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Effects of Directed Movement on Focus

Catherine A. Zoeckler
St. Catherine University, cazoeckler@stkate.edu

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An Action Research Report

by

Catherine Zoeckler

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Catherine A. Zoeckler

St. Catherine University

St. Paul, Minnesota

Advisor ________________________________ Date______________________________

Abstract

The purpose of this study was to determine if directed movement would positively affect the focus for all children. Children with underdeveloped executive functions frequently disrupt the learning of others. This study was implemented in a mixed-age lower elementary classroom populated by 27 children ages 6 to 9 years. The project covered a total of six weeks, four of which included directed movement for at least three days of the week. Prior to implementing movement into the classroom, three lessons were presented that related to brain function, focus and mindfulness. Pre-study student work samples, teacher observations of the work period and student self-assessments provided baseline data. Throughout the duration of the directed movement portion of the study weekly self-assessments and teacher observations were conducted. A post-study student-assessment was provided and student work samples were again collected. Upon completion, the majority of the students reported having enjoyed the directed movements incorporated into the classroom routine. The results showed an improvement in the ability to focus and in productivity indicating that frequent directed movement has a positive impact on executive functions.

Keywords: Executive functions, mindfulness, productivity, focus

An adorable six-year-old's warm smile and brown eyes melt your heart and an instant later he launches himself across the classroom repeatedly stomping and kicking every lesson he encounters. Frustrated classmates call out, “Hey! You messed up my work!” When greeted earlier, he yelled, “Hel-lo!” at the top of his lungs using the same tone and volume used to blurt out answers in small group lessons. He rolled, kicked, shouted, and sprawled his way through his first year in a Montessori classroom. Did he learn? Some. Mostly he distracted and prevented the classroom from normalizing into a beautiful, self-directed Montessori environment.

But he is not alone. Recently a larger than normal percentage of students with issues relating to executive functions, seem to dominate Montessori classrooms (Cossentino, 2010). These students seem less focused at lessons, often interrupt, and have difficulty sitting for longer than two or three minutes at a time. The term Executive Functions refers to self-control, planning, and working memory (Diamond & Lee, 2011). Children having low executive function skills display a lack of attention, poor self-control and extremely low level of persistence (National Institute of Mental Health, 2015). At the age of 6, 7, 8 or 9-years-old these children have not developed social skills equal to their peers and are at risk of falling behind academically (Diamond & Lee, 2011). Although they are provided with weekly teacher conferences and daily work plans, children in my environment continue to wander the classroom disrupting other students and requiring constant redirection. They are intelligent and appear eager to comply when the behavior is brought to their attention over and over again. The issue may stem from a sensory integration disorder, hyperactivity or attention deficit but seems to be exacerbated by a lack of self-awareness of the student's poor self-control and the constant need to move. Studies show that interventions that include exercise and mindfulness may increase the development of executive functions in six-year-olds and others (Diamond & Lee, 2011).

This action research project incorporated directed movement into the daily routine for all students in the class and created a daily self-assessment of work completion and student satisfaction. I hope to aid the development of executive functions which, in turn, should improve the students' ability to stay focused and on task.

The classroom that my action research was conducted in is a multi-age Montessori lower elementary classroom with twenty-seven students: 18 boys, 9 girls, ages 6-9 years old. Before the project began, work samples were collected across all age levels that would be compared to samples collected at the end of the project. Samples were scored with a rubric demonstrating organization, level of completion and task adherence. The project was completed in six weeks.

The purpose of this research was to improve student cognitive abilities by introducing mindfulness and aerobic, cross-body exercises. Principles of Positive Discipline, the theory of "flow" (Nakamura & Csikszenmihalyi, 2009) and Lucy Jo Palladino's theory of finding one's "focus zone" (2007) aided in building a framework. As reinforcement, older children were shown the video titled *The Scientific Power of Meditation* (ASAP Science, 2015) while younger children listened to Eline Snel's *Sitting Still Like a Frog* (2013) audio recording. I hoped to discover how directed movement affects focus in elementary students.

Literature Review

Attention Deficit Hyperactivity Disorder (ADHD) is on the rise. The average elementary classroom in the United States now has between 10% and 15% of children that are identified with ADHD (Cossentino, 2010). The National Institute for Mental Health (2012) states that ADHD is one of the most common brain disorders and that there is no cure. Children with ADHD show a higher motor activity when compared to typically developing children. In particular, a higher level of activity is seen in children with ADHD while completing in-seat assignments (Rapport et al., 2009). Further studies have shown that students with ADHD obtain significantly lower scores in reading and mathematics and overall have less academic achievement (Tsal, Y., Shalev, L. & Mevorach, C., 2005). My study looks at activities that may aid children in a Montessori classroom that appear to have some traits of ADHD in order to improve time focusing on tasks and reducing distractions to others.

