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Movement Interventions for Appropriate and Coordinated Movement

Brianna N. Blasberg
St. Catherine University, bnblasberg236@stkate.edu

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An Action Research Report

By Brianna Blasberg

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Brianna Blasberg

Saint Catherine University

St. Paul, Minnesota

Advisor _____ Date _____

Abstract

The purpose of this action research was to determine the effect of fundamental movement lessons and independent movement jobs on appropriate and coordinated movement as well as focus of students. Twenty-five students from a lower elementary class of first, second, and third graders in a public Montessori school participated in the study. Data was collected over a period of six weeks using a coordination scale, student feedback, work plans, and time on task observations. Results show a positive correlation between movement intervention and student coordination, on task behavior, focus, and productivity. All students reported positive associations with the movement jobs and improvement in perceived focus. Increases were observed in concentration and productivity; coordination levels also improved. The data shows movement can be integrated into the classroom to support appropriate movement and student learning. Further research should be conducted over a longer time frame to substantiate these results.

Keywords: movement, focus, coordination, Montessori

Montessori theory portrays the classroom as a peaceful and idyllic environment of self-directed learning. Independent and self-motivated learners responsibly moving about the classroom and building their knowledge are integral to the scene. The reality, however, can feel far removed from this picture. Step into my classroom, and you may see beautifully arranged materials crashing to the ground, bumped or dropped by a student lacking in coordination. Elsewhere, active learners begin to boil over into a frenzy of wandering, pencil tapping, and treading across rugs. All eyes turn toward the commotion and learning no longer remains the focus of the classroom.

The prevalence of students struggling with appropriate and coordinated movement extends well beyond my classroom walls. Growing populations of students with such special needs have been documented in classrooms throughout the United States (Armstrong, 2015; Cossentino, 2010), concurrent with a decrease in the role of physical activity in children's lives (Aeikens, 2015; Davis, 2007; McCabe, 2016; Strauss, 2014). Despite the inherent freedom of movement and other supports incorporated into the Montessori environment (Armstrong, 2015; Cossentino, 2010), my students continue to struggle to regulate their movements. The disruption caused by many of these behaviors, in turn, impacts the focus and productivity of all students within the classroom community.

Physical activity has been linked to learning and associated with positive impacts on cognitive performance, behavior, and affect. I hypothesized that incorporating a movement intervention into the classroom might help students develop their motor skills and provide an outlet for active learners. Montessori environments feature carefully arranged shelves with materials from various subject areas such as language, math, cultural, and peace education. During the work period, students choose their tasks and are free to access the materials needed to

independently complete their jobs (meaningful work). For this research, I utilized whole-group fundamental movement lessons in conjunction with the addition of a movement shelf. After introducing the materials, students were able to select prepared movement jobs from the movement shelf throughout the work period. This established more opportunity for gross motor activity within the classroom.

This study was conducted over a period of six weeks in a lower elementary (first through third grade) Montessori classroom in a public, neighborhood, Title I school. The majority of the 25 students have had, at most, one year of half-day kindergarten Montessori experience before entering first grade and are still working to develop the independence and concentration characteristic of a Montessori student.

Through this action research, I hoped to support appropriate and coordinated movement as well as improve focus and productivity within the classroom. I used multiple measures to assess for any effect, including regular time on task observations, weekly work plans to track productivity, coordination scales, and student feedback forms. I sought to gain understanding to the question: what effect will fundamental movement lessons and the addition of movement activities, in the form of jobs to be carried out independently, have on appropriate and coordinated movement and thus focus of students in a lower elementary, mixed first through third grade, Montessori classroom?

Review of Literature

The positive effects of movement on cognition have long been validated by research. Research also points to increased physical activity in the classroom as a solution to problematic movement behavior. Despite this, the modern model of traditional education is centered on students sitting, stationary, in desks as recess minutes are cut. Inappropriate and uncoordinated

movement, regardless of the cause, may be improved by incorporating more opportunities for movement into the school day. The following is a review of current literature regarding problems with appropriate and coordinated movement and possible interventions.

Concerning Trends and Patterns in Movement

Developmental coordination depends on motor development as well as neurological development. Typically, humans progress through four phases of motor development: the Reflexive Movement, Rudimentary, Fundamental Movement, and Specialized Movement Phases (Fuchs, 2014). The progression through each stage, however, depends upon opportunities for practice and mastery of skills (Fuchs, 2014). Leonard (2016) explains that "[t]he development of motor skills can therefore be viewed as part of an interactive developmental process with perceptual, social, and cognitive abilities, which is subject to the constraints of the body and the environment" (p. 1). Movement, therefore, is not merely a physical issue.

Developmental Coordination Disorder (DCD) is a neurodevelopmental disorder prevalent in five to six percent of the population (Leonard, 2016). Motor impairments are the principal criteria for diagnosis, often manifesting as clumsiness or slowness (Leonard, 2016). DCD exemplifies the connections between physicality and the brain. According to Poulsen and Ziviani (2004), Children with DCD exhibit different patterns of social and physical play and are less physically active than well-coordinated peers. DCD motor impairment is significantly correlated to peer difficulties in social functioning as well as interference with academic productivity (Leonard, 2016). DCD often co-occurs with Attention Deficit Hyperactivity Disorder as well as deficits in Executive Functions (Leonard, 2016).

Executive functions (EFs) are another focus of brain research, which provides insight into some issues behind inappropriate student movement. EFs are the neurologically-based skills

which involve mental control and inhibition (Armstrong, 2015). The performance of EFs is largely based in the prefrontal cortex (Diamond & Lee, 2011), which is an area that is negatively impacted by Attention Deficit Hyperactivity Disorder (ADHD) (Zoeckler, 2016). Inhibition is considered a core EF, encompassing self-control and self-regulation (Diamond & Lee, 2011). Research on EFs has demonstrated the importance of the skills in school and throughout life. Specifically, Diamond and Lee reported that EFs were shown to be more imperative to school readiness than intelligence quotient. EFs predict math and reading competence throughout one's school experience and are also critical for physical health (Diamond & Lee, 2011). EFs develop throughout much of childhood, with the most active development happening during elementary school years (Davis et al., 2007).

One of the most well-known issues related to movement in children is ADHD. Numbers of children diagnosed with ADHD have recently been on the rise, growing to 11% amongst children aged four to 17 in 2011 (Armstrong, 2015) with between 10% and 15% of students identified as having ADHD in average elementary classrooms (Cossentino, 2010). The disorder can present with increased motor activity and impulsivity, inattentive focus, or a combination (Armstrong, 2015). Underdeveloped vestibular systems, often found in children with attention issues, cause poor core strength and balance (Wiebelhaus & Hanson, 2016). Brain research has discovered that the ADHD brain is three years behind in development when compared with a neurotypical brain (Armstrong, 2015). The interaction of hyperactivity, impulsivity, inattentiveness, poor core strength and lack of balance can lead to movement behavior that is significantly outside of the norm (Armstrong, 2015; Mulrine, Prater & Jenkins, 2008).

Compounding these problems is an overall decrease in the amount of physical activity incorporated into children's lives (Aeikens, 2015; Davis, 2007; McCabe, 2016; Strauss, 2014).

