increase in academic performance was linked to an increase in brain function, as oxygen saturates the brain after physical activity. This was not unlike the findings of Tremarche et. al.

The problems with this study are the information was all self-reported by the students, which could increase unreliability, as well as it was an extremely large sample size with all levels of cognitive and physical abilities. This study did not point out the specific students results, nor how it related to the scores and their backgrounds. This study simply stated the overall results of increased Physical Education classes increased the students' general academic performance. One positive aspect of this study is that researchers included information about student socioeconomic status, which by evidence in the last study, makes a great deal of difference in a child's academic performance. Other forms of research have shown a relationship between a student from a low-income family not scoring as high academically due to lack of educational support at home and low priority given to education. In this study, about 25% of the students were considered poor or very poor and about 38% of students scored in the poor to very poor range academically. However, since we do not know the specific students and their scores, it is difficult to see the relationship of these percentages for this study.

The concept of movement and exercise increasing academic performance has been studied for many years. There are existing programs in schools where the concept of movement in the classroom and brain based teaching practices are being used. This next study focuses on one specific program, Brain Gym. Brain Gym is described on the website www.braingym.org as being a series of movements to increase academic performance. These movements include marching in place, lifting an ankle and tapping it repeatedly, astep/cross motion, and many more. The exercises usually happen outside the classroom in a larger space, such as a gymnasium, so the students have room to spread

out. This may take about 30 minutes out of the day, a few days a week. The Brain Gym creators run the program on the principle of "moving with intention leads to optimal learning" (braingym.org/about). The creators of Brain Gym International (formerly Educational Kinesiology Foundation), identified 26 specific movements that relate to the "first years of life when learning to coordinate the eyes, ears, hands, and whole body" (braingym.org/about).

Templeton and Jensen (1996) looked at Brain Gym in a classroom as a means to increase academic performance as well as classroom climate. The researchers approached a school district and asked them to provide a classroom that would benefit from the practices of Brain Gym. One principal volunteered a fourth-grade class of 28 students, in which the teacher recently sought help because her class was lacking a positive classroom climate (Templeton and Jensen, 1996). It was stated that this teacher did not find merit in Brain Gym and did not cooperate with the researchers. She would often not follow the Brain Gym protocol as written and this may have affected the results of the study as Brain Gym is a very systematic, research-based routine (Templeton and Jensen, 1996). The results showed the students felt that there was a slight increase in classroom climate, because they reported that they felt better, "more awake", and were "able to focus better" (Templeton and Jensen, 1996). In this study, the students' academics did not increase significantly, this could be from the teacher not participating and not following protocol (Templeton and Jensen, 1996). It is evident that Brain Gym requires time and effort from the teacher/staff leader for it to be successful. It is a commitment the teacher has to make in order to implement this program with fidelity.

A study completed in Norway was researching the effects of daily physical activity on academic performance (Resaland, G. K., Moe, V. F., Aadland, E., Steene-Johannessen, J., Glosvik, Ø, Andersen, J. R., Anderssen, S. A., 2015). This study used a program called Active Smarter Kids (ASK), which included a total of 165 minutes of activity per week through physically active educational lessons (30-minute lessons 3 times per week), activity breaks (5 minute activity breaks 1 time per day), and physically active homework assignments (10 minutes 1 time per day). The researchers tracked the number of minutes of physical education class, which in the case of all Norway schools is 90 minutes per week, the physical activity every student had each week (approximately 45 minutes per week), along with the activity in each section of the ASK program (Resaland, et. al., 2015). This resulted in the students in the intervention school receiving about 300 minutes of physical activity per week and the control school recieving about 135 minutes per week (Resaland, et. al., 2015). The physical activities were carried out in a positive manner and meant to include all children to ensure full participation. The program was designed to have 25% of the students' physical activity be vigorous, meaning the person is sweating and short of breath. The vigorous activities included running, relay racing, obstacle courses, and active play on the playground (Resaland, et. al., 2015). The study followed all the fifth graders in 57 schools within two counties; 28 of the schools implemented the ASK intervention and 29 schools were the control, where programming consisted of regularly scheduled physical education classes (Resaland, et. al., 2015). The teachers who were involved in the study attended 3 training sessions the year before, were involved in refresher courses, and participated in an online forum. On

this forum, they received videos and ideas for lessons and could ask questions and share their experiences (Resaland, et. al., 2015).

The ASK program was designed around inspiration from Harter's Competence Motivation Theory, Achievement Goal Theory, and Ryan and Deci's Self-Determination Theory. Harter's Competence Motivation Theory states a person will have the motivation to achieve more tasks once they feel they have mastered other tasks (oxfordreference.com). Achievement Goal Theory defines the types of goals that a person may make that lead to achievement behaviors to reach those goals (Wentzel, K. R., and Miele, D. B., 2009). Ryan and Deci's Self-Determination Theory is a "theory of motivation and personality that addresses three universal, innate and psychological needs: competence, autonomy, and psychological relatedness." (learning-theories.com). Combining aspects of these theories, the ASK program was designed to promote a positive learning environment with teachers setting high, but achievable, expectations. This provided students with feelings of confidence and self-efficacy, in turn increasing their motivation in the classroom (Resaland, et. al., 2015). Each school was assessed on their academic performance through regular standardized testing. The Norwegian National Test assesses students on reading, mathematics, and English (Resaland, et. al., 2015). The researchers also assessed each student's executive functioning skills, specifically examining each's inhibition, cognitive flexibility, and working memory. There were also many other tests that went into calculating the results for this study. The researchers took time to factor in each student's cardiovascular fitness, muscle strength, motor skills, body mass, pubertal stage, blood pressure, blood samples (to ensure the

children did not have diseases that could impact results). Additionally, all of the students, teachers, and parents were given questionnaires (Resaland, et. al., 2015). With these assessments complete and all factors considered the researchers determined the schools that implemented the intervention, ASK program, scored significantly higher on the standardized tests than the control schools (Resaland, et. al., 2015). The researchers believed that public schools can be the first line of defense and prevention when it comes to public health.

