Chatham University

College of Continuing and Professional Studies

Department of Occupational Therapy

USE OF A SENSORY BASED PROGRAM TO IMPROVE ON-TASK CLASSROOM BEHAVIORS OF AT-RISK URBAN ELEMENTARY STUDENTS

An Evidence-Based Occupational Therapy Capstone Project
In
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by
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ABSTRACT

On-task behavior is a required component for student participation and completion of grade level expectations in school. Attention deficits in general education students are escalating and can impede acquisition of foundational knowledge necessary to build future academic learning. Off-task behaviors in classrooms appear as inattention and hyperactivity, which may emerge from sensory processing deficits, specifically sensory modulation dysfunction. This capstone project applied a sensory-based intervention program with at-risk students to improve their on-task behavior and academic performance. In collaboration with two general education teachers, twelve students engaged in a six-week intervention called S'cool Moves. Small group sessions were conducted for 15 minutes, one time per week and students performed the sensory-based strategies three times per week in class. Collaborative sessions were held with teachers one time per week. Pre and post-testing with two quantitative measures, Momentary Time Sampling and an informal recorder tool, determined on-task behavior and assignment completion. Participant perspectives were unveiled through two qualitative measures, a teacher survey and student focus group. Outcomes revealed 100% of the students increased their averaged on-task behavior, 58% of the students increased weekly assignments completed, and off-task behaviors related to sensory modulation dysfunction decreased. Findings suggest short-term, sensory-based interventions implemented in natural classroom environments among at-risk students can enhance their engagement in school occupational performance. A coadjutant partnership with educators expanded the utilization of sensory-based interventions as an integral part of classroom techniques and circumvented the adverse impacts of inattention and hyperactivity behaviors creating optimal academic performance.

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Chapter 1

Introduction

This chapter presents an overview of the setting and the basis for the evidence-based capstone. The description on the problem and rationale with at-risk students gives reasoning for targeting attention difficulties and on-task behaviors amongst urban elementary students. A brief explanation of assistance and potential obstacles for the project follows, and the significance of the evidenced–based project to the field of occupational therapy is established.

Description of Evidence-Based Project Setting

The evidence-based project setting is in Dayton, Ohio. Also called the Miami Valley region of Ohio, Dayton sits between the state capital of Columbus and Cincinnati. The Dayton Public School District has 30 school buildings located within and beyond the Dayton city and county lines. The district offers an education to nearly 13,800 children (ODE, 2013b, p.1). There are 16 occupational therapists at Dayton Public Schools who maintain caseloads of 50-55 students' ages 3-21 identified with a disability under the Individuals with Disabilities Education Act of 1997.

One of the 30 Dayton Public Schools, River's Edge Montessori is located in the McPherson Town Historic District, which is small and historic in appearance with large oak trees, brick homes, narrow sidewalks, and quiet dead-end streets. Approximately 516 students, in preschool through sixth grade, attend River's Edge School (ODE, 2013a, p.1). The student population is multicultural and bilingual, with families from all parts of the world including Africa, the Middle East, Puerto Rico, and China.

River's Edge Montessori is unique in its physical structure and in the method of instruction compared to the other schools in the district. One distinctive feature is the Great

Miami River runs directly behind the school building; windows outside the rear building offer a picturesque view of downtown Dayton. Moreover, the main premise of River's Edge Montessori is written on the tile floor, "Follow the child."

Another difference at River's Edge Montessori is how the classroom environment matches the school mission and educational philosophy. The mission statement of River's Edge Montessori is "to meet each child at his individual developmental level and facilitate meaningful learning experiences" (REM, 2014, para.2). The Montessori philosophy, based upon the work of its creator Maria Montessori, "exposes children to an enriched, structured environment, and the children perceive their inner abilities, leading towards growth in intelligence, physical and psychological skills" (REM, 2014, para 5). The teachers recognize the importance of students being active learners, who are free to move around the room or work quietly. Students use developmental, kinesthetic materials rather than strictly paper–pencil tasks.