Cultural shifts, including shortened recesses (Strauss, 2014), increases in screen time, and a reduction in what are considered to be safe play areas, have resulted in less interaction with the natural world for children today (McCabe, 2016). This lack of physical activity has an adverse effect on classroom behavior (Aeikens, 2015). Strauss (2014) found that, in comparison with children from the 1980s, only one out of 12 children had normal core strength and balance. Restricted movement can result in an underdeveloped vestibular system, the same problem observed in relation to ADHD (Strauss, 2014). Without proper movement, children will naturally start fidgeting in order to engage both brain and body (Strauss, 2014). Lack of physical activity is a notable concern in our culture today.

These concerns, in addition to others, have had an impact in classrooms across the country. Special education populations in most public schools have been reported to be between 11% and 15% (Cossentino, 2010). By comparison, reports have suggested that independent Montessori schools serve a population with 22% special needs (Cossentino, 2010). How, then, can schools address the needs of those students who are struggling with appropriate and coordinated movement?

Movement as Intervention

Neuroscience research has established a strong connection between movement and learning. The U.S. Department of Health and Human Services (2010) reported that physical activity affects the brain's physiology by increasing blood flow, oxygenation, growth of cerebral capillaries, production of neurotrophins, neurotransmitter levels, density of neural network, and brain tissue volume. These physiological changes affect brain chemistry, cerebral metabolism, and growth and development (Mulrine, Prater & Jenkins, 2008). The improved neuroplasticity creates a better environment for brain growth (Hubing, 2016), resulting in improved attention,

enhanced coping and positive affect, and improved information processing, storage, and retrieval (U.S. Department of Health and Human Services, 2010). More recently, exercise has also been linked to improved EF skills (Davis et al., 2007; Diamond & Lee, 2011). The "dynamic interaction" through which cognitive and motor skills develop (U.S. Department of Health and Human Services, 2010) is recognized in countries such as Finland, Singapore, and the Netherlands, where physical activity in education is a priority (Hubing, 2016).

Many studies cite the positive impact of movement interventions on cognitive performance (Davis et al., 2007; Hill, Williams, Aucott, Thomson & Mon-Williams, 2011; Hubing, 2016; Mulrine, Prater & Jenkins, 2008; U.S. Department of Health and Human Services, 2010). Classroom physical activity has been associated with greater concentration, math fluency, and reading comprehension, as well as improved overall reading and math skills (U.S. Department of Health and Human Services, 2010). Physical activity has also been shown to boost memory, sorting, sequencing, and imagination (Hubing, 2016). In the U.S. Department of Health and Human Services' (2010) review, eight out of nine studies suggested "that classroom-based physical activities may have favorable associations with indicators of cognitive functioning, academic behaviors, and/or academic achievement" (p. 23). The review also concluded there was no evidence to suggest that utilizing class time for physical activity was negatively associated with academic achievement.

According to Davis et al. (2007), Goh (2014) Hubing (2016), Mulrine, Prater and Jenkins (2008), and Wiebelhaus and Hanson (2015), the benefits of movement also extend to student behavior and affect. Physical activity results in greater concentration, increases in appropriate verbal and motor behavior (Mulrine, Prater & Jenkins, 2008; U.S. Department of Health and Human Services, 2010), and improved self-perception of students' abilities to pay attention and

remain on task (Wiebelhaus & Hanson, 2016). Exercise also increases the ability of students to regulate their emotions and cope with stress (Hubing, 2016). Improved on task behaviors are well documented in relation to physical activity (Goh, 2014; Mulrine, Prater & Jenkins; Wiebelhaus & Hanson, 2016), in addition to enhanced executive functioning (Hubing, 2016). Mulrine, Prater, and Jenkins (2008) found that these effects of movement result in decreased discipline problems, particularly in disruptive and problematic social behaviors. Furthermore, student participation and attendance are found to increase with classroom physical activity (Mulrine, Prater & Jenkins, 2008).

The benefit of movement on EFs has been documented in research (Davis et al., 2007; Diamond & Lee, 2011; Hubing, 2016). Indeed, the EF hypothesis, developed in the field of gerontology, predicts that, among the positive impacts of physical activity on cognition, the greatest improvement will be found on EF performance (Davis et al., 2007). Davis et al. (2007) found that children's EFs improved with regular, vigorous exercise. Diamond and Lee (2011) reviewed data supporting the positive impact of aerobic exercise, yoga, and martial arts on the development of EFs and proposed sports as another potentially beneficial intervention. Such findings may encourage future research to include measures of EF in relation to exercise.

Movement in Montessori

Movement is an integral component in Montessori educational philosophy. Montessori recognized that movement and cognition are interconnected and developed an educational philosophy which allowed children to learn through movement and self-discovery (Pate et al., 2014). Montessori (1949/1967) made this perspective clear when she wrote:

> We may put it like this: the child's intelligence can develop to a certain level without the help of his hand. But if it develops with his hand, then the level it reaches is higher, and

> the child's character is stronger. So even here, in what we tend to think of as a purely psychological matter, the facts are that a child's character remains rudimentary unless he finds opportunities for applying his powers of movement to his surroundings. (p. 152)

Accordingly, Montessori education allows for freedom of movement and incorporates a wide variety of hands-on materials to actively engage children in the work of learning (Armstrong, 2015; Cossentino, 2010).

Montessori education includes other embedded movement supports, as well. Classrooms feature "prepared environments" which are carefully organized with engaging materials (Armstrong, 2015). Children are allowed autonomy through choice in their work, determination of work space and free movement throughout work time (Cossentino, 2010). Montessori classrooms also engage students in movement through purposeful, multi-sensory "practical life" tasks such as washing dishes or gardening (Armstrong, 2015). Nature is another important element of Montessori philosophy, and outdoor gross motor activity is often emphasized (Armstrong, 2015). Combined, the components of Montessori philosophy work together to incorporate and support movement at school.

The freedom of movement inherent in Montessori philosophy does, in fact, correspond with more physical activity. Research by Pate et al. (2014) concluded that children in Montessori preschools were more active, both at school and at home, when compared with peers in traditional preschools. In addition, Diamond and Lee (2011) found that Montessori students showed better EFs than their non-Montessori peers. This was attributed to the Montessori process of "normalization" which, Diamond and Lee (2011) argue, is focused on developing EFs. In Montessori practice, normalization refers to the process of adapting to classroom expectations of "self-discipline, independence, orderliness, and peacefulness" (Diamond & Lee,

2011, p.5). Diamond and Lee (2011) also noted the importance of education that addresses emotional and social development as well as physical development in order to support the development of EFs.

Movement Interventions

Movement, broadly, has been the focus of much research in education. Movement interventions vary widely and, as focus has moved from physical education classes and recess to classroom physical activity, many different programs have been developed (Goh, 2014). Diamond and Lee's (2011) review of research found that aerobic exercise improved prefrontal cortex function and EFs. However, Davis et al. (2007) found these benefits occurred with daily, 40-minute sessions of aerobic activity but not with shorter, 20-minute doses. Resistance training, in contrast, was not found to have any benefits on EFs (Diamond & Lee, 2011).