The ASK program requires students to complete physically active educational lessons, brain breaks, and physical activity homework (activesmarterkids.com/ask). The lesson suggestions on the website the link to many content areas such as math and social studies. Most of the activities require large pieces of paper to make charts for matching games and puzzles to work out on the ground. Other activities involve relay races and competitions, and include opportunities for teamwork (activesmarterkids.com/physicallyactivelessons). Each of the Brain Breaks last 5 minutes and it is suggested to have one each day of the week. The ASK program website has a link to their own Youtube channel that consists of all of their suggested brain break videos. Finally the program requires students to complete 10 minutes of physical exercise as homework every night (activesmarterkids.com/ask). More information on the ASK program, its lesson and brian break suggestions can be found at www.activesmarterkids.com.

With this collection of studies, it can be concluded that exercise programs positively impact students, where both health and academic achievement are concerned.

There are many ways to incorporate extra movement and exercise opportunities in the school day. Programs, such as Brain Gym and the ASK program, which were described in this section, can help teachers with specific movements and directions for adding movement in their classroom. The programs are very specific and may take time and training that teachers may not have access to in their districts. Another option for schools that was mentioned in these articles, were regular Physical Education (PE) classes. It would be very beneficial for schools to continue PE as an option for all students to continue to increase the academic performance of their students.

Students with Disabilities and Physical Activity to Increase Academic Performance

There is a significant achievement gap between students in the general education setting and students with disabilities receiving special education. Professionals in the field of special education are frequently looking for new ways to help students with disabilities achieve their goals and new ways to decrease that achievement gap. The studies in this section will look to see if movement and exercise can increase academic performance in students with disabilities as an option to assist special education professionals with decreasing the achievement gap. The first study shows the effect of completing exercise activities immediately before a lesson begins for students with Intellectual Disabilities. The next study looks at the program Brain Gym and how it increases the abilities in students with Developmental Disabilities. Another study will assess the motor function of students with Developmental and Cognitive Disabilities and how that relates to their academic functioning. The last study in this section looks at the

neck reflexes and motor ability of students with Developmental and Cognitive Disabilities and how those may affect certain areas of academic performance.

In a 2012 study done by Everhart et al., students with intellectual disabilities in a life skills class were studied to determine if an increase in their academic performance occurred, when an exercise was completed immediately before a lesson. There were two classes of students separated by grades. The first class was the primary group with seven students in Kindergarten through second grade and the second was the intermediate group with six students in third through fifth grade (Everhart et al., 2012). Each group was led by a 10 minute age-appropriate exercise video, then immediately asked to perform their regular math or language activities. The researchers began with a 5 day baseline period where they collected data from each student on their mathematics and language arts performance. The researchers then collected data for 16 days on the student's' performance on math and language arts class work immediately after the students completed the 10-minute exercise video. After the 16 days, there was a 4 day period of no exercise videos, then added back in for 3 days to ensure that the physical activity was the source of their progress, if there was progress to measure (Everhart et al., 2012). The conclusion of this study found there was consistent improvement in the intermediate group in both language arts and math, but there was no association for the primary group (Everhart et al., 2012). The reason for the lack of correlation between the primary group's academic progress and the physical activity was thought to be that the students were too young to have complex motor control, accurate mimicry skills to complete the exercises correctly, and the attention span to complete the full 10 minute exercise. This study

shows that organized programs with specific movements are better for slightly older children.

Brain Gym is a program that was referred to in a previous study in this literature review, with typically developing children 18 years prior to this next study. That study ended up being mainly inconclusive due to lack of participation from the cooperating teacher. In this study, done by Watson and Kelso (2014), Brain Gym was reexamined as a viable means of increasing student's academic achievements in students with developmental disabilities. Brain Gym claims to "promote whole-brain learning" for "optimal learning" (Watson & Kelso, 2014). Further research, described in Watson and Kelso's study, shows that there is a lack of quality evidentiary support in the research that gives Brain Gym these claims (2014). Brain Gym is a program that requires implementation by a certified teacher. The program suggests movements for students to complete that will increase their academic performance. Watson and Kelso research this claim in this study.

Watson and Kelso wanted to complete quality research to create a baseline of data on the effectiveness of Brain Gym on students with developmental disabilities, including autism. Their study consisted of three students, ages 7 and 9, in a university based after school program that helps students with developmental disabilities with academic and life skills (Watson & Kelso, 2014). The instructors went through the training on how to implement Brain Gym to ensure it was done properly. The researchers collected baseline data from the students on how they completed fine motor tasks and time spent on task (Watson & Kelso, 2014). The sample time lasted 7-8 weeks with the interventions

completed about 2-3 times per week, depending on the subject (Watson & Kelso, 2014). Brain Gym was tested against a control group who engaged in simply walking in the hallway for 8-10 minutes. Brain Gym is a series of 4 moves lasting 30 seconds each, with each student completing all four moves then completing either a language arts or mathematics task. The creators of Brain Gym have titles to their movements; the four that are used in this study were called Midline Movements, Energy Exercises, Deepening Attitudes, and Lengthening Activities (Watson & Kelso, 2014). Descriptions of these movements were not found in the research and only provided to those trained in the program. The decision of which intervention was completed for each subject on a given day was made by a coin flip (Watson & Kelso, 2014). The results of the study were that two of the students increased their academic engagement, however, the increase in engagement was not significant enough to be considered effective. The third participant decreased in his overall academic engagement, rendering it ineffective. It was concluded that Brain Gym does not increase academic engagement in students with developmental disabilities (Watson & Kelso, 2014). The researchers felt the claims made by Brain Gym were false and the program use is not a quality way to increase academic performance. The authors also wanted to ensure that teachers and administrators were careful to complete their own research when it comes to implementing self-proclaimed evidence-based interventions. Comparing this study to the one in the previous section it may be concluded that Brain Gym needs to be implemented just as the program states to be successful, which means with the proper movements, timing, and encouragement. Or

possibly the program is not successful and is not an evidence-based practice that should be used in classrooms.