Effects of ADHD in the Montessori classroom

Statistics show that ADHD children now make up 10% - 22% of the average Montessori classroom population (Cossentino, 2010). Many of these children find their way to Montessori schools because they don't fit in in traditional schools, they are falling behind academically or are having difficulty socially. Some of the ways Montessori schools are helpful for these children are the use of manipulative materials, freedom of choice and individualization (Cossentino, 2010) as well as providing a 3-year classroom cycle. Some of the ways the Montessori classroom is disrupted by these children are directly related to a delay in the development of executive functions (EFs) (Cossentino, 2010; Davis et al., 2007). The symptoms of ADHD are difficulty staying focused, difficulty controlling behaviors and hyperactivity (i.e. acts as if driven by a motor) (Armstrong, 2015; Davis et al., 2007; National Institute for Mental Health (NIMH), 2012). These symptoms manifest in fidgeting and squirming in their seats, nonstop talking, dashing around the classroom, touching things impulsively, being impatient, blurting out answers in lessons, reacting emotionally without restraint, having no regard for consequences, and interrupting (Armstrong, 2015; NIMH, 2012). Symptoms of an inattentive form of ADD/ADHD include having difficulty sustaining attention, avoiding mental effort, losing things, being forgetful, easily distracted, and disorganized and having poor listening skills and difficulty following through on tasks (NIMH, 2012). These symptoms all require additional support and control in the classroom and interfere not only in the learning for the ADD/ADHD student but also that of classmates (Mulrine, Prater & Jenkins, 2008).

Executive Functions and ADHD

Recent studies have shown that children with ADHD have a reduced connectivity between brain hemispheres, less activity in the frontal cortex and are up to 3 years behind normal development socially and emotionally (NIMH, 2012). The delay affects paying attention, thinking and planning (NIMH). Core executive functions including cognitive flexibility, self-control, and working memory need to be developed in these children in order for them to be successful learners (Diamond & Lee, 2011).

Brain images have shown that the frontal lobe and the temporal lobe are areas where Executive Functions (EFs) are performed (Armstrong, 2015). These areas are affected by ADHD (Armstrong, 2015) as well as the cortex showing a delay in maturation and an abnormal pattern in the structure that allows the two halves of the brain to communicate (NIMH, 2012). Core EFs are needed when one needs to concentrate, think and to inhibit acting on one's first impulse

(Diamond & Lee, 2011). Core EFs consist of flexibility, inhibition, and working memory. More complex EFs are problem solving, reasoning and planning. Diamond and Lee (2011) found that EFs are even more important than intelligence quotient (IQ) in determining school readiness and to optimize educational success, EFs must be developed (Blair, 2007; Gathercole, Pickering, Knight, Stegmann, 2004; Prince et al., 2007; Riggs, Greenberg, Kusche, Pentz, 2006; Raver et al., 2008; O'Shaughnessy, Lane, Gresham, Beebe-Frankenberger, 2003 in Diamond & Lee, 2011).

Reaching Normalization, Flow, Optimal Experience and Focus Zone

Much research has been conducted on the flip side to ADHD, which is a relaxed and calm state of productive focus that allows the brain to relax into a reasoning state (Kahn, 2003 Montessori, 1949; Nakamura & Csikszenmihalyi, 2009; Palladino, 2007; Rathunde, 2001). Montessori (1949) called it normalization when children are so engaged in working that no amount of distraction can pull them away. She believed that love of work, concentration, self-discipline and sociability all must be present for the normalization process to occur (Montessori, 1949). "An interesting piece of work, freely chosen, which has the virtue of inducing concentration rather than fatigue, adds to the child's energies and mental capacities and leads him to self-mastery" (Montessori, 1949, p. 257). In this state they are utilizing and engaging EFs to the best of their ability at that point in their development. Csikszenmihalyi described a theory for maximum enjoyment and productivity as "flow." Flow is "the quality of experience as a function of the relationship between challenges and skills. Optimal experience or flow, occurs when both variables are high" (as cited in Kahn, 2006, p. 2).

The term *flow* describes moments when a person is fully concentrated on a task at hand,

> relatively oblivious to the passage of time, and feeling clear about what needs to be done from one moment to the next. Flow theory is a person-environment interaction theory in that flow is triggered by a good fit between a person's *skills* in an activity and the *challenges* afforded by that activity (Rathunde, 2001, p. 14).

Kahn described the relationship between Montessori and flow as the optimal experience. Normalization can only occur in the first plane of development, but when individuals reach an optimal experience, they return to a state of "normality" (Kahn, 2003). In her book, *Find Your Focus Zone*, Lucy Jo Palladino explained that flow can be difficult to achieve because so many conditions need to be exactly right. Goals, skills and challenges all need to be aligned at the right time in order to achieve it. Palladino instead utilizes an upside down U-curve where stimulation of adrenaline and selective attention overlap in the center third of the curve. She calls that center range "the optimal range of performance" or the focus zone (Palladino, 2009, p. 20). The focus zone can easily be attained when the brain is neither under stimulated nor overstimulated, and clear choice is made to attempt a task.