Many programs developed to integrate physical activity into the classroom are structured around short, approximately 10-minute movement breaks incorporated into academic subjects. These include Energizers (Wiebelhaus & Hanson, 2016), TAKE 10!®, Physical Activity Across the Curriculum (PAAC), and Texas Initiatives for Children's Activity and Nutrition (I-CAN!) (Goh, 2014). According to Goh (2014), these programs were found to effectively increase student physical activity levels, on-task behavior, and focus and have been received positively by teachers. These findings were consistent with the U.S. Department of Health and Human Services' (2010) review of research, which found brief movement breaks were related to appropriate verbal and motor behavior, as well as greater concentration. One study, however, reported that integrated aerobic exercise did not impact on task behavior except for a subset of hyperactive students (U.S. Department of Health and Human Services, 2010).

Other, more specific, teacher-led interventions incorporate different disciplines of movement. Tae-Kwon-Do, in combination with mindfulness training, has been correlated with gains in EFs (Diamond & Lee, 2011). Likewise, yoga integrates mental concentration and breath control in addition to physical postures (Wiebelhaus & Hanson, 2016). In a study of elementary-age students with attention difficulties, Peck, Kehle, Bray and Theodore (2005) found that yoga supported attention, self-control, and body awareness, resulting in decreased off task behavior throughout the study and in follow-ups. BrainDance is another teacher-led movement intervention involving a series of movement exercises based on fundamental movement patterns which humans begin developing before birth (Furmanek, 2014). Dance, more generally, has been found to stimulate brain development and support learning (Hanna, 2008; Hanna, 2016).

Movement interventions may be implemented in a more student-driven format, as well. Wiebelhaus and Hanson (2016) utilized activity stations to allow students to engage in two to three movement activities per day. Their results indicated a decrease in students' off task behaviors. Fuchs and Craft (2012) developed Movement Matters, a movement curriculum designed specifically for Montessori classrooms. The curriculum utilizes teacher-led lessons on fundamental movements, followed by independent work with a movement shelf. The movement shelf contains extensions of the fundamental movement lessons for students to engage with as jobs for independent practice during work time (Fuchs, 2014). The option for independent movement work allows students the opportunity to engage in purposeful, permitted movement throughout the learning process. Goerg (2016) utilized a movement shelf with three to six-year-old students and found that concentration levels became more consistent throughout the work period. McCabe (2016) applied a similar approach through action research and observed increased focus. The study also noted that movement lessons requiring focused attention

generated a feeling of calmness in students (McCabe, 2016). Both researchers noted the keen interest of students in regard to movement shelf materials and documented plans to continue the practice in their classrooms (Goerg 2016; McCabe, 2016).

In synthesizing various approaches to movement intervention, there were principal considerations and recommendations for implementation. Structured movement activities were more often found to have positive effects (El Nokali, 2004). Furmanek (2014) stressed that, with any movement activity, it is important to identify physical boundaries. Scheduling was another important consideration. Regular, frequent, repeated movement practice is most effective (Diamond & Lee, 2011; El Nokali, 2004). Physical activity should occur throughout the day, rather than a single session, in order to be more successful in addressing EFs (Diamond & Lee, 2011). In addition, emphasis should be on fitness (Hubing, 2016) and enjoyment rather than mastery and competition (Furmanek, 2014). Furthermore, movement activities that garner children's interest are likely to be more successful (Armstrong, 2015; Diamond & Lee, 2011).

Methodology

The purpose of this action research project was to determine what effect fundamental movement lessons and the addition of a movement shelf would have on appropriate and coordinated movement and thus focus of students in a lower elementary, mixed first through third grade, Montessori classroom. I collected data for six weeks during the 2017-2018 school year, beginning approximately four weeks into the school year and spanning the months of September and October. The participants in this project included 25 students varying in age from six to nine years old. With permission from their parents, the students in the class participated in whole group movement lessons and engaged in movement jobs chosen from the movement shelf (see Appendix A).

Prior to implementing movement lessons and jobs, I established baseline coordination levels using a student coordination scale (Appendix B). After a day of observation, I measured each student using a set metric regarding coordinated movements such as moving without bumping into furniture or others and carrying items without dropping them. From these figures, I identified a subset of eight students to continue monitoring for this data set only. The eight students with the lowest initial coordination ratings were then observed two more times, mid-intervention and post-intervention, to determine what, if any, impact the movement lessons and jobs had on coordinated movement.

I used student feedback forms (Appendix C) to gather inquiry data regarding student perceptions of their focus as well as the collective focus of the class. Before enacting the movement interventions, I led a discussion on the meaning of focus. I then read the form out loud while students responded to questions with a visual scale consisting of thumbs up, thumb to the side, and thumbs down. This procedure was repeated at the end of my research to determine what, if any, change in perceptions had occurred. The post-intervention form included some additional, open-ended questions to gather more information regarding students' feelings toward the movement jobs. Students who were unable to write their answers dictated their responses to a teacher.

Throughout the implementation of research, I collected and analyzed students' weekly work plans (Appendix D). This student-generated artifact is a regular practice in my classroom. Students recorded the jobs (assignments or activities) they completed during each morning work period. A teacher reviewed the work and initialed if complete and correct. At the end of each week, I calculated the number of tasks completed, to use as an indirect measure of student focus and productivity during work time.

The time on task metric (Appendix E) consisted of observations at 30-minute intervals during the morning work period on two set days each week to determine the percentage of students who are on task. For this observation, on task behavior was defined as being engaged in a lesson or learning task as well as purposeful actions related to learning. When a student had disengaged from the task and learning environment to take part in an unrelated activity, it was identified as an off task behavior. Although the total length of work time varied each day, this provided another measure of the overall focus and productivity of the class. My original plan was to begin collecting baseline observations during the first week of my research. However, this was delayed until week two of my study due to jury duty and schedule modifications. My initial time on task observation did take place before implementation of movement interventions.

I introduced whole group movement lessons targeting fundamental movements during the second week of my study. These fit into our mandated physical education instructional time and addressed a range of movement skills that were later utilized in independent movement jobs. The three initial lessons, adapted from Fuchs and Craft (2012), focused on stability, balance, and flexibility. Lessons introduced vocabulary and led to discussions of how we utilize such skills throughout the day, including moving about the classroom and accessing materials during work time. I continued to present approximately three lessons per week throughout the implementation of my research.

The movement shelf was introduced in the third week of research. After modeling each movement job to the students, it was added to the movement shelf. During the morning work period, children were able to access and use the movement jobs between their other tasks. This fit in with the general routines and expectations of the classroom, where students choose their work and are free to move about in order to access the materials needed to complete their tasks

independently. Due to shorter work time than the ideal three-hour Montessori work period, students used a three-minute timer to regulate their work at the movement shelf. The jobs were popular, so a nearby whiteboard was used as a "wait list." Students engaged in a movement job would check the list when finished and quietly seek out the next person to let them know the material was available. I added six movement jobs (Appendix A) to the shelf over the course of three weeks: a balance board, yoga pose cards, a jumping mat, egg and spoon work, a jump rope, and fitness dice. All of these jobs were completed in an area of the classroom near the movement shelf, which was positioned next to the door, except for jump roping. Students who selected the jump rope would bring a basket with the material and timer just outside of the classroom, where visible through the window.