Another study approached the subject of comparing the motor skills and cognitive skills of students with Developmental and Cognitive Disorders (DCD) to those skills of typically developing students (Asonitou, K., Koutsouki, D., & Charitou, S., 2010). This study assessed 42 preschool students, age five, and of both genders, some with DCD and some of typical development. The researchers gave the students two assessments, the Movement Assessment Battery for Children (MABC) and the Cognitive Assessment System (CAS) for assessments. (Asonitou, et al., 2010). The MABC assesses students on their motor function in three main areas: manual dexterity, ball skills, and static and dynamic balance (Asonitou, et al., 2010). The students were also tested on their ability to run as they were observed running the 50-yard dash. The CAS assesses students in their cognitive processing skills, specifically in the areas of planning, attention, and simultaneous coding (Asonitou, et al., 2010). Asonitou's goal was to determine if MABC scores could be used as a future predictor of academic problems. Meaning that if a student has motor difficulties, it may impact their academic performance in the future. Their research found that there was a significant difference in scores between students with DCD and students without, especially in the areas of manual dexterity, ball skills, static and dynamic balance, running, planning, simultaneous coding, and attention (Asonitou, et al., 2010).

The researchers felt they could distinguish a child with DCD versus a child without, using these skill assessments at an early age. The study further stated that these

assessments could be an identifier of future academic performance, because the components assessed are related to planning, attention, simultaneous and successive coding. These areas of brain function relate to making plans, decisions, judgements, and evaluations; attention span; and analyzing and organizing information. Students who have skill deficits in these areas will not perform well in school. When the MABC assessment is given at an early age and the results show there is limited functioning, early intervention strategies can be implemented. Early intervention strategies in these areas can significantly increase academic performance of individuals with a Developmental or Cognitive Disorder. The researchers claimed that their study supports the fact that sound motor skills can increase academic performance.

A review of multiple studies of the Institute for Neuro-Physiological Psychology (INPP) Developmental Test Battery, which tests for neurological dysfunction in students with special needs, was done by Sally Goddard Blythe. In 2005, Blythe sought to examine whether or not neurological dysfunction was a significant problem in underachieving students and could it be increased if there was a specific exercise program carried out for one year. There were three studies, done at three separate schools, completed with the INPP Developmental Test Battery. The participants of these studies ranged in age from 5 to 10 years and were chosen if the student was reading at a grade level below their current grade (Blythe, 2005). Students were given the neurological test at the start of the study and then participated in an exercise program. The students in the study then completed the neurological test again after a range of 8 to 14 months, depending on the school the student attended. The exercise program used

specific actions and movements that were to be completed by the students. The program looked at specific reflexes that are associated with specific academic strengths. For example, they examined the students' asymmetrical tonic neck reflex (ATNR), symmetrical tonic neck reflex (STNR), and the tonic labyrinthine reflex (TLR) because these can be associated with balance, posture, coordination, and perceptual stability (Blythe, 2005). Dysfunction of these reflexes can affect the performance of the connections between the vestibular-ocular-proprioceptive pathways (Blythe, 2005). Specifically, a dysfunction in the ATNR affects hand-eye coordination, resulting in poor handwriting, inability to cross the vertical midline, and visual tracking while reading. A dysfunction in the STNR results in poor posture, difficulty sitting still, and speed of refocusing. Finally, a dysfunction in the TLR will result in improper head and body posture and movements through space in relation to the environment, as well as control of eye movements (Blythe, 2005). These functions and movements can significantly affect a child's learning in the areas reading, handwriting, spelling, and drawing, as well as attention and focus. After one year of the exercise program, the results showed increases in the neurological functioning and academic performance in students. Specifically, School One increased in both neurological functioning and academic performance (reading and spelling), School Two increased their neurological functioning, and School Three's scores stayed the same in both. Going further, Blythe concluded that specific exercises and activities are needed to increase academics and general physical education class alone will not have an educational improvement (Blythe, 2005).

There are many research studies and interventions available to assist teaching those with special needs. The studies in this section specifically examined the effectiveness of movement as an academic intervention with students with special needs. The articles also addressed the ability to predict if a student will struggle with academics in the future when their physical disabilities are considered. If parents and educators take this information into consideration and work to increase their child's motor skills, it is possible for them to increase the child's academic ability in the future. Parents and educators can increase a child's motor ability through exercise programs, physical therapy, or simply increased exercise. There is potential to decrease the achievement gap between typical students and students receiving special education services, interventions are implemented at an early stage.

Movement and its Effect on Academic Performance in Students with Different Learning Styles

This next section reviews studies that looked at the learning styles of multiple students in a group. The first study examined the impact of movement upon low versus high academic achievers in a cooperative learning environment, to assess its effect on both types of students. The next two studies assessed students identified as being of lower socioeconomic status. The first one used moderate to vigorous exercise as a method of movement and the other used a program called FITNESSGRAM. This section looks at students without disabilities, but may have other learning barriers affecting their academic progress. These studies are looking to see if exercise and movement will help the students with the different challenges they are facing.