Classrooms also vary compared to traditional style classrooms. The rooms are set up by multiple ages, with three grade levels within each classroom. For example, 6-9 year-old children combine in one classroom for first through third grades, and 9-12 year-old students are in one classroom for fourth through sixth grades (Duax, 2013); and there is one teacher and paraprofessional in each classroom.

At River's Edge Montessori, occupational therapy provides direct services to 35 students in special education. The students served have a variety of diagnoses, which include cochlear implants, vision loss, Attention Deficit and Hyperactivity Disorder (ADHD), autism, emotional disturbances, and learning disabilities. Types of service delivery include consultation, collaboration, and direct therapeutic interventions that occur in all school environments, such as classrooms, hallways, and the cafeteria.

Description of Evidence-Based Occupation Therapy Problem and Rationale

Children displaying attention difficulties in the school setting are at-risk for suboptimal school performance (Basch, 2011; Fedewa & Erwin, 2011). Attention challenges may stem from predisposed factors such as poverty, medical, or environmental determinants (Basch, 2011; Ben-Sasson, Carter, & Briggs-Gowan, 2009; Fisher & Duran, 2004; Froehlich et al., 2007). All of River's Edge Montessori families are economically disadvantaged (ODE, 2013a, p. 1). Many students attending Dayton Public Schools are academically and/or developmentally behind other students enrolled in surrounding suburban schools. An article in the Dayton Daily News reported that nearly 80% of the kindergarten students enter Dayton Public Schools unprepared to perform at the kindergarten level (Kelley, 2014, para 3). Some students enter school with the attention, motor, cognitive, and social skills ready to meet academic demands, while other students require additional support.

Attention difficulties are often associated with Attention Deficit-Hyperactivity Disorder, one of the fastest growing and prevalent "mental health and behavioral problems that affect youth" (Basch, 2011, p. 641). According to the U.S. Centers for Disease Control and Prevention (2009), five million children, ages 3-17 have a diagnosis of attention deficit-hyperactivity disorder, and children within this group who also come from low socio-economic families, increased from 7% to 10.6% between 2007-2009 (National Conference of State Legislatures, 2011, para 10). Attention Deficit-Hyperactivity Disorder presents on a continuum, with the severe range resulting in a diagnosis, while the mild range of inattentive and hyperactivity behaviors in children often go undiagnosed and untreated (Peck, Kehle, Bray, & Theodore, 2005). Therefore, the students in the mild range may experience damaging outcomes into

adulthood such as limited social connections and employment options (Basch, 2011; Fedewa & Erwin, 2011).

One of the causations of attention problems in the classroom that is not predominately considered is sensory processing deficits. Approximately 5-10% of typically developing children in America have a sensory processing disorder that may adversely affect school performance (Ahn, Miller, & Milberger, 2004, p. 291). Additionally, in an urban Head Start program, 17-35% of preschoolers had a sensory modulation disorder, a pattern of sensory processing disorder (Reynolds, Shepherd, & Lane, 2008). In the classroom setting, sensory processing difficulties may appear as behaviors commonly seen among children with attention deficit-hyperactivity disorder. Dunn and Bennett (2002) and Mangeot et al. (2001) found that sensory processing disorder patterns may co-exist among children diagnosed with attention deficit-hyperactivity disorder.

Children who display sensory processing deficits struggle with fulfilling grade level requirements, and show attention, motor, cognitive, and/or social emotional skill deficits, which affects school performance (Ben-Sasson et al., 2009; Golos, Sarid, Weill, & Weintraub, 2011). Dr. A. Jean Ayres developed the sensory integration theory based on neuroscience, describing the process that occurs in the central nervous system that affects childhood development and behavior from a sensory base (Lane & Schaaf, 2010). Sensory processing disorders are due to disruptions with the brain's ability to take in sensory information (vestibular, proprioception, tactile, visual, auditory, gustatory and auditory) from the environment and organize the sensations to make an adaptive response (Ayres, 1979; Paul et al., 2003).