Each time students accessed a movement job they would place a stick in a specified jar on the movement shelf. I recorded each daily total, along with the length of the day's work period, to track the frequency at which the movement jobs were being accessed (Appendix F). This proved to be the most challenging method of data collection. More than once, a student chose to add or remove sticks from the jar. To account for this, I sometimes had to ask all students to share how many times they had utilized the movement jobs.

Data Analysis

Data was collected on the utilization of movement jobs to reflect student engagement with the movement shelf. Each day, the average number of jobs per hour was calculated (Figure 1). Overall, the figures reflect consistent use of the materials. Information gathered on the use of movement jobs was less reliable than other measures due to student errors in data collection. However, the data mirrors anecdotal observation, where students were observed to use the movement jobs on a regular basis.

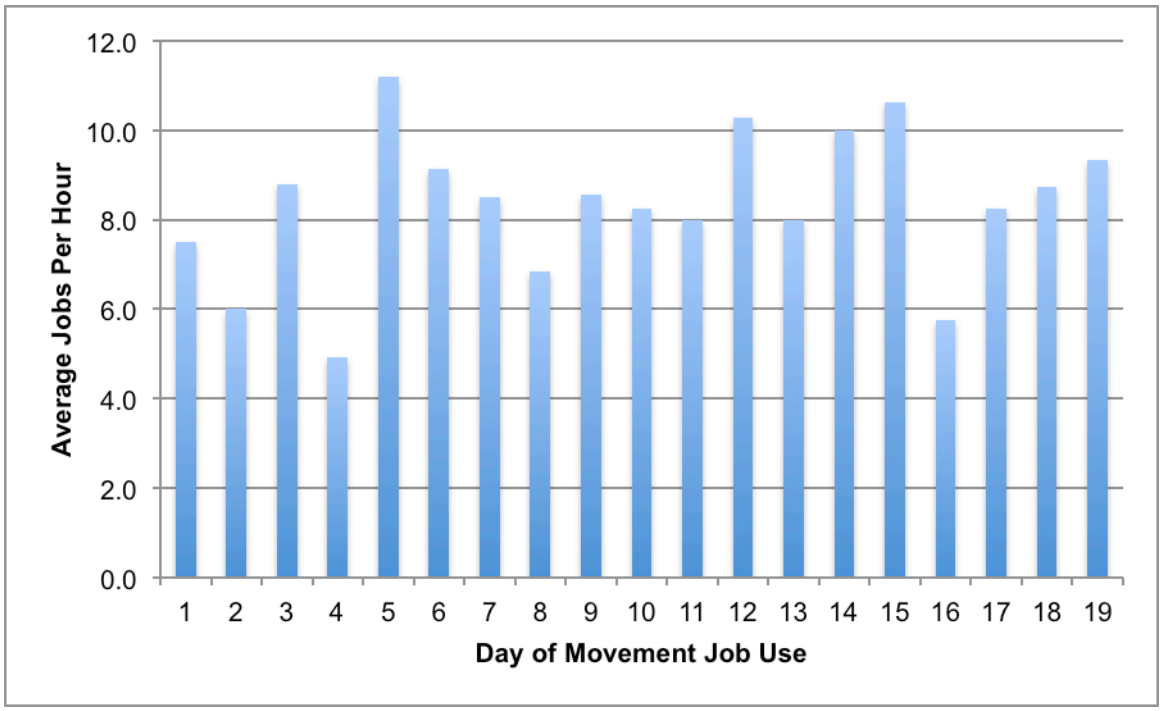

Figure 1. Average number of movement jobs used per hour

The student coordination scale was administered three times to a subset of eight students with the lowest pre-intervention scores. Averaged results (Figure 2) show gains in every category from pre-intervention to post-intervention. The average total score for students increased from 17.5 to 21 out of 25 possible points. The most substantial improvement occurred in relation to the measure "Student moves around the classroom without bumping into furniture or others." Second to this category in growth was "Student can execute planned motor activity (i.e. managing manipulatives to complete an academic task)." These results suggest the movement intervention may have had a positive effect on students' coordinated movement.

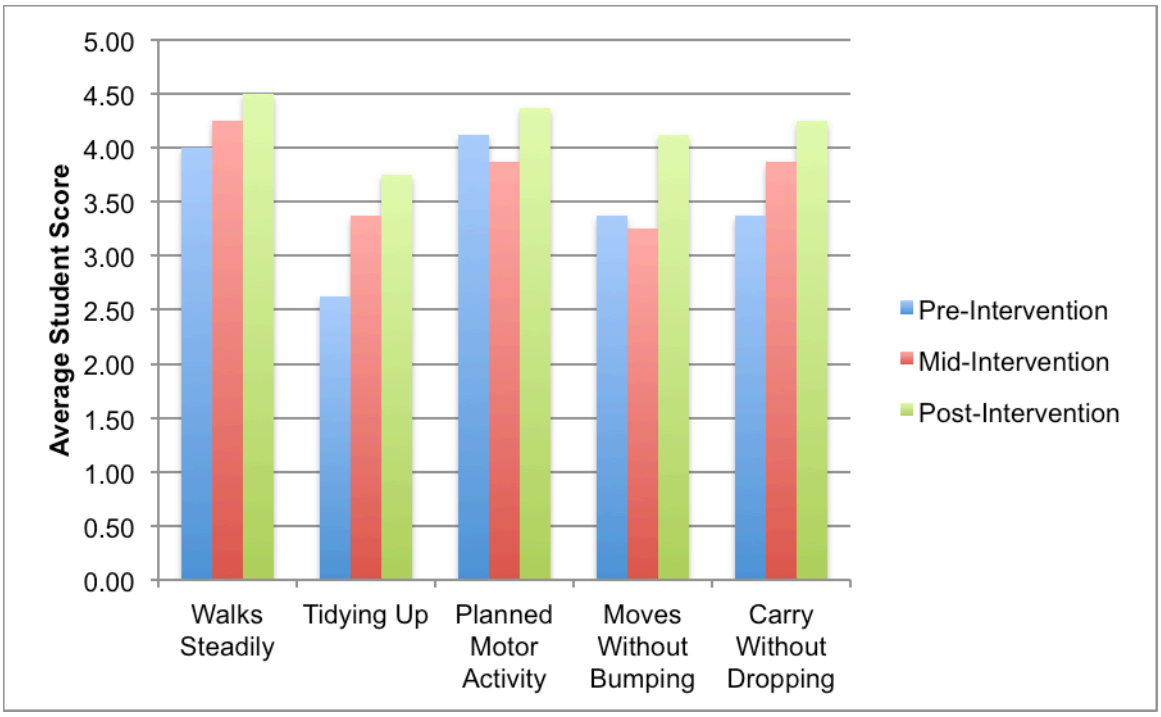

Figure 2. Comparison of average student coordination scores throughout intervention

Time on task observations revealed a positive correlation between the movement intervention and on task behavior. From week two to week six the average daily percentage of students on task generally increased from 75% to just over 90% (Figure 3). Scores remained relatively stable during the last two weeks of the study, varying only 1.5%. Since this study was completed in the fall, the process of normalization (students adjusting to expectations and becoming productive, independent workers) could also be related to the observed improvements in on task behavior.