Effective Interventions in Development of EFs

Diamond & Lee (2011) presented meta data on methods tested to aid in the improvement of executive functions. Their results showed that aerobic exercise, mindfulness and classroom curricula that include movement and mindfulness all showed measurable improvement in EFs. Additionally, aerobic exercises and repetition increase connectivity and stimulate working memory (Diamond & Lee, 2011). McCabe (1999) cited data from over 80 studies determining that "children can raise their achievement level, increase their motivation, and heighten their understanding through motor skills, music and proper nutrition" (McCabe as cited in Hendy, 2000, p. 84). In a review of McCabe, Hendy recommended movement experiences that have a graduated degree of challenge allowing for development as a sequential process that follows the growth of the child (Hendy, 2000). Palladino (2007) outlined a comprehensive program to enrich attention that incorporated vocabulary, mindfulness to increase or decrease stimulation, regular exercise, proper rest and diet as well as implementing a lifestyle free of clutter and reliance on electronic devices (e.g. computer, cell phone, etc.) (Palladino, 2007). A 2004 study led by Karen Harris at Vanderbilt University showed that self-monitoring through self-assessment of both performance and attention indicated an increase in focus and productivity (i.e. utilizing EFs) in children with ADHD (Harris et al., 2005). Studies based on movement as an intervention base their research on a theory that a stimulus or arousal is necessary in these children to engage EFs. The research indicated that the ADHD brain when under aroused requires the child to move, shout, grab or hit impulsively to self-correct (Diskstein et al., 2006; El-Sayad et al., 2002; Mann et al., 1992 in Rapport, et al., 2009). When stimulated, EFs are engaged. Harris et al. (2005) showed that awareness of positive outcomes enabled children to take control of maintaining the balance of stimulation in order to produce a state of normality, whether it is called flow, optimal experience or being in the focus zone (Harris, 2005).

Exercise (movement) aids the development of EFs

Early studies focusing on movement affecting cognitive abilities in adults were prevalent, but since the year 2000 many researchers have made foundational findings in the effects of movement in improving learning in children (Davis, 2007; El Nokali, 2011; Hill, Williams, Aucott, Thomson & Williams, 2011; Roberts 2009; Schottelkorb 2009). In a study conducted by Roberts (2009), students' academic achievement scores were correlated to their overall fitness level. The development of physical fitness indicated a strong positive correlation and an increase in student achievements, particularly in the area of mathematics (Roberts, 2009). El Nokali (2011) studied 4 to 5-year-olds as well as 8 to11-year-olds to compare the effects of recess versus directed exercise on student achievement. Her study concluded that for the younger children more playtime resulted in lower self-regulation and achievement but more directed physical activity resulted in better reading and mathematics scores. Similar results were found for the older children, more recess negatively impacted math achievement where more physical education showed positive correlation to self-control (EFs) and achievement. The results of a study by Davis et al., (2007) on 7 to 11-year-olds supported meta-analysis results showing physical exercise training significantly improved cognitive ability. High doses of exercise were shown to increase EFs, especially in planning which related to organizing and controlling goal-directed actions. The conclusions indicate that physical activity may be necessary for a healthy neural system in children (Davis et al., 2007). Two studies conducted by Hill et al. (2011) focused on student cognitive skills directly after acute physical exercise of elementary children in the U.K. The study was only 2 weeks long but showed definitive correlation by presenting a standardized CTB test of student achievement after a week of exercise and again after a week without exercise. The results showed a distinct increase in cognitive functions after exercise. This study also isolated children with ADHD for analysis and indicated that their improvement matched the rest of the group. Based on that finding, the conclusion indicated that the best approach would be to implement a regular physical activity program into the mainstream classroom (Hill et al., 2011).

Programs developed to direct movement and aid focused attention

There have been many programs and systems devised to incorporate directed movement (i.e. exercise) into the classroom. The goal of each of these programs is to improve focus, self-control and student achievement. All of the improvements suggested are within the area of EFs. Brain Gym, based on the original work of Dr. Paul Dennison in the early 1970's, relating to brain plasticity and an interdependence of physical movement and academic achievement, (Dennison & Dennision, 1994 as cited in Hornbeak, p. 17) is a popular movement-based program designed for teachers and parents to implement with children to enhance learning. The 26 basic activities within the model of Brain Gym are supported by research to enhance learning and performance. Brain Gym is the core component of Educational Kinesiology also known as Edu-K (Hornbeak, 2007).

Melani Alexander Fuchs, an elementary teacher from Ithaca, NY, created a program of daily activities for young children. There are four phases of motor development reflexive, rudimentary, fundamental and specialized (Gallahue, 1992). Fuchs advocated that daily movement education “should be an essential part of the school curriculum” (Fuchs, p. 30) to increase coordination, organization, self-control and behavior choices (Fuchs, 2015).

Yoga 4 Classrooms is a program that utilizes a deck of cards with 67 yoga-based activities that can be utilized by children independently in a classroom (Yoga4classrooms, 2015). Studies show that exercise facilitates “children's executive function, by increasing activation in the prefrontal cortex and serotonergic system” (Yoga4Classrooms, 2014, Supporting Research). Yoga has been supported by meta-analysis reviews to be beneficial to the learning environment as well as in reducing stress and improving cognitive development (Rempel 2012; Roeser 2012;

Sharma 2014; Zelazo 2012 cited in Yoga4Classrooms, 2014, Supporting Research). By integrating directed physical movement, breathing and focus, yoga may be an ideal form of exercise to aid in children's cognitive development (Yoga4Classrooms, 2014).

As a teacher in a classroom of young children, I want to do everything possible to assist in their development and learning. Children with delayed development of EFs display poor self-control and focus. These children are at risk of falling behind academically and interrupt the learning of other students. The literature shows that directed physical exercise aids in the development of EFs and offers increased opportunities to reach a state of optimal experience for learning. Several education professionals have developed movement-based programs specifically for teachers to implement into their classrooms including the two I used: Brain Gym and Yoga 4 Classrooms.