Sensory modulation is a pattern of sensory processing dysfunction that enables a student to focus on essential sensory stimulation while inhibiting unimportant sensations. This

consistent ability to attend and inhibit incoming sensations in any environment is necessary to "regulate and organize the degree, intensity, and nature of responses to sensory input in a graded and adaptive manner" (Chu & Reynolds, 2007, p. 376). The patterns of sensory modulation include sensory-seeking (constant need for intense sensory experiences), over-responsivity (overreact with fear, avoidance, distraction or aggression to non-toxic sensations) and under-responsivity (unresponsive to sensory input others notice) (Dove & Dunn, 2008).

Over-responsivity, under-responsivity and sensory seeking behaviors appear in the classroom setting as impulsivity, poor sustained attention, lack of self-control, inability to complete in-class and homework assignments, and hyperactivity behavior such as frequently being out of a seat and rocking in a chair (Lin et al., 2012; Mangeot et al., 2001; Peck et al., 2005). The over-responsive behavior to sensations appears as hyperactivity, fear, and poor impulse control, and the under-responsive behavior appears as inattentiveness during school tasks. Sensory seeking behavior appears as constant impulsivity or distractibility (Dunn & Bennett, 2002; Fedewa & Erwin, 2011; Lin et al., 2012; Mangeot et al., 2001; Peck et al., 2005). When a child's sensory processing systems cannot meet the school environment and task demands, the results may adversely affect current and future academic performance (Lane & Schaaf, 2010).

At River's Edge Montessori, the number of students referred to the school support team, has increased due to attention and behavior issues that disrupt class instruction and learning experiences. This rise in referrals has appeared in school settings across the nation. In a survey of teachers, Dunn, Cole, and Estrada (2009) researched why teachers make referrals to school support teams; the highest ranked reason, at 39%, stemmed from student inattention, and the second reason was poor academic skill performance (p. 32). To counteract student academic

failure through early intervention, River's Edge Montessori designed a school support team for Response to Intervention. Response to Intervention (RtI) is based upon two federal laws, the Individuals with Disabilities Education Act of 2004 (IDEA) and the reauthorization of the Elementary and Secondary Education Act of 1965, better known as the No Child Left Behind Act of 2001 (AOTA, 2009; Reeder et al., 2011). Response to Intervention, a preventative approach, is a multi-tiered intervention model based upon the use of intense, short-term evidence-based strategies to improve student's academic and behavior performance through documented progress monitoring (AOTA, 2009; Bell & Swinth, 2005; Knippenberg & Hanft, 2004; Reeder et al., 2011).

Parents and educators should have treatment options that address the functional performance in the classroom, reducing the possible toxic consequences of attention difficulties extending into adulthood (Basch, 2011; Fedewa & Erwin, 2011; Fisher & Duran, 2004). One potential option is sensory-based interventions. In the United States, 90% of school-based occupational therapists utilize sensory-based interventions from the principles of sensory integration (May-Benson & Koomar, 2010, p.403). Sensory-based interventions target the sensory system, such as the vestibular, or tactile senses, to enable alertness and attention to engage in and perform academic, social, and daily living activities within the classroom setting (Chu & Reynolds, 2007; Dunn & Bennett, 2002).

Under the Response to Intervention approach, occupational therapists can be proactive and utilize sensory-based interventions with all students in their natural class environment. By offering therapeutic support to at-risk students in the general education setting, students will receive assistance sooner, thereby reducing the number of future referrals and enhancing

students' opportunities to successfully perform expected demands within the classroom (Knippenberg & Hanft, 2004; Reeder et al., 2011).

Another benefit of providing early intervention services under the Response to Intervention model includes using a collaborative approach with teachers. Occupational therapists can support teachers and students by integrating sensory-based interventions within the classroom schedule. Teachers can expand their repertoire of strategies to apply with students who have attention issues in class. By working together with educators, students can improve on-task behavior by learning sensory-based strategies to apply that will loosen the destructive grip sensory stimulation has upon maintaining attention during class expectations (Dunn, 2008).

Support for the Evidence-Based Project

Assistance for the capstone project appeared in multiple ways since the start of the project. Family and close friends have given verbal encouragement and spiritual support. The support from co-workers will make the project easier to facilitate. A few co-workers have offered to review the chapters for clarity, brainstorm ideas for implementation, and problem solve challenging situations. The Related Services supervisor and the principal at River's Edge Montessori have shown interest in the potential evidence-based capstone project as well.