One study examined the differences between low achievers and high achievers when it came to implementation of an 'active cooperative learning' style (Shoval & Shulruf, 2011). This study wanted to identify the learners that would most benefit from the small group cooperative learning style which the researchers had developed (Shoval & Shulruf, 2011). The study featured 158 second and third graders from five classes in three different schools. The students were to be taught about angles as their geometry lesson. The students were separated into small groups each with a mixture of low achievers with high achievers. Within the groups, the students would learn about the angles by moving their arms to represent an angle (Shoval & Shulruf, 2011). Students were characterized as 'passive', 'social', or 'active' learners. 'Active' learners were more active than other students with objects and other people and would tend to take the lead within the groups. 'Social' learners communicated and interacted with other students more than others. 'Passive' learners tended to sit back and watch what others were doing, then followed. The data showed that the passive students scored the best before the interventions, active learners scored the highest afterwards, and the social students' scores stayed the same (Shoval & Shulruf, 2011). This data suggested that when movement is incorporated into the lesson, the academic achievement of active low achieving students increases. This study further supports the argument that students are better able to remember content when an activity is kinesthetic in nature, as opposed to simply fitness based. Research indicated that kinesthetic learners remember more, when their body is moving at the time the information is delivered. This type of learning is supportive of this literature review.

A study done in the Northern Netherlands by Mullender-Wijnsma et al., in 2015 was conducted to determine if moderate to vigorous exercise would increase academic engagement for socially disadvantaged children. Mullender-Wijnsma et al., assessed 81 children (41 girls and 40 boys), 20 of them were socially disadvantaged. The students were in second and third grade and participated in a previously proven exercise program, called 'Fit and Vaardig op school' (F&V) or 'Fit and academically proficient at school' (2015). F&V is a program that incorporates movement within the lesson. This means that the students would answer questions relating to language arts and math by using their bodies. An example of this is they would jump 5 times when asked the sum of 2 and 3. For 22 weeks, three times a week the students would spend 10-15 minutes on math and 10-15 minutes on language arts lessons using this method (Mullender-Wijnsma et al., 2015). At the conclusion of this study, it was noted that student time on task, increased, no matter their socioeconomic status (Mullender-Wijnsma et al., 2015). It was also determined that more research was needed to fully conclude if there is a significant relationship between the movements and increased academic performance (Mullender-Wijnsma et al., 2015).

A 2013 study done by Coe et al. examined the relationship between physical fitness and academic achievement, as well as investigated the effect of socioeconomic status on that relationship. Coe noted that research has already made the claim that students who are physically fit tend to have higher academic performance (2013). This study included 1,701 third, sixth, and ninth grade students in a Midwestern United States school district (Coe et al., 2013). The study used the FITNESSGRAM test and the

PACER run to assess the student's physical fitness level, used the school district's regular standardized tests to assess academic performance, and the district's records on whether the students qualify for free or reduced lunch, using that information to determine a student's socioeconomic status (Coe et al., 2013). At the conclusion of this study it was determined that middle and high school students who were fit, performed better academically, than when compared to elementary students who were fit. Additionally, it was found that students of low socioeconomic status generally performed lower than their peers at all grade levels, no matter their physical fitness level (Coe et al., 2013).

This section revealed some inconclusive information relating to movement and an increase in academic performance. These studies showed there is some information out there that does not support the claim being addressed in this literature review.

In the first study in this section, the students were grouped by their learning types. Then the study assessed them on a specific learning style that may only help students with a certain learning type. The kinesthetic approach was helpful to the active learners, but may not have benefited all learners. The second study in this section looked at students from a low socioeconomic status and had them engaging in a fitness program to increase their academic performance. However, the program was not successful. Conclusions drawn from this study seem to indicate that a student's socioeconomic status is a stronger determinant of academic performance than their physical fitness abilities. The third article in this section revealed the same conclusion. However, it also noted that a fitness program is successful for increasing the academic ability of older students, but

not the younger elementary aged students. In summary, physical fitness programs may only benefit some students when the socioeconomic status of the students is considered.

Movement and the Academic Performance Difference in Each Gender

The last section of this literature review looks at the academic performance of students of each gender, as it relates to movement. One study proposed moderate to vigorous exercise while the others used the FITNESSGRAM assessment. These studies make a valid attempt to answer the question, does increased movement and physical activity increase academic performance in school aged students with and without disabilities? This section works to answer this question by looking at another form of brain-based teaching which focuses on gender differences and how gender may affect a student's learning. The studies will show the effect of movement on the academic performance of each gender, while demonstrating that movement can help increase academic performance in all students, no matter the gender.

A large study done in Korea, totaling 75,066 students, concluded that moderate exercise increases academic performance for all middle and high school students (So, 2012). This study specifically examined the level of physical activity the students were completing by analyzing surveys students in seventh through ninth grade completed online. The survey results showed that vigorous activity had more of an impact on boys than girls, although moderate physical activity influenced both boys and girls, and strength training in either gender did not make a difference (So, 2012). This study was very large and only assessed students through their standardized test scores and through a survey about their activity level (So, 2012). In considering the context of this literature

review, it would have been beneficial for researchers to consider a small demographic within to conduct their research.