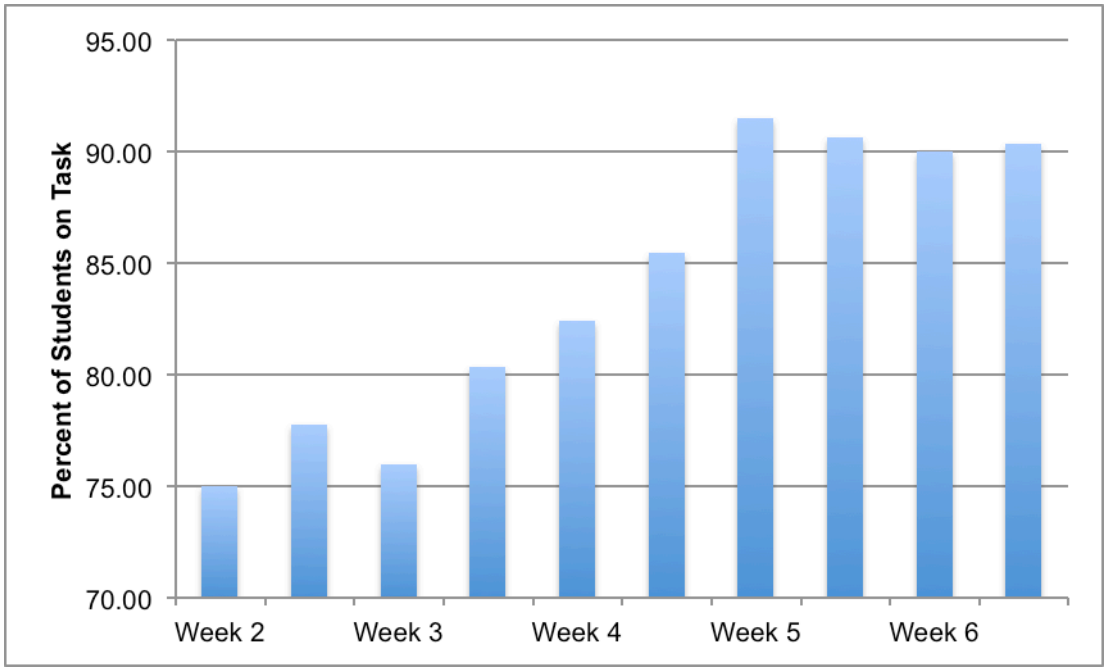

Figure 3. Average percentage of students on task during morning work period

Focus of the class was also measured through student work plans. Figure 4 shows the average number of jobs completed each week. The data reflects a general increase in productivity over the course of the intervention, with a slight decrease in week three and a substantial jump in week six. Overall, this seems to corroborate the findings from the time on task observation; productivity appeared to improve along with on task behavior. This suggests the movement intervention may have had a positive effect on the focus of students.

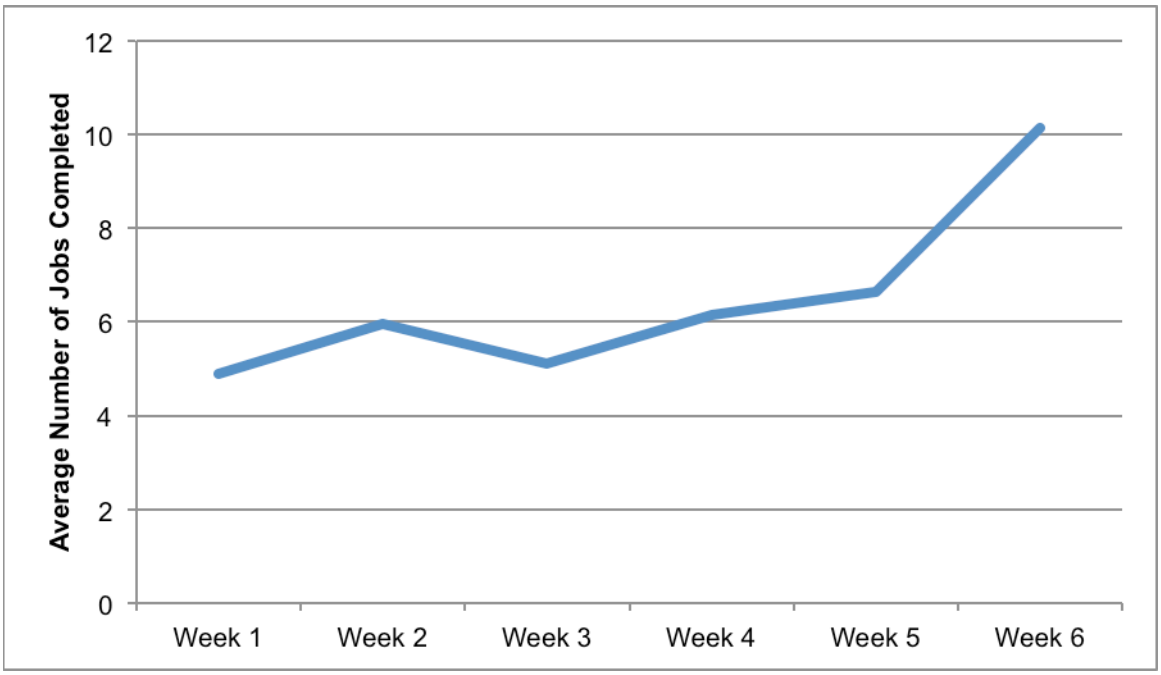

Figure 4. Average number of jobs completed each week

Looking more closely at the work plan data, I analyzed the week over week change in the number of jobs completed by individual students (Figure 5). The average weekly change demonstrates all but one student made positive growth in terms of job completion. The negative changes for that individual student may be explained by multiple absences toward the end of the study. Over the course of the study, students made average gains of 1.1 jobs per week.