Another area of support for the capstone project is the availability and use of the sensory-based materials for the project. The Dayton Public School district has some sensory materials in storage for use in the capstone. The school district will provide use of the copier and the paper products needed.

Barriers to the Evidence Based Project

Several potential barriers may hinder the implementation and success of this capstone project. Funding from the district to supplement the project will not be available; the author will

have to obtain materials not already available from the district. Also, the occupational therapy department has not formally carried out a formal Tier-2 level of Response to Intervention within school buildings, only the Tier-1 level consultation; which means no one can provide experienced guidance. Due to high caseloads, and lack of interest in pursuing programming, no therapist has conducted short- term interventions among at-risk general education students.

Another aspect to recognize is the participant commitment to the project. Teachers may consider dropping out due to increasing job demands, and students may resist or refuse to participate after initiating implementation. In addition, coordinating a designated time around classroom schedules (i.e. special classes, lunch) can be problematic, especially in the middle of the school year when schedules are full and a routine is established. There is also a potential to miss the therapeutic sessions in the project due to various reasons, such as participant absenteeism, inclement weather, and scheduled school activities. Sessions will be made up; however this will add time to the practitioner's existing therapy schedule.

Lastly, obtaining written approval from parents may be a barrier if the parents refuse or delay in returning the required consent forms in a timely manner. Moreover, any student whose family speaks English as a second language will require support from additional staff to translate the required information. All parents involved in the project will receive some form of verbal contact (face to face or phone call) in addition to written formats. This will take time and parents may not be available to discuss the capstone project.

Significance of the Evidence-based Project to the Field of Occupational Therapy

This evidenced based project will contribute to the school-based therapist's knowledge of implementing a short-term intervention, with a collaborative approach for general and special education students requiring support in their natural classrooms. By accomplishing this,

educational personnel will gain a broader perspective on the role of occupational therapy services in the school setting. The capstone project will also assist in establishing occupational therapists as a unique member of the educational culture and team; by providing a medical and holistic viewpoint on identifying potential sensory-processing, motor, cognitive and mental health deterrents, impeding the overall school performance of students while also pinpointing student strengths and interests, for developing a holistic profile of the student.

For far too long, school –based occupational therapy has been universally synonymous with improving handwriting skills and working with students in special education. This project can alter this old, inaccurate belief. By strengthening collaborative relationships with school staff and displaying the true elements of the profession by designing programming and utilizing evidence-based activities to meet the needs of all students in attaining school success.

Additionally through collaborative approaches, occupational therapists are making promising shifts towards becoming inclusive members of school cultures. The reductionist, pull-out frame of reference isolates both practitioners and students from authentic contexts and natural application of learned skills to school occupations. However, comprehensive occupation-based approaches seem to occur frequently for only handwriting and fine motor curriculum support. Many school-based practitioners report that the resistance to performing integrative services in general education classrooms lies within high caseloads, teacher unwillingness, and lack of knowledge on integrative therapy services in classrooms (Reeder et al., 2011). School-based occupational therapists must be knowledgeable in supporting all students within authentic school settings. By applying evidence-based sensory techniques, this project will add knowledge, confidence, and evidence for occupational therapists to address one of the most prevalent issues influencing student school performance and success, attention difficulties.

Chapter 2

Introduction

This chapter discusses the process taken to produce the evidence for the capstone project. The PIO introduces the main purpose of the capstone, specifically using sensory-based interventions to enhance on-task behaviors of at-risk students. The description of the methodology taken to obtain evidence for the PIO follows. The final sections of this chapter summarize the extensive literature portfolio and the evidence located to support the use of sensory-based interventions to target the improvement of on-task behaviors amongst at risk students.