Another study further examined if there are any other factors that affect academic performance in middle school students along with physical activity. This study done by Srikanth et al. looked at the relationship between cardiovascular fitness, physical activity levels, body composition, academics, socioeconomic status, gender, a general self-concept, and social support (Srikanth, S., Petrie, T. A., Greenleaf, C., & Martin, S. B., 2015). The researchers assessed 1,211 middle school students in sixth through eighth grades in one school district in Texas (Srikanth et al., 2015). The students self-reported on their physical activity levels, general self-concept, and social support. Information from state records on students who receive free and reduced lunch, was the determination of socioeconomic status. Their cardiovascular fitness was assessed using the PACER test, which is a shuttle run test that was completed in their physical education classes. Body composition, cardiovascular fitness, and other physical activities were assessed using the FITNESSGRAM assessment, also completed in physical education class. Finally, the academic performance of students was analyzed through data regarding state standardized reading and math test scores (Srikanth, 2015). The study concluded that in general, physical fitness increases academic performance. While it was found that psycho-social aspects of a student's functioning contribute to his/her success, it was also noted that gender & body composition are not factors that contribute to increased academic performance. However, socio-economic status makes a significant difference on academic achievement (Srikanth et al., 2015). This has been reported in other studies

as well and will continue to be major contributing factor when it comes to the success of students in all schools.

Another extremely large study examined the performance of all the students in the state of Texas. This study focused upon the association between physical fitness and academic achievement (Janak, J. C., Gabriel, K. P., Oluyomi, A. O., Peréz, A., Kohl, H. W., & Kelder, S. H., 2014). Students participating in this study were also given the FITNESSGRAM assessment, which examines the cardiorespiratory fitness, body composition, abdominal and back muscular strength and endurance, upper body muscular strength and endurance, and lower back/hamstring flexibility (Janek et al., 2015). Students participating in this study came from varying socioeconomic backgrounds, and participated in the FITNESSGRAM assessment, the PACER test and the one mile run, all of which measure composition, strength, and fitness. Academic performance was measured according to student achievement on the Texas Essential KNowledge and Skills (TAKS) assessments, which are standardized and required for all students residing in the state of Texas (Janek et al., 2015). The results from this study were different than the other studies that are summarized within this literature review. Researchers ultimately found that cardiovascular fitness did not impact a student's academic performance, however, BMI (body mass index; body composition) did present a statistical relationship with academic performance (Janek et al., 2015). These findings conflict with the findings of a previous study, indicating that further research needs to be completed on the effect of a student's BMI on their academic achievement levels.

This portion of the literature review examined the effect of gender on the academic performance of school age adolescents in relation to their physical fitness routines and abilities. Research in this area would indicate that there may not be a significant difference when it comes to gender and physical fitness on the student's academic performance. There was another correlation that was found in some of these studies, and that was that there is a link between socioeconomic status and academic performance. This could be due to fewer opportunities for sports and physical activity, as well as many other factors related to lower socioeconomic status.

Table 1: Summary of Literature Review Studies

Research	Findings	Ideas/Take Away	Title and Author
General Studies on the Relationship Between Physical Activity and Academic Performance			
Student performance on standardized tests in Language Arts and Math vs. Number of Physical Education hours	The school with more PE hours scored significantly higher in Language Arts than the other school.	Schools should not decrease Physical Education hours.	Tremarche, P. V., et. al. (2007) Physical Education and its Effects on Elementary Testing Results.
Student performance on standardized tests vs. the amount of Physical Education classes completed within a week	Students with more PE classes in a week scored higher on standardized tests.	Schools should not decrease Physical Education hours.	Kim, S., & So, W. (2012). The Relationship Between School Performance and the Number of Physical Education Classes Attended by Korean Adolescent Students.
Tested 'Brain Gym' as a quality way of increasing student movement	Inconclusive due to lack of teacher participation.	Further research has shown that Brain Gym is not an evidence based practice and not a useful tool in increasing academic performance.	Templeton, R. A., & Jensen, R. A. (1996). Can Adding Movement to Learning Improve the Classroom Environment?
Student performance on standardized testing while implementing the ASK program. Other factors were also considered in the findings.	The ASK program significantly increased the test scores of the students completing the program vs the control.	Further research on the ASK program has concluded it is an evidence based practice with high quality results.	Resaland, G. K., et. al. (2015). Active Smarter Kids (ASK): Rationale and design of a cluster-randomized controlled trial investigating the effects of daily physical

			activity on children's academic performance and risk factors for noncommunicable diseases.
Students with Disabilities and Physical Activity to Increase Academic Performance			
Short exercise (10 min) before an academic task in students with significant disabilities.	There was a significant increase in the performance of the students in grades 3-5 than the students in K-2.	Exercise programs may be more helpful starting a certain age than in the younger grades.	Everhart, B., et. al. (2012). The Influence of Daily Structured Physical Activity on Academic Progress of Elementary Students with Intellectual Disabilities.
Brain Gym as a viable program for increasing academic performance.	Results not significant to conclude a successful program.	Brain Gym is not a viable program for increasing academic performance.	Watson, A., & Kelso, G. (2014). The Effect of Brain Gym® on Academic Engagement for Children with Developmental Disabilities.
Can early motor skill assessments predict future academic proficiency?	Their study found that students that scored lower on the motor ability assessments also scored lower on academic assessments. However, they were also comparing students with diagnosed Developmental Cognitive Disorders and typically developing children.	This study may show assessing a child's motor function and early intervention of deficiencies will help increase the child's future academic performance.	Asonitou, K., et. al. (2010). Motor skills and cognitive abilities as a precursor of academic performance in children with and without DCD.
Neurological dysfunction can predict decreased academic performance, and exercise interventions will then be able to increase the student's performance despite their assessed dysfunctions.	Specific neurological functions affect certain academic tasks. Using specific exercises, the researchers could increase neurological functioning and gross motor movements as well as academic performance.	Assessing a student's specific gross motor movements and neurological functions during special education evaluations may help to know specific movements needed to increase that student's academic performance.	Blythe, S. G. (2005). Releasing Educational Potential Through Movement: A Summary of Individual Studies Carried Out Using the INPP Test Battery and Developmental Exercise Programme for use in Schools with Children with Special Needs.
Movement and Its Effect on Academic Performance in Students with Different Learning Styles			
Does 'active cooperative learning' increase student's academic performance?	The students retained more information when there was movement attached to the lesson.	Teachers can use movement in their lessons to increase information retention.	Shoval, E., & Shulruf, B. (2011). Who benefits from cooperative learning with movement activity?
Studied a program that	The study concluded	Teachers may still benefit	Mullender-Wijnsma,