Description of Research Process

This study determined how directed movement aided in increasing executive functions and created increased opportunities for learning in children in my classroom. Directed movement was added to the routine of a mixed age, lower elementary class of 27 children consisting of 18 boys and 9 girls. The ages of the children were ten 6 year olds, nine 7 year olds, seven 8 year olds and one 9 year old.

Directed movement was introduced three times per week for 15 minutes during or immediately following morning circle. To determine if the activity would improve executive functions in children, data collection tools measured level of focus, organization and completion of tasks, perseverance, and student self-assessment. For the purpose of this project directed movement is defined as exercise incorporating mindfulness and following a pattern or rhythm.

Daily mindfulness had previously been established by integrating a mindfulness candle and a minute of silence during the morning circle. Samples of work completed by the class were collected as a baseline prior to introducing any intervention. These were scored according to the Rubric for Student Artifacts Collected (Appendix A) to indicate completeness, neatness, planning, and timeliness. Similar artifacts were collected for comparison at the completion of the intervention. Throughout the six week project 15 minute observations were made and recorded on the Observation of Behaviors Tally Sheet (Appendix B) during work time to tally student behaviors including the number of minutes they remained on task, unfocused behavior such as wandering and disturbing others, and focused behavior such as working to completion. In addition, individual incidences of engagement, persistence, focus, and my notes and perceptions were recorded on a Daily Field Journal (Appendix C).

Two lessons relating to vocabulary and process of focus were presented over a period of one week and prior to introducing the directed movement. First, the concept of how the brain reacts to stimulation was introduced using the Dr. Dan Siegel's Brain in the Palm of Your Hand demonstration (2004). Briefly, the fist closed over the thumb is like the connected and reasoning brain. The brain stem is represented by the lower palm of the hand, the thumb represents the mid-brain and the fingers represent the cortex region. When excited, overstimulated or afraid, glands produce hormones or “juices” that create a barrier to allowing reasoning, clear communication and problem solving in the cortex. The children were instructed to bend their thumb in and to make a fist over it to represent a calm, reasoning brain. They then open their fists by raising their four fingers straight up to show how the hormones could cause them to “flip their lids” and react without clear thinking (Siegel & Hartzel, 2004). The second lesson was designed to introduce new vocabulary and concepts including focus, distraction and self-assessment. Children volunteered to get out dictionaries to find the definitions. Those definitions were written on sentence strips. The children were asked to share times when they felt focused and times they felt distracted, and what contributed to those feelings. The fundamental needs for focus were presented as being calm, having basic needs met (not hungry or thirsty), having a clear goal and having materials needed to meet the goal including an understanding of what was to be done, and having the skill to do it (Palladino, 2007). During a class meeting, the children created the group poster shown in Figure 1 outlining their strategies to get to their focus zone.

During week two of the project, I introduced directed movement activities for 15 minutes three times per week. Initially, they were done with the whole class sitting in a circle. Brain Gym activities of rhythm clapping, brain buttons, cross-crawl and hook-ups (Appendix D) were introduced (Hornbeak, 2007). On subsequent days Brain Gym figure eights and yoga movements including neck rolls, washing machine, cobra, mountain, dog, and cat were added.

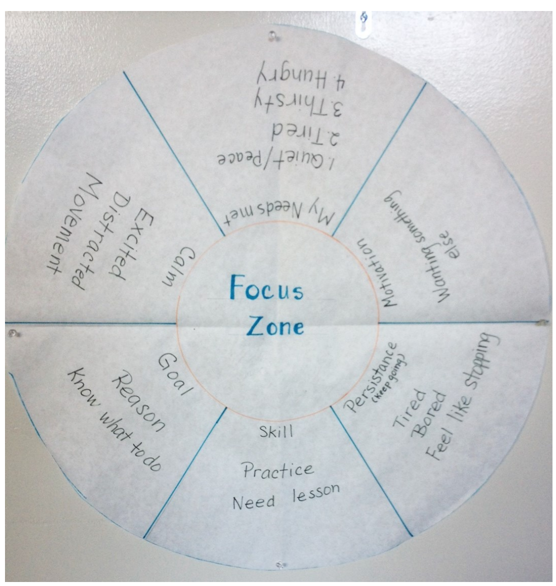

Figure 1. Focus zone poster

Over the course of the project songs with movements, regular calisthenics, and partner yoga stretches were included. No special clothing was required although the children did remove their shoes and yoga mats were provided. The mats seemed to help contain the movements of individual children. Throughout the program the number of students in each group increased each week. Initially, only 8 to 10 children were in each group, then 14 to 15, and finally the activities were done with the whole class. During the last two weeks, the directed movement was increased to every day. During the sixth week, Brain Breaks were introduced as individual opportunities for students to utilize the Yoga 4 Classrooms cards throughout the day (2015).

Students completed the Student Self-Assessment (Appendix E) once per week during weeks one through four and daily during week five. To complete the Self-Assessment of how they felt about their work time they were asked to choose one from each of the following groups by circling either: Happy or Unhappy, Focused or Distracted, Calm or Excited. They were also asked to explain why. Additionally, they were asked to answer Yes or No to the following prompts: I was my personal best. I got my work done. I am getting better at getting my work done. Then they were asked to rate their level of focus for the day from 1 (not focused) to 10 (very focused). A revised Self-Assessment (Appendix F) was completed daily during the sixth week which replaced the prompt, “I was my personal best” with “I took a brain break. On the last day of the project the students completed a final, Post Study Self-Assessment (Appendix G) to determine if they wanted to continue the directed movement activities and which movement activities they liked the best.