The Evidence-Based Practice Question

This evidence-based practice question reflects the need to assist the growing number of students who are struggling to control and maintain on-task attention behaviors during academic instruction. Sensory-based interventions may support on-task behavior to participate in class activities. At-risk students may present with attention and/or sensory processing difficulties that can adversely affect academic performance. Sensory processing deficits can overlap with behaviors observed in children with attention deficit-hyperactivity disorder, for example hyperactivity, impulsivity, and inattention. Integrating and processing sensory information is a developmental process in which the brain registers, interprets and organizes sensations (vision, auditory, taste, smell, touch, movement, and force), that teach children about oneself, people, and objects (Ayres, 1979). Processing sensory information also establishes meaning from adaptive responses during interactions with objects and people in the environment (Ayres, 1979). If children are at-risk, the brain's ability to interpret, process, and organize these sensations in the classroom can become dysfunctional and maladaptive behaviors could ensue, hindering attention

and thus learning (Ayres, 1979; Watling, 2011). This has led to the formation of the following PIO question:

Population: At-risk students in an urban elementary setting

Intervention: Sensory-based intervention program

Outcome: Improved on-task classroom behaviors

Question: Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Narrative Synthesis of CAT Portfolio

Methodology of literature search. The literature investigation, conducted from January 2014-June 2014, consisted of a variety of search terms in multiple databases. Searches performed were mainly on the Chatham University library site, along with Google Scholar Search, OT Seeker, and the American Occupational Therapy Association website. Databases consisted of CINAHL, EBSCO, ERIC, and PubMed.

After consulting with the Chatham librarian, search terms were selected to use in the advanced search process. A review of reference lists of previously selected articles also revealed additional related articles. Inclusion criteria for the selected articles included: published from 2000-2014, at-risk and/or elementary aged children with attention difficulties, attention, and/or academic performance as the targeted outcome, and sensory integration therapy or sensory-based strategies as the identified intervention. The searches used the following keywords in isolation and in combination: at risk factors, at risk children, economically disadvantaged, low socioeconomic status, attention deficit-hyperactivity disorder, attention span, on-task behavior, classroom movement programs, movement programs, academic performance, learning readiness, school performance, occupational therapy, collaboration, sensory processing disorder, sensory

integration, and sensory-based programs or interventions. The search became exhausted when repeated articles arose with alternate key phrasing.

The appraised articles were located in the following journals: *The American Journal of Occupational Therapy, Archives of Pediatric and Adolescent Medicine, British Journal of Occupational Therapy, Canadian Occupational Therapy Journal, Journal of Abnormal Child Psychology, Journal of Counseling and Clinical Psychology, Journal of Developmental and Physical Disabilities, Journal of Learning Disabilities, Journal of Occupational Therapy, Early Intervention and School, Neuropsychiatric Disease and Treatment, Occupational Therapy International, Journal of School Health, Occupational Therapy Journal of Research, Physical and Occupational Therapy in Pediatrics, and Scandinavian Journal of Occupational Therapy.*

Description of the portfolio. Multiple studies were obtained to build a portfolio of evidence on at-risk children, sensory processing, attention deficit and hyperactivity disorder, sensory-based interventions, and collaborative services. There were 50 articles located, and 34 were selected to form the Critical Appraisal Portfolio (See Appendix A: Critically Appraised Topic p. 77) to support the evidence-based project. The collection of articles, published from 2001-2014, were selected based upon the topic, quality of study, and relevance to the capstone. The final critical appraised portfolio consists of four Levels I, 12 -Level II, 10 -Level III, six -Level IV, and two -Level V studies. The research designs include: four experimental pretest-posttest designs, five single subject designs, two multiple baseline designs, three randomized cross over designs, one quasi-experimental study, nine cohort studies, two case reports, one descriptive correlational research design, one longitudinal study, one national research study, one -two year prospective study, one systematic review, one critical appraisal review, and two literature reviews.

Synopsis of evidence that directly supports the project. Children who display attention difficulties, may also have underlying sensory processing deficits that often go unnoticed (Dunn & Bennett, 2002; Miller et al., 2007). Sensory processing dysfunction appears as attention and hyperactivity behaviors in the classroom setting (Dunn & Bennett, 2002; Dunbar, 2008). Children at-risk, due to low socioeconomic or minority status for example, have a higher likelihood of not receiving treatment or support to address attention and other health-related issues (Basch, 2011; Froehlich et al., 2007). Studies reveal the relationship of impoverishment and other risk factors with atypical sensory processing amongst at-risk children ((Bar-Shalita, Vatine, & Parush, 2008; Ben-Sasson et al., 2009; Reynolds et al., 2008). Between 17-35% of minority students in a Head Start program exhibited sensory modulation symptoms of under-responsiveness and sensory-seeking behaviors in a cohort study by Reynolds et al., (2008, p. 192). Ben-Sasson et al. (2009) found that children with at-risk factors such as low socioeconomic homes, or prematurity, had a higher risk for sensory over-responsiveness, impairing functional performance.