used movements incorporated with the lessons. Example is student would jump 5 times to answer the question of 2 plus 3.	students were more on task throughout the lessons, but it was not conclusive of increasing academic performance.	from using movement in their lessons. Time on task and attention during the lesson is still very important.	M., et. al. (2015). Moderate-to-vigorous physically active academic lessons and academic engagement in children with and without a social disadvantage: A within subject experimental design.
This study was looking at the relationship of a student being physically fit and his or her academic performance.	The study showed the relationship being positive in the middle and high school levels and not significant in the elementary levels.	Encouraging students and adolescents to stick with sports and physical activities through their school years may increase their academic performance.	Coe, D., et. al. (2013). Physical Fitness, Academic Achievement, and Socioeconomic Status in School-Aged Youth
Movement and the Academic Performance Difference in Each Gender			
Does moderate or vigorous have more of an effect on academic performance?	The study concluded vigorous exercise was more effective in males and moderate exercise was effective in both males and females. Strength training did not have an effect.	It could be said that boys need more movement than girls throughout the day. Teachers and parents would benefit from encouraging the children to move more, especially boys, and again stick with sports and physical activity.	So, W. (2012). Association between physical activity and academic performance in Korean adolescent students.
This study looked at the relationship of physical fitness and academic performance, while adding in other factors.	The study concluded that physical fitness does have an increase in academic performance, as well as self-worth and socio-economic status. A child's gender and body composition does not make a significant difference.	Encouraging children to exercise and be involved in sports and physical activities will have positive improvements on their academic performance.	Srikanth, S., et. al. (2014). The Relationship of Physical Fitness, Self-Beliefs, and Social Support to the Academic Performance of Middle School Boys and Girls.
This study is very similar to the previous one. It measured the student's academic performance as compared to their socio-economic status, body composition, and cardiovascular fitness.	The study concluded that the student's cardiovascular fitness did not have a significant effect on academic performance, but body composition did.	Further research may need to be done to conclude specifically the level of physically fit a student needs to be in order for it to affect their academic performance.	Janak, J. C., et. al. (2014). The Association Between Physical Fitness and Academic Achievement in Texas State House Legislative Districts: An Ecologic Study.

CHAPTER III: APPLICATION

Suggestions for Teachers and Parents Through This Study

It is concluded, through this literature review, that there is a correlation between movement and exercise and an increase in academic performance. I would now like to share ideas and ways for teachers to implement movement into their classrooms and curriculum. I will suggest three ways for implementation of movement into the classroom. The first will be the most simple and non-intrusive; the next two require more resources and time for implementation in a classroom setting.

Brain Breaks

My first suggestion is a small change most teachers can do easily and with the least amount of added resources. This change is to add short brain breaks within the school day. This is beneficial for all students as it may impact their ability to focus on tasks, pay attention to lessons and directions, and give them a general interest in their school day. One of these brain break ideas is a short (less than 5 minutes) activity that involves dancing/exercises, stretching/yoga moves, or breathing/meditation. These can be teacher led or from a video. Through the internet there are many free websites on brain breaks and applications that can be easily used in a classroom setting. An example is GoNoodle.com. This website is free and features hundreds of videos for this purpose that are kid friendly, short, and entertaining. The videos are only a few minutes long and almost all teachers have a projector and computer in their classroom already, so there is no need for any added resources.

Brain break videos can also easily be found on YouTube, however, these may need to be previewed by an adult before showing to children. Through the success of the ASK Program and other research, it would be beneficial to complete one of these short

brain break/movement breaks each day. The following table represents an example of a typical daily schedule for an elementary classroom:

Monday
8:00-8:15 Morning Business
8:15-9:25 Math
9:25-9:50 Science/Social Studies
9:50-10:10 Recess
10:10-10:20 Silent Reading
10:20-11:05 Art
11:10-11:40 Phy Ed
11:40-11:55 Fact Fluency
11:55-12:05 Literacy Prep
12:05-12:55 Lunch/Recess
12:55-1:05 Planner/Mail
1:05-2:15 Literacy
2:15-2:55 Writing
2:55-3:05 Clean-Up/Dismissal

There are many areas where a Brain Break may be added. The following is the same schedule with a note in the section of the day where a Brain Break may fit.

Monday

8:00-8:15 Morning Business **Great way to start the day.*	*A dancing or stretching type of brain break video will help the students wake up.
8:15-9:25 Math **Between two attention focused subjects.*	*A stretching activity would be helpful to get the body moving between longer sitting periods.
9:25-9:50 Science/Social Studies	
9:50-10:10 Recess	
10:10-10:20 Silent Reading	
10:20-11:05 Art	
11:10-11:40 Phy Ed **Switching gears from non-academic subjects to attention focused subjects.*	*A mindfulness or meditation type video will help the students regain focus and concentration.
11:40-11:55 Fact Fluency **Movement based instructional lesson on math facts.*	*Students may play quick moving fact fluency games while standing or walking around the room. *Or the teacher may have the students answer questions through jumping the answer, showing on their fingers, or moving their arms to show an angle.
11:55-12:05 Literacy Prep	
12:05-12:55 Lunch/Recess	
12:55-1:05 Planner/Mail	
1:05-2:15 Literacy **Between two attention focused subjects.*	*A dancing activity would be a great choice here for an end of the day wake up.