Analysis of the Data

This data was collected from students and observations were recorded by the classroom teacher. Feedback and student work samples were collected before the intervention began, weekly throughout the course of the project and at its completion. Observations of students were recorded for 15 minutes daily throughout the course of the six-week research project.

The children completed a weekly Student Self-Assessment (Appendix E). These weekly assessments were completed prior to beginning the directed movement, during the project and at the completion of the six-week intervention. The graph below (Figure 2) reports how focused or distracted the children felt on days they participated in directed movement. In addition, the assessment asked whether they were calm or excited, how focused they felt and whether they completed their work.

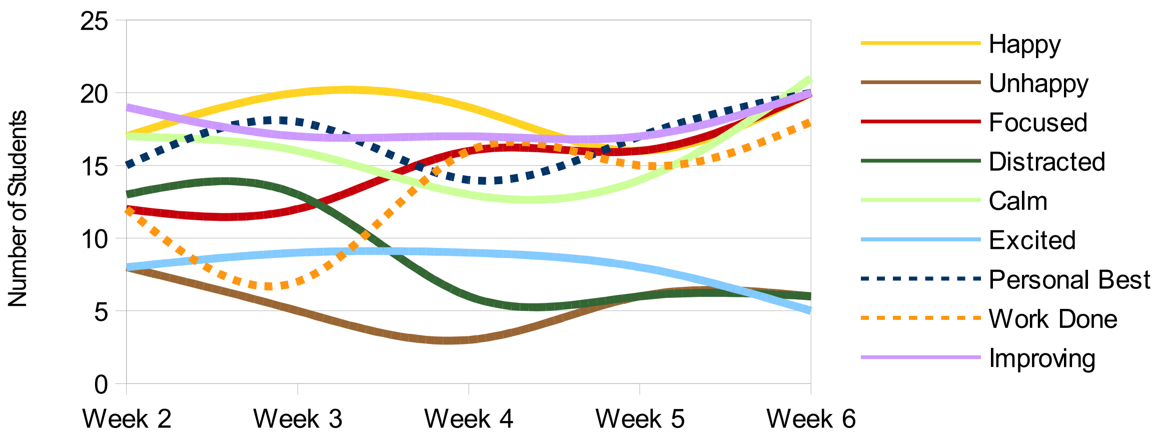

Figure 2. Student Self-Assessment of Behaviors

An overall increase in work done (productivity) correlates to the increase in focus over the same time period. Other notable indicators were the decline in the number of students that were distracted over the course of the project and the relatively consistent level of effort throughout the project as shown in Figure 3.

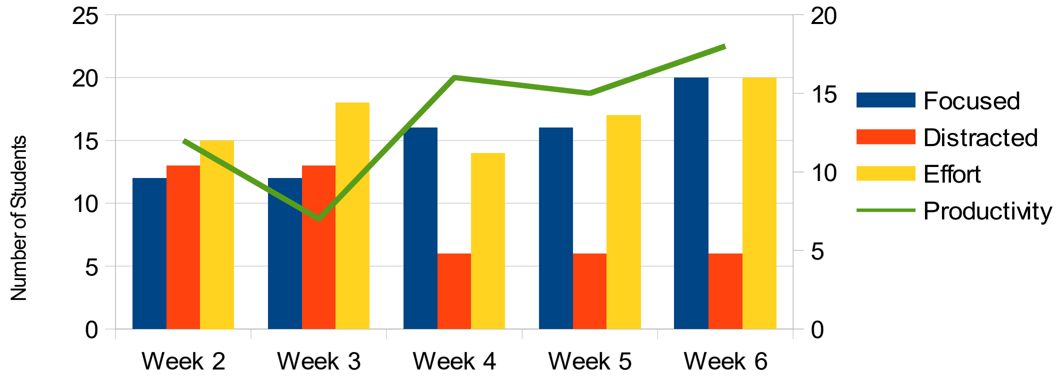

Figure 3. Student Self-Assessment of Productivity

The following table (Table 1) shows the percentage changes reported by the students. According to the data the children provided, the number of children who felt focused rose from 12 to 20 for an increase of 67 percent over the course of the project. The number of students that reported that they felt distracted decreased by 54 percent, from 13 to 6. There was a 23 percent increase in the number of students who thought the classroom was calm during their work periods. Thirty-three percent more students felt their work performance was their personal best after the intervention while the feeling that they were improving was fairly constant. Productivity, as measured by ranking whether their work plans were completed, rose from 12 students to 18 students for 50 percent increase.

Table 1

Comparison of Focus, Distraction and Improvement from Week 1 to Week 6

Student Self Assessment						
	Focus	Distractions	Calm	Improving	Personal Best	Work Done
Week 1	12	13	17	19	15	12
Week 6	20	6	21	20	20	18
Difference	8	-7	4	1	5	6
Percent Change	67	-54	23	5	33	50

The children were also asked to rate their personal level of focus on a scale of 1 to 10 using the scale: 1 – not focused, 3 – partly focused, 5 – somewhat focused, 8 – fairly focused, and 10 – very focused. The results of this self-assessment show that perceived student focus increased throughout the study (Table 2). During week 1 of the project the mean of focus was 6.08 compared to 7.77 in week 6 indicating an average increase of level of focus of 27.79%. The median increase was 41.66% and the mode indicated a 100% increase from level 5 to a level of 10 indicating that more than half of the class felt they were fully focused during their work period at the end of the project.