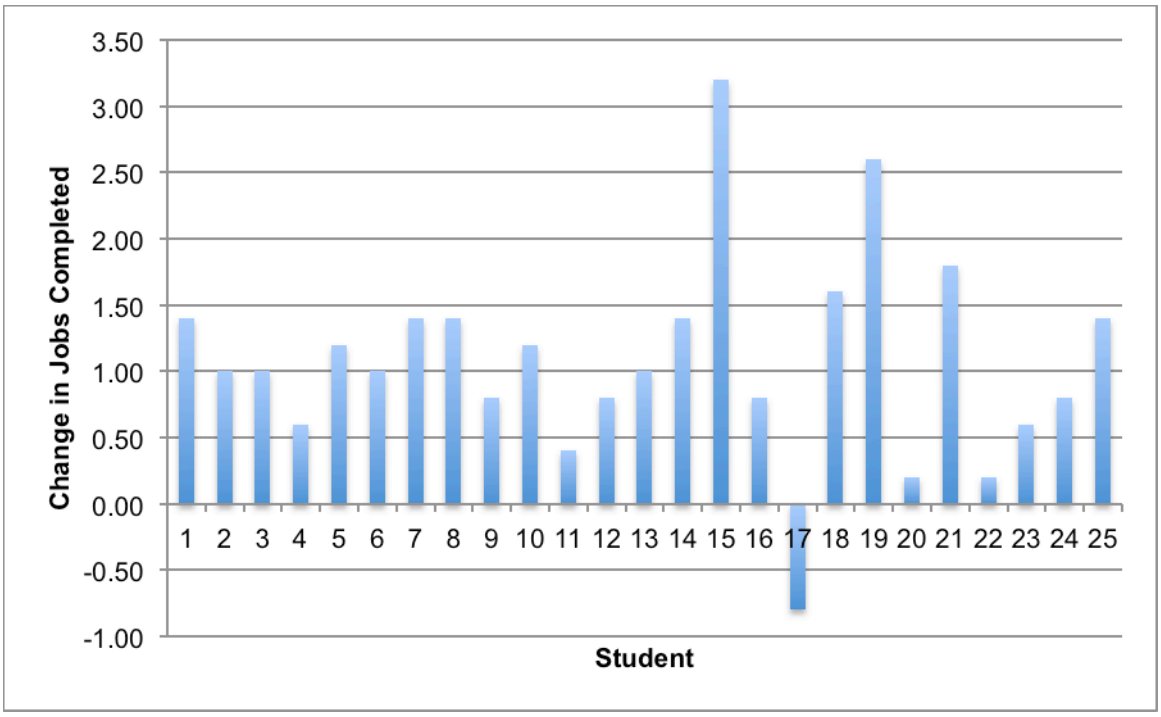

Figure 5. Average weekly change in job completion by student

Student feedback forms offered some insight into student perspectives on focus and movement activities. Although data for many questions remained consistent from pre-intervention to post-intervention (Table 1), a more substantial shift was noted in response to the first two statements. Five (20%) of students changed their response to the assertion "I feel focused during work time" from sometimes to yes (Figure 6). Similarly, six students gave a more positive response to "Our class is focused during work time" (Figure 7). While relatively stable, feedback in other areas does seem somewhat contradictory. However, the concept of focus was highlighted in our discussion prior to eliciting student responses and the improved perception of individual and class focus does mirror the data collected through time on task observations and work plans.

Table 1. Changes in Student Responses to Feedback Form

Statement	Pre-Intervention			Post-Intervention		
	N	S	Y	N	S	Y
I feel focused during work time.	0	12	13	0	7	18
Our class is focused during work time.	10	15	0	4	17	4
I feel wiggly during work time.	9	9	7	10	9	6
I pay attention in lessons.	2	7	16	4	3	18
I can concentrate on my work.	1	5	19	1	7	17
I get distracted a lot during work time.	6	8	11	10	3	12
I know what to do to help me focus.	3	4	18	3	3	19