2:15-2:55 Writing	
2:55-3:05 Clean-Up/Dismissal	

Active-Social Learning Opportunities

I feel if teachers can incorporate active-social learning opportunities in their classroom, students will have an increase in performance. Some of this research has shown that when students are engaged in what they are doing they are more likely to learn.

There are many ways to incorporate active-social learning opportunities. One study showed us that students simply moving their arms in the type of angle the teacher was looking for increased their ability to know the types of angles on assessments. Another instructional example would be to have students jump during math lessons. This might mean the student would jump 5 times to answer the math problem 2 plus 3. These are great suggestions for the more active students in a classroom. Other opportunities for active-social learning may include:

- Teachers may have students moving about the room talking with a partner about the lesson topic.
- Students may go to different areas of the room to answer questions.
- Students may be able to answer questions by jumping or pointing.
- Flexible seating options can allow for movement without being distracting to other students or the teacher:
    - allowing a student to stand at their desk

- having a bubble seat cushion
- an exercise ball
- bean bag chair
- a foot band on their chair

Movement-based curriculum

Lastly, a much larger and more time-consuming way to add in movement is to implement a movement based program into the class curriculum. Though it may be more time-consuming, it is often the most beneficial. There were two programs that were mentioned in the literature review, Brain Gym and the ASK (Active Smarter Kids) program. Further research determined there is little supportive evidence for the program Brain Gym. This is not a suggested program through this literature review because it is not an evidence based practice, so I am going to suggest the ASK program.

Research supporting this program, the outline and description, and videos and examples can all be found on their website www.activesmarterkids.com. The program originated in Norway at the Sogn og Fjordane University College in Sogn og Fjordane, Norway. Professors and researchers at the University developed this program to increase academic performance in adolescents. It consists of three components including physically active educational lessons, brain breaks, and homework. Teachers are required to have students perform a physically active educational lesson, which is 30 minutes long, three times per week. These lessons include large charts or puzzles that are placed on the ground and completed by groups of students or individually and having relay races to answer questions. The second component of the ASK program has teachers provide

students with a five-minute brain break video once per day. These videos include dancing, stretching, and breathing techniques so the students are able to regulate their body and mind for optimal learning. The last component requires students to complete at least 10 minutes of physical activity at home for homework each evening. This homework can include sports, running, walking, swimming, or any sort of vigorous play or activity. With the program implemented appropriately there can be a lot of success in the increase of academic performance in adolescent students.

Teachers and parents should always encourage students to have an active and healthy lifestyle. Research from this literature review has shown that students who simply are more active achieve higher on standardized tests. Encouraging children to be in sports, play outside, go for walks or bike rides can benefit children, not just physically, but educationally as well. Attached is an infographic created to inspire teachers on the ways that they can incorporate movement into their classrooms to increase the learning of their students.

CHAPTER IV: CONCLUSION

Literature Review Overview

More attention is being brought to the topic of brain-based teachings and physical activity and the positive effect each can have on academic progress. From the studies mentioned in this literature review, it could be concluded that incorporating physical activity into the classroom, or school day, is generally beneficial for students' academic progress. This was shown in these studies through increased standardized test scores, increased focus and attention, improvement from pre- to post- questionnaires, and improvement on their classroom work. There were few studies where this correlation was not concluded. In the studies within this literature review, there were varying degrees of physical movement as well as differences in the types of assessments completed to measure academic progress. These make a difference in the results of the studies. There

are also many other factors that are at play when it comes to a child's academic progress, such as nutrition, socioeconomic status, mood, and a presence of a disability.

Each section of the literature review referred to a population of students they were assessing to answer the question: does increased movement increase the academic performance of school aged students with and without disabilities? The first section of this literature review, which looked at a general population of people, concluded that exercise programs have a benefit, not only for health reasons, but also for academic purposes. This section gave ideas on how to implement this intervention into the everyday classroom. There are programs, such as Brain Gym and the ASK program, which were described in this section, to help teachers with specific movements and directions for implementing movement routines in their classroom. The programs are very prescribed and may take time and training that teachers may not have access to in their districts. Another option for schools that was mentioned in these articles, were regular Physical Education (PE) classes. It would be very beneficial for schools to continue PE as an option for all students as a means to increase the academic performance of their students.

The second section examined students with disabilities and the link between physical activity and motor skills on academic performance. The studies in this section looked specifically at using movement as an academic intervention with students with special needs. It would be beneficial for parents and educators to take this information into consideration and work to increase the child's motor skills, which may give the opportunity to increase the child's academic ability in the future. There is potential then

to decrease the achievement gap between typical students and students receiving special education services if interventions are implemented at an early stage. It would be beneficial for parents and special educators to encourage the school district to perform gross motor assessments through the special education evaluation process. This would help staff to determine if there are specific needs in the gross motor area, where adding physical therapy (PT) services to a student's Individual Education Plan would not only benefit the student physically, but academically as well.