Table 2

Student self-assessment of focus level

	Week 1	Week 3	Week 4	Week 5	Week 6	Change	Percentage
Sample	25	26	24	23	26		
Mean	6.08	5.94	6.96	7.70	7.77	1.69	27.79
Median	6	5.75	7	8	8.5	2.5	41.66
Mode	5	5	10	10	10	5	100

While Table 2 shows average results for the entire class, individual results were quite varied. The children with identified executive function delays such as ADHD, ADD, or autism spectrum disorders were grouped into Subset A and their results are shown in the graph below.

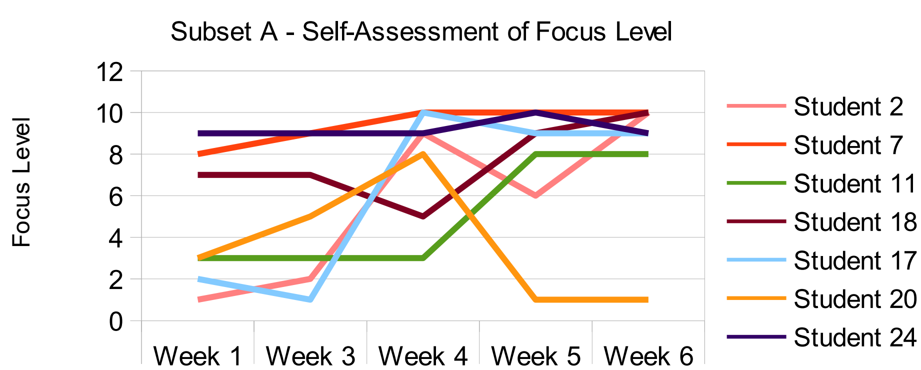

Figure 4. Subset A Focus Level

The results from this group were very encouraging as it indicated a perceived increase of focus from those students that are most at risk for falling behind academically. Journal notes indicated a reluctance to participate or challenges remaining focused for specific students that make up the outliers: student 11 during the first four weeks of the project and student 20 for the last two weeks. Table 3 indicates a steady increase in the average focus of this subset from week 1 to week 6.

Table 3

Subset A – Averages of Perceived Focus

Perceived level of focus for Subset A

	Week 1	Week 3	Week 4	Week 5	Week 6
Mean	4	4.5	7.5	7.17	8
Median	3	5	9	9	9
Mode	3	9	9	9	10

Over the course of the six week project, student behaviors were observed daily for 15 minutes approximately 90 minutes after directed movement exercises were done. Observations were made during the morning work period and both focused and unfocused behaviors were recorded using the Observation of Behaviors Tally Sheet (Appendix B). An overview of the results are shown in the graph below (Figure 5). Trend lines indicate the general increase or decrease in each type of behavior. The fact that the trend lines intersect after only one week of directed movement intervention seemed to indicate an almost immediate improvement of focus.

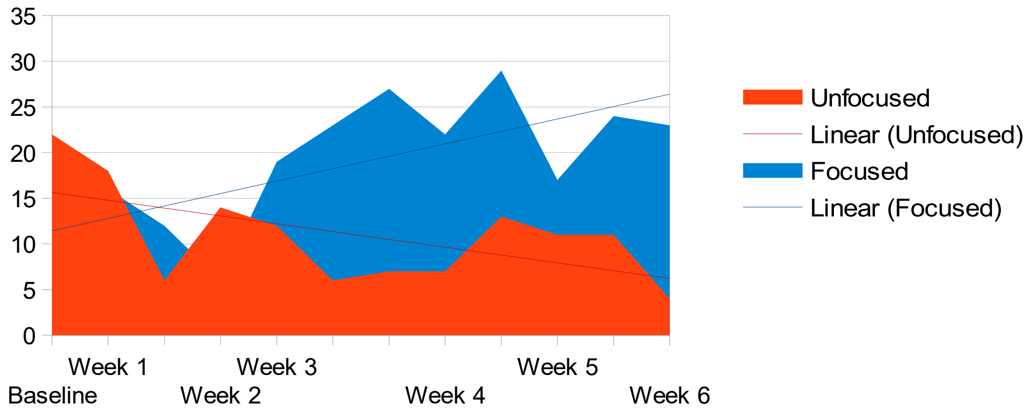

Figure 5. Teacher Observed Behaviors

Focused behaviors included being focused on a task and working to the completion of a task. Unfocused behaviors were wandering, being inattentive to directions and disturbing others. The behaviors were tallied (Appendix G) during observation and then plotted. Figure 5 above shows a steady increase in focused behaviors and decline in unfocused behaviors during the intervention. The following chart summarizes the actual data recorded (Table 4). The baseline data was recorded prior to beginning the directed movement intervention. During week six the unfocused behaviors were reduced to a mere four over a fifteen minute period while focused behaviors increased to 23 for the same period.

Table 4

Increases and Decreases in Focused and Unfocused Behaviors

	Teacher Observations	
	Unfocused	Focused
Baseline	22	9
Week 6	4	23
Mean	10.92	18.92
Median	11	20.5
Mode	6	23

An initial concern was that utilizing student self-assessments would skew results in favor of their perception of "good" behavior, which would be focused and calm. The results of behaviors recorded during observations show that students actually rated themselves more strictly than actual counting of behaviors indicated. Observations indicate a 155 percent increase in focused behaviors at the end of the six-week project. Unfocused behaviors decreased by 82 percent during the same time. This is compared to the 67 percent increase in the number of children that rated themselves as focused and 54 percent overall reduction in perceived distractions.