Key: N = No, S = Sometimes, Y = Yes

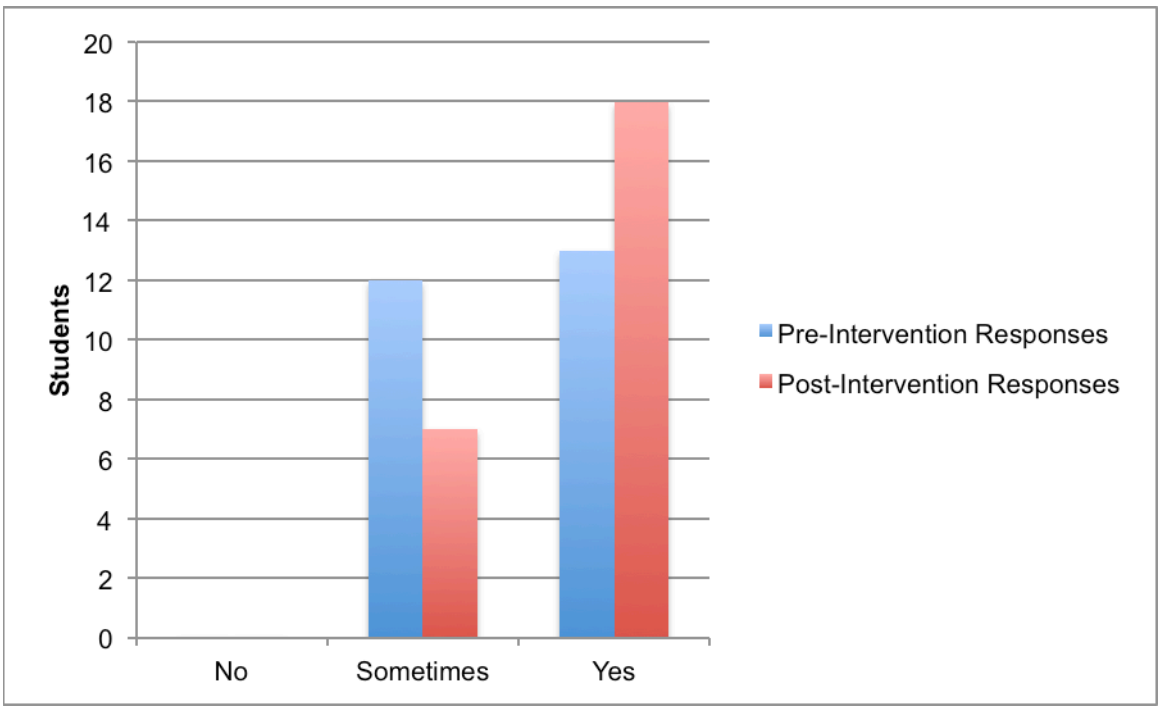

Figure 6. Perception of individual focus during work time

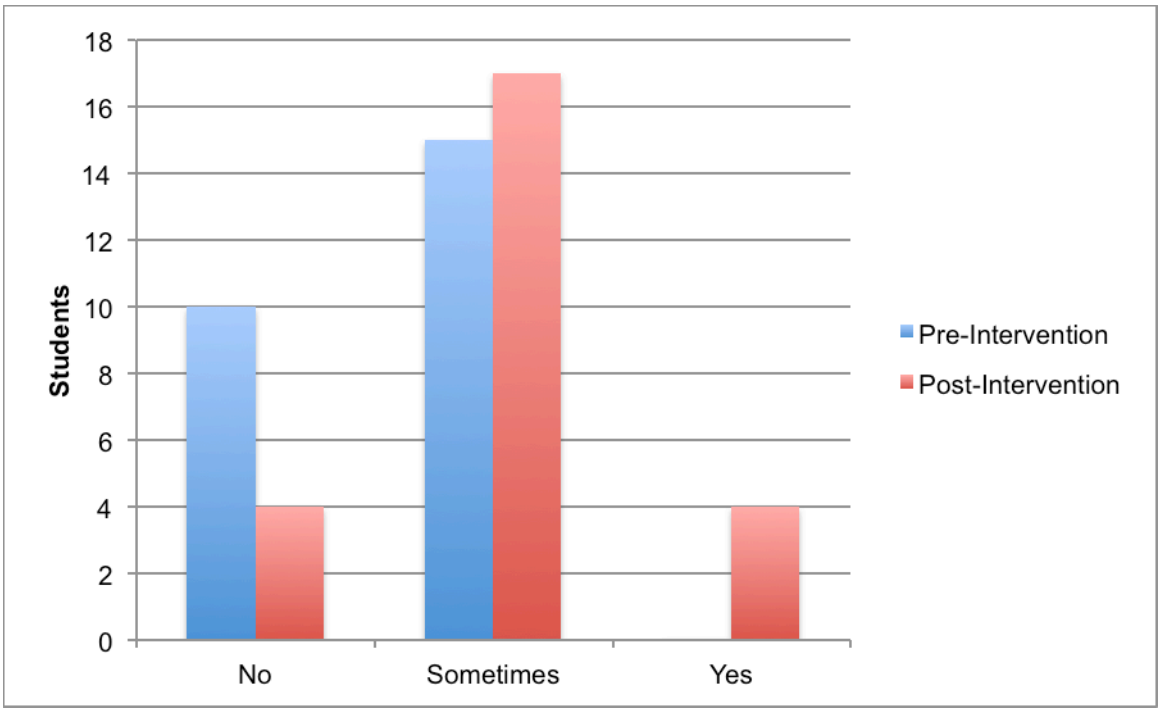

Figure 7. Perception of class focus during work time

More insight into student perspectives was gained through open-ended student feedback. When asked "How do you feel after completing a movement job," 100% of students provided a positive response, including "good," "happy," "relaxed," and "calm." Students preferred the jump rope and balance board over other movement jobs (Figure 8), with reasoning focused largely on gaining skills or moderating energy. One student did specifically mention liking the jump rope because "I get to go outside." In contrast, students were more divided on their least favorite movement material. The balance board, jumping rug, and jump rope were most commonly identified as less desirable. Reasoning for ill-favored materials centered on difficulty of the work and energy demands. This data clearly reflects divided opinion regarding certain movement jobs and distinct student motivations.

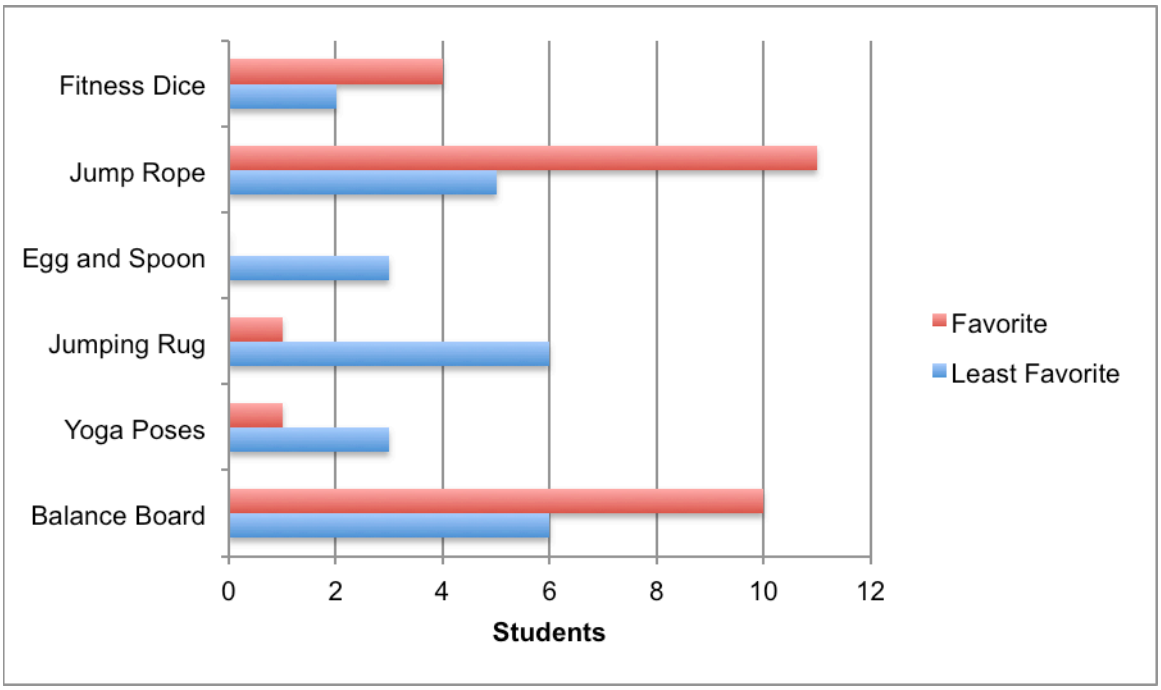

Figure 8. Movement job preferences

When asked why and when they chose to complete a movement job, students cited a variety of reasons (Figure 9). Eight out of 25 students noted they did a movement job when they finished another job, reflecting a possible self-motivation strategy. While some students reflected that they used the activities to calm themselves, even more specified they used the work when they got tired. Several students acknowledged their enjoyment of the job as a primary motivation, with one writing “I love doing it.”

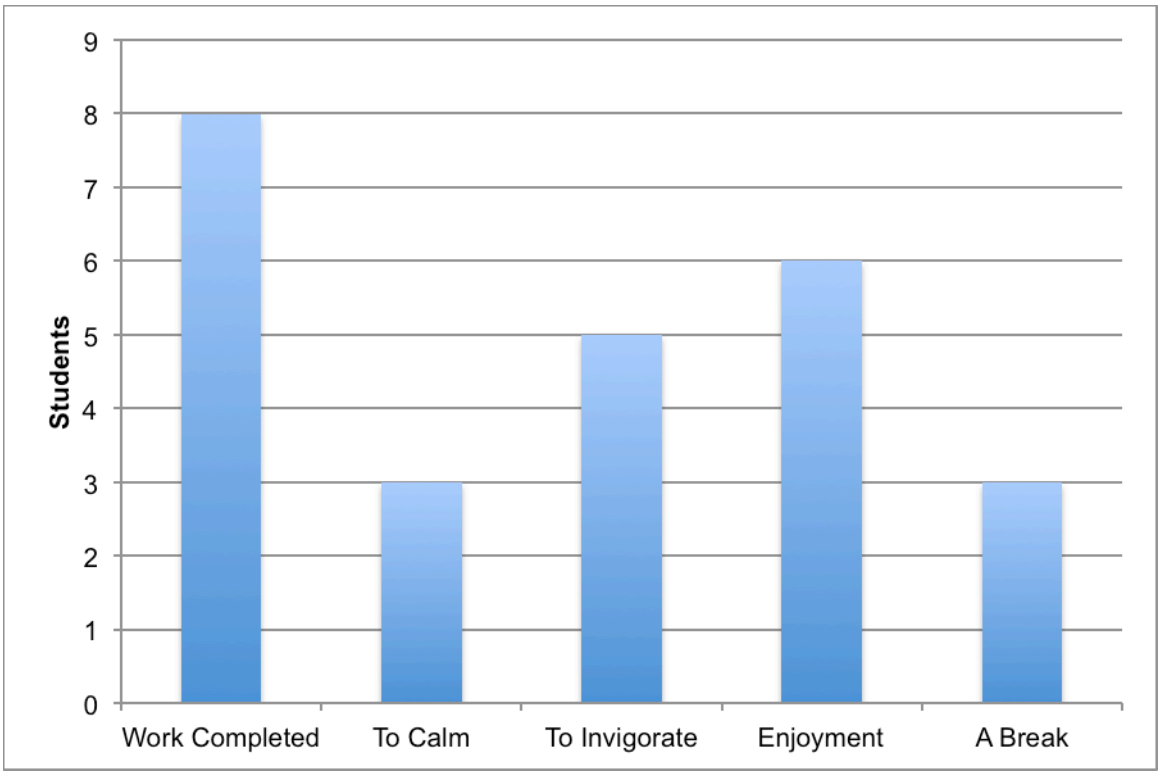

Figure 9. Student reasoning for completing movement jobs

Action Plan

The results of the study indicate that student coordination, on task behavior, focus and productivity improved over the course of implementation. All students developed positive associations with the movement jobs and self-reported some improvement in both individual and class focus. Increases in concentration and productivity were supported by data collected through observations and student work plans. Students with the lowest coordination levels saw growth in their scores over the study period, as well. The data relay a positive correlation between movement interventions and student coordination, on task behavior, focus, and productivity.