The question that guided this literature review and practical recommendations for increasing movement among students was: does increased movement and physical activity increase academic performance in school aged students with and without disabilities? A review of literature pertaining to these topics, would reveal that yes, increased opportunities for physical activity do increase in academic achievement. While, there may be other factors that contribute to the academic performance of a child, such as a presence of a disability, socioeconomic status, and feelings of self-worth, there is data to support that increased exercise and movement in the classroom results in increases in a student's academic success. The follow up question of, "what is the best way to include physical activity or movement into a student's day to reach his or her potential maximum academic output?", is a little more difficult to answer. This may be reliant on school resources and school demographics. However, the suggestions in the Application Chapter will give schools, teachers, and parents suggestions on what may be done to increase academic performance through movement. The top suggestions for teachers are to implement an evidence based practice into the school day and incorporate movement into

the lessons. The top suggestion for parents would be to encourage your children to be involved in sports, or incorporate some type of exercise into their daily routine. Finally, the top suggestion for school districts and school administrators would be to not to take away Physical Education classes and recesses. All opportunities for movement in the school setting are valuable; and given the link to academic achievement, should be given priority.

References

Anderssen, S. A., & Resaland, G. K. (n.d.). ASK. Retrieved from https://www.activesmarterkids.com/ask

Asonitou, K., Koutsouki, D., & Charitou, S. (2010). Motor skills and cognitive abilities as a precursor of academic performance in children with and without DCD. *Procedia - Social and Behavioral Sciences,5*, 1702-1707. doi:10.1016/j.sbspro.2010.07.350

Blythe, S. G. (2005). Releasing Educational Potential Through Movement: A Summary of Individual Studies Carried Out Using the INPP Test Battery and Developmental Exercise Programme for use in Schools with Children with Special Needs. *Child Care in Practice,11*(4), 415-432. doi:10.1080/13575270500340234

Coe, D., Peterson, T., Blair, C., Schutten, M., & Peddie, H. (2013). Physical Fitness, Academic Achievement, and Socioeconomic Status in School-Aged Youth. *Journal of School Health J School Health, 83*(7), 500-507. Retrieved July 2, 2015, from Academic Search Premier.

Dennison, P., & Dennison, G. (n.d.). What is Brain Gym? Retrieved from www.braingym.org/about

Duman, B. (2010). The Effects of Brain-Based Learning on the Academic Achievement of Students with Different Learning Styles. *Educational Sciences: Theory and Practice, 10*(4), 2077-2103. Retrieved June 24, 2015, from ERIC.

Everhart, B., Dimon, C., Stone, D., Desmond, D., & Casilio, M. (2012). The Influence of Daily Structured Physical Activity on Academic Progress of Elementary Students with Intellectual Disabilities. *Education, 133*(2), 298-312. Retrieved July 2, 2015, from Academic Search Premier.

Janak, J. C., Gabriel, K. P., Oluyomi, A. O., Peréz, A., Kohl, H. W., & Kelder, S. H. (2014). The Association Between Physical Fitness and Academic Achievement in Texas State House Legislative Districts: An Ecologic Study. *Journal of School Health,84*(8), 533-542. doi:10.1111/josh.12176

Jensen, E. (2005). *Teaching with the Brain in Mind* (2nd ed.). Alexandria, VA: Association for Supervision and Curriculum Development (ASCD).

Kim, S., & So, W. (2012). The Relationship Between School Performance and the Number of Physical Education Classes Attended by Korean Adolescent Students. *Journal of Sports Science and Medicine,11*, 226-230.

Mullender-Wijnsma, M., Hartman, E., Greeff, J., Bosker, R., Doolaard, S., & Visscher, C. (2015). Moderate-to-vigorous physically active academic lessons and academic engagement in children with and without a social disadvantage: A

within subject experimental design. *BMC Public Health, 15*(1), 1-9. doi:10.1186/s12889-015-1745-y

Resaland, G. K., Moe, V. F., Aadland, E., Steene-Johannessen, J., Glosvik, Ø, Andersen, J. R., Anderssen, S. A. (2015). Active Smarter Kids (ASK): Rationale and design of a cluster-randomized controlled trial investigating the effects of daily physical activity on children's academic performance and risk factors for non-communicable diseases. *BMC Public Health,15*(1). doi:10.1186/s12889-015-2049-y

Self-Determination Theory (Deci and Ryan). (2016, October 04). Retrieved from https://www.learning-theories.com/self-determination-theory-deci-and-ryan.html

Shoval, E., & Shulruf, B. (2011). Who benefits from cooperative learning with movement activity? *School Psychology International, 32*(1), 58-72. doi:10.1177/0143034310396806

So, W. (2012). Association between physical activity and academic performance in Korean adolescent students. *BMC Public Health, 12*(258), 1-7. Retrieved July 2, 2015, from Academic Search Premier.

Srikanth, S., Petrie, T. A., Greenleaf, C., & Martin, S. B. (2014). The Relationship of Physical Fitness, Self-Beliefs, and Social Support to the Academic Performance of Middle School Boys and Girls. *The Journal of Early Adolescence,35*(3), 353-377. doi:10.1177/0272431614530807

Templeton, R. A., & Jensen, R. A. (1996). Can Adding Movement to Learning

Improve the Classroom Environment? *American Educational Research Association*. Retrieved from ERIC Database.

Tremarche, P. V., Robinson, E. M., & Graham, L. B. (2007). Physical Education and its Effects on Elementary Testing Results. *Physical Educator,* 64(2), 58-64.

Watson, A., & Kelso, G. (2014). The Effect of Brain Gym® on Academic Engagement for Children with Developmental Disabilities. *International Journal of Special Education, 29*(2), 75-83. Retrieved June 24, 2015, from ERIC.

Wentzel, K. R., and Miele, D. B., "5. Achievement Goal Theory: The Past, Present, and Future." *Handbook of Motivation at School*, Routledge, 2009, p. 77.