An additional tally was made of the number of minutes students stayed on task during the 15 minute observation. The maximum length of focus recorded for this study was 15 minutes as that was the duration of each observation. A tabulation of the number of students that stayed on task for two minutes, five minutes, ten minutes and fifteen minutes is shown in Table 5. None of the students stayed on task for a full 15 minutes during the week before the directed movement activities began and only four reached the 10 minute mark. Most of the students remained focused on a task for five minutes or less.

Table 5

Number of Students on Task for 2, 5, 10 or 15 Minutes

	Minutes of Focus			
	2	5	10	15
Baseline	7	6	4	0
09/21/15	6	12	3	0
09/24/15	4	8	5	0
09/28/15	9	5	1	0
09/30/15	10	9	2	0
10/01/15	10	14	3	0
10/06/15	1	1	3	20
10/07/15	10	9	4	1
10/19/15	2	2	5	14
10/22/15	2	9	12	0
10/23/15	0	6	5	13
10/26/15	3	6	6	10
10/28/15	0	5	10	17

A notable change occurred during the third week of daily directed movement when all 27 students were focused on tasks during the observation as shown outlined in red in Table 5. After that point in time, students were more readily observed staying on task for longer and longer periods of time. Fewer children lost focus after only two minutes. It was observed that the classroom became calmer during the work period as fewer and fewer children created distractions. Breaks in focus were still commonly observed upon completion of a task, when it became necessary for children to leave their seat, and when distractions occurred.

In order to corroborate the results of the observations and self-assessments, randomly selected work samples were collected from the students as an additional data source. Twenty individual work samples were collected prior to the beginning of the directed movement phase of the project and another twenty were collected at the end of the intervention. The documents were ranked according to a rubric (Appendix A) using a 1 – 4 rating system with 4 being the highest score for the following categories: On time, Completeness, Planning, Neatness. These four areas are important in focus and are critical executive functions. Improvement in these areas would be seen as an improvement in the development in executive functions.

The data from the rubrics was analyzed using two methods. First, each document was scored by simply adding the four ranks giving cumulative total rank per sample. The average ranking comparison for each category and overall rank are listed below in Table 6.

Table 6

Rubric Results of Collected Samples

Average Rank on Collected Samples

	Pre	Post	Change	Percent
On Time	2.80	3.90	1.1	39%
Completion	3.45	3.95	0.5	14%
Planning	3.35	3.95	0.6	18%
Neatness	2.15	3.85	1.7	79%
Sum	11.75	15.65	3.9	33%
Mean	2.94	3.91	0.98	33%
Median	3.08	3.93	0.85	29%

The average ranking of work samples collected before directed movement was introduced was 11.75. At the end of the intervention the average ranking increased to 15.65 out of a possible 16 for a 33% overall improvement. These results show improvement in each individual category. The amount of on-time work increased by 39%, the level of completion increased by 14%, the execution of planning rose by 18% and overall neatness improved by 79%. The average increase when all categories are averaged showed a 33% increase. These results indicated a direct, substantial increase in executive functions from the beginning to the end of the project.

A post study assessment was completed by the children to determine how they felt about the project and the daily directed movement activities. They results of the survey are below in Table 7.

Table 7.

Post Study Assessment

	Yes	No	Percent
I like doing yoga and exercises in the morning	24	3	89
I would like to keep doing morning yoga	25	2	93
I liked taking brain breaks	19	8	71
I would like to keep taking brain breaks	19	8	71
I feel that I am getting better at staying focused	22	5	81

According to the results, 89 percent of the children liked the addition of directed movement activities to the morning routine. The majority of students wanted to continue doing yoga in the morning at school and nearly all of the children felt that their ability to focus was improving. They enjoyed taking brain breaks throughout the day and felt that they would like to continue those as well. The classroom had become a much calmer, peaceful and less distracted environment. The adults in the classroom and those that visited often commented on the contented buzz that had been created.

The data shows that this project was successful in creating an environment conducive to focus. The subjects in the study felt their ability to focus had improved and teacher observations and samples of their work showed improvement in planning, completeness, finishing work on time and in neatness. The children enjoyed directed movement and wanted to include it as a part of the classroom routine. A poll of their favorite directed movement activities showed the top five favorites as: Brain Gym: Hook-Ups and Cross Crawl and Yoga: Cobra, Washing Machine and Dryer.

Action Plan

The results from this action research project showed that directed movement had a positive effect on the focus of the lower elementary children in the study. The directed movement included activities from both Brain Gym and yoga. The children seemed to enjoy both of them equally and the majority wished to continue the activities. After the project was completed the children individually recognized feeling distracted and sought out the movements on their own. Many of the children continue to use yoga mats for movement and mindfulness brain breaks throughout the day. The classroom became calmer. The majority of the students felt more focused and better able to cope with distractions of fellow students. One new opportunity for research would be to observe to see if this new behavior continues indefinitely or if it wanes as the year progresses.

The limitation in this study was that it was conducted with only one group of students. Another opportunity for further study could be achieved by observing a control group that did not participate in the directed movement simultaneously with a group that did participate.