Other variables may have affected these measures. The most prominent variable is the process of normalization that occurs at the beginning of each school year. The study began approximately 3.5 weeks into the 2017-2018 school year. Twelve out of the 26 students were

returning to the classroom and familiar with routines. My instructional aide was also new to the school and previously unfamiliar with Montessori theory. With the work period being newly established, it is generally expected for students to become more focused and productive over time. This makes it difficult to attribute the positive outcomes to movement interventions. Interruptions such as school assemblies and increasing frequencies of student absences may have also affected results. The positive correlations noted in data do, however, reinforce that the movement interventions did not seem to have an adverse effect.

I will continue to utilize a movement shelf in addition to whole group movement lessons. The positive correlations with desired outcomes, in addition to the continued interest and enthusiasm of students, warrants its continued presence in the classroom. I am pleased that student engagement with movement jobs did not seem to cause a distraction. I plan to rotate the available movement jobs throughout the year as well as introduce new materials. Additionally, student feedback indicated a continued need to moderate distractions and provide focus strategies for the children to use during work time. In addition to continued use of the movement interventions, I plan to integrate more mindfulness education into my teaching to offer more strategies to students.

I anticipate a continued positive correlation between movement activities and student learning. Though the data show relatively consistent usage, it will be interesting to monitor the utilization of the movement shelf. I will continue to observe and assess the effects of the movement shelf to ensure it benefits students.

Future action research should focus on longer-term study or implementation at various times during the school year to help distinguish any positive correlation from effects of the normalization process. Educators would also benefit from research which studies the impact of

each movement job more in-depth. This would aide teachers in selecting appropriate movement jobs for the classroom as well as providing a verified variety of jobs to meet distinct needs of students. Another recommended area of research is to study variable time limits in relation to student engagement with the movement shelf. While some classrooms employ no limit and rely on student discretion, it would be informative to learn the variable effects of different lengths of utilization.

This study affirms a positive correlation between movement intervention and student coordination, on task behavior, focus, and productivity. It supports further research into the use of independent, student-led movement interventions such as the utilization of a movement shelf. I believe such access to movement activities would be beneficial for students in other classrooms, as well. The data shows that movement can be integrated into the classroom to support appropriate movement and student learning.

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Appendix A

List of Movement Jobs

The movement shelf will contain jobs that can be accessed and utilized independently throughout the work period.

Some activities adapted from:

Fuchs, M. A. & Craft, D. H. (2012). *Movement matters. A movement album for Montessori early childhood programs*. Cortland NY: Active Play Books.

Movement Jobs Available:

Balance Board

Aims: Practice stability, balance, coordination, and focus

Materials: Balance board

Presentation: Take balance board off the shelf and place on the floor. Place one foot on either side and try to maintain balance with the board level to the ground.

Yoga Poses

Aims: Practice stability, balance, and flexibility

Materials: Container, Yoga pose cards (with pictures and instructions)

Presentation: Review the concepts of stability, balance, and flexibility. Demonstrate the work by choosing a pose and modeling the steps while reading the instructions aloud. Model slow, careful movements and maintaining a pose through breaths.

Jumping Mat

Aims: Practice jumping

Materials: Rug with two circles sewn to either end

Presentation: Carry the jumping mat to the work space and unroll on the floor. Remove shoes. Jump from one circle to the other. Jumping can executed be forward, backward, and side to side.

Egg and Spoon

Aims: Practice locomotor movement and stability while carrying an object; careful focus

Materials: Two baskets, several plastic eggs, spoon, ribbon cut to appropriate length (about six feet)

Presentation: Remove the material from the shelf and set up the baskets the approximate distance apart. Unroll the ribbon between the two baskets. Pick up the spoon, bend, and carefully balance and egg on the spoon. Turn and walk carefully along the line, slowly lean over and deposit the egg into the empty basket. Return along the line to repeat the process until all of the eggs are transferred.

Jump Rope

Aims: Practice jumping and agility

Materials: Basket, jump rope

Presentation: Following a whole group lesson on jumping and using a jump rope, demonstrate how to remove the material from the shelf to an appropriate location outside the classroom. Reinforce the skills of turning the rope, anticipating the swing, and jumping with clearance.

Fitness Dice

Aims: Practice various gross motor movements and develop muscles

Materials: Two ten-sided fitness dice (one with numbers, the second with diagrams and names of various exercises)

Presentation: Demonstrate the work by choosing an exercise and modeling the steps. Allow children to practice each exercise. Once each exercise has been taught, model appropriate rolling of the dice and show how to use the dice in combination to dictate how many repetitions of each exercise are to be performed.

Appendix B

Student Coordination Scale

Student:
Date:

Almost never	Rarely	Sometimes	Often	Almost Always
1	2	3	4	5

1.	Student walks steadily without tripping.	1	2	3	4	5
2.	Student is quick and competent in tidying up.	1	2	3	4	5
3.	Student can execute planned motor activity (i.e. managing manipulatives to complete an academic task).	1	2	3	4	5
4.	Student moves around the classroom without bumping into furniture or others.	1	2	3	4	5
5.	Student can carry items without dropping them.	1	2	3	4	5
Total						/25

Appendix C

Student Feedback Form

I feel focused during work time.	
Our class is focused during work time.	
I feel wiggly during work time.	
I pay attention in lessons.	
I can concentrate on my work.	
I get distracted a lot during work time.	
I know what to do to help me focus.	

Additional Post-Intervention Feedback Questions:

How do you feel after completing a movement job?

Which movement job did you like the best? Why?

Which movement job did you like least? Why?

When/why did you choose to do a movement job during work time?

Appendix D

Work Plan

Name: _____

Week of: _____

Language

Math/Geometry

Cultural

Other

Effort Mon. ◯ Tues. ◯ Wed. ◯ Thurs. ◯ Fri. ◯

Technology | | | | | |

Math Facts | | | | | |

My **goal** is to…

- ☐ focus during worktime
- ☐ follow the instructions given to me
- ☐ _____
- ☐ challenge myself
- ☐ listen more carefully

Appendix E

Time On Task Observation Date:

Time	Number of Students **On Task**	Number of Students **Off Task**	Percentage **On Task**
9:15			
9:45			
10:15			
10:45			
11:15			

For purposes of this observation, on task behavior will include being engaged in a lesson or learning task as well as purposeful behaviors related to learning, such as getting supplies. Off task behavior will include behaviors where a student has disengaged from the task and learning environment to engage in an unrelated behavior, such as socialization.

Notes:

Appendix F

Utilization of Movement Jobs

Date	Number of Times Students Engaged in Movement Job	Length of Work Period (Minutes)