The group in my research that had the lowest measured improvement in focus were those that had been identified with hyperactivity disorders. The group instruction setting provided too much distraction and freedom for them to be successful with the movements. Their movements did not follow patterns and sequencing necessary to qualify as directed movement. Even so, they believed that they were doing yoga and reported enjoying the activities, and showed improvements in their productivity and focus. These findings provide another opportunity for a future study to determine if teaching students identified with hyperactivity in a one-on-one setting would enable them to improve in following the stretching and breathing exercises included in the project and how that would affect their self-regulation and focus.

Another goal of the study related to how it was presented and implemented in order to determine the best method for integrating directed movement into a classroom routine. Notes on how and where activities were presented and modified based on outcomes provided a fairly clear outline for how to integrate movement activities. My notes indicated that the movements do not need to be done in a perfectly quiet environment, but children do need to be attentive so initially the space should be free of distractions. As the children learned the movements, they became calmer and less playful during the directed movement activities. This information indicated that after an initial instructional period, the children had internalized the movements.

Over the weeks that the students did the movements, they required less space to practice them. Their bodies became more self-regulated as the study progressed over time. It appeared that after four weeks of group directed movement practice, the children learned the movements and how to move into a workable formation on their own. Furthermore, because they learned the names of the movements and had favorites, they enjoyed leading their classmates.

The children now organize themselves and do yoga during a transition time after lunch.

They continue to take brain breaks and focus themselves in an area of the classroom set up for those activities. Directed movement has been integrated into the classroom. The results were so positive for this classroom that we will continue yoga practice indefinitely three times per week with parent volunteers leading the children. A specialist in social thinking directs the activities one-on-one with the children with most severe EF delays.

I see so much value in the outcomes from this research that I would like to share the information with other teachers. I believe that this study shows that directed movement has a strong impact on executive functions. These activities are as important to thinking skills as physical education is to keeping a fit body. After presenting the results of this study to teachers at my school, they want to implement directed movement into their classrooms. I will be sharing the activities and resources utilized in the project in a lesson plan so teachers at my school may integrate directed movement into their classrooms without trial and error. I hope to make the information available on a wider scale by submitting an article for publication on teacher resource sites. I believe that daily directed movement should be introduced in every school and hope that soon it will become a normal part of the routine in every classroom.

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Appendix A

Rubric for Student Artifacts Collected

Name: ____________________ Date collected:____________________

	Rank	4	3	2	1
On Time		Finished before due date	On time	Late	Needed reminder to complete
Completeness		100.00%	> 75%	50%-75%	< 50%
Planning		Ideas relate to topic, well organized on paper	Mostly relates to topic, info mostly organized on the paper	Some info relates to topic, somewhat organized on paper	Not related to topic, info not organized properly on paper
Neatness		Neatly written, stays in lines	Fairly neatly written, some erasures or errors	Messy writing or coloring	Scribbling, doodling or holes in paper

Appendix B

Observation of Behaviors Tally Sheet

Date____________________Time:________________

	Minutes on Task				Unfocused Behavior				Focused Behavior	
Name	**2**	**5**	**10**	**15**	**Disturbs others**	**Wanders**	**Inattentive to directions**	**Out of Seat**	**Focused on task**	**Works to completion of task**

Appendix C

Field Journal

Date:_________________________________Time:__________________

Incidences of engagement____

Incidences of persistence ____

Incidences of focus____

Notes:____

Appendix D


The Brain Gym® "PACE" Warm-up
1 - Water
2 - Brain Buttons
3 - The Cross Crawl
4 - Hook-ups

Appendix E

Student Self-Assessment

How do I feel about my work time today? (Circle one for each group)

1. Happy or Unhappy Why?___________________________________

2. Focused or Distracted Why?___________________________________

3. Calm or Excited Why?___________________________________

4. I was my personal best . Yes No

5. I got my work done. Yes No

6. I am getting better at finishing my work. Yes No

7. My level of focus today was:

(Circle a number 1 = not focused 10 = very focused)

1	2	3	4	5	6	7	8	9	10
not focused		partly focused		somewhat focused			fairly focused		very focused

Name ____________________ Date _________________________

Appendix F

Student Self-Assessment #2

How do I feel about my work time today? (Circle one for each group)

1. Happy or Unhappy Why?____
2. Focused or Distracted Why?____
3. Calm or Excited Why?____
4. I took a brain break. Yes No
5. I got my work done. Yes No
6. I am getting better at finishing my work. Yes No
7. My level of focus today was: (Circle a number 1 = not focused 10 = very focused)

1	2	3	4	5	6	7	8	9	10
not focused		partly focused		somewhat focused			fairly focused		very focused

Name ____________________________ Date __________________________

Appendix G

Post Study Assessment

(Circle one)

I like doing the yoga and exercises in the morning.	Yes	No
I would like to keep doing morning yoga.	Yes	No
I liked taking brain breaks.	Yes	No
I would like to keep doing brain breaks.	Yes	No
I feel that I am getting better at staying focused.	Yes	No

The moves or activities that I like the best are: (circle all that you like)

washing machine dryer neck rolls lift and stretch cobra dog cat frog

tree warrior child pose hook-up cross-crawl rhythm clap and tap

hokey pokey follow the leader

partner yoga windmill Simon says brain breaks

other:____