Research studies reveal how economically disadvantaged children may have attention deficit-hyperactivity disorder and/or sensory processing disorder, making students' at-risk for poor educational performance (Basch, 2011; Ben-Sasson et al., 2009; Froehlich et al., 2007; Reynolds et al., 2008). Furthermore, Froehlich et al. (2007) conducted a cross-sectional survey across the U.S. and determined that underprivileged children ages 8-15 met the criteria for attention deficit-hyperactivity disorder two times greater than wealthier families and were less likely to receive and maintain medical and behavioral treatment.

Bar-Shalita et al. (2008) noted that a child's academic performance was statistically different than typically developing children, if the child had the presence of a sensory

modulation disorder. When a child is at-risk (Fisher & Duran, 2004) or has a mild disability such as attention deficit-hyperactivity disorder, the children also demonstrated differences in academic engagement compared to typically developing children (Munkholm & Fisher, 2008). When children enjoy a task and/or learn strategies, they will continue to participate in required academic, daily living and leisure activities despite the challenges, therefore potentially improving overall outcomes (Bar-Shalita et al., 2008; Basch, 2011). Students may benefit from early interventions to improve access to academic activities and success for completing schoolwork (Fisher & Duran, 2004; Munkholm & Fisher, 2008). Many interventions target the management of the symptoms of attention disorders, rather than accentuating functional academic outcomes (Basch, 2011). Sensory-based interventions can fill the gap to provide students with methods to manage attention and to increase on-task behavior in order to improve school performance.

Varieties of single, sensory-based interventions can stimulate tactile, vestibular, and proprioceptive sensory systems to assist children in improving on-task behaviors (Worthen, 2010). Kercood, Grskovic, Lee, and Emmert (2007) found that fourth grade students who received stimulation through a small fine motor manipulative decreased the number of off-task behaviors during math assignments. Children wearing weighted vests displayed significant improvement with on-task behavior during fine motor activities by 18-25% (VandenBerg, 2001, p.425); first through fourth graders in Taiwan made significant improvements in attention processing and on-task behaviors while completing a standardized computer performance test (Lin, Lee, Chang, & Hong, 2014).

Another single, sensory-based strategy implemented with students was dynamic alternate seating. By providing vestibular and proprioceptive stimulation to calm the over-responsive and

sensory-seeking student, children improved attention and in-seat behavior to class instruction and assignments when using stability balls (Fedewa & Erwin, 2011), Disc O Sit cushions (Pfeiffer, Henry, Miller, & Witherell, 2008) and therapy balls (Schilling et al., 2003). Fedewa and Erwin (2011) also reported an increase in the on-task behaviors of general education students, with no prior attention issues, who also used the stability balls in class.

Sensory interventions that targeted more than one sensory system and actively engaged the students produced positive results in short periods. Peck et al. (2005) used the Yoga Fitness for Kids program for three weeks, with fourth graders undiagnosed but showing attention problems. The results were large effect sizes in improved attention to task, with continued skills at follow up. Lin, Min, Chou, and Lin (2012) combined vestibular, tactile, and proprioceptive strategies to decrease the high activity levels of Taiwanese preschoolers. After eight -weeks, the teachers reported that the program easily fit into the instructional routine and that the students displayed longer attention spans, focused during lessons, and sat quieter with less extraneous body movements (Lin et al., 2012).

Sensory-based interventions to support additional outcomes. Multiple sensory-based interventions required concentration for execution and promoted attention to tasks and targeted alternate outcomes such as aggression, motor development, or atypical behaviors that hindered academic engagement. In a pre-test-post-test design, Shaffer et al. (2001) utilized the Interactive Metronome, a computerized program requiring hand and foot rhythmicity, concentration, and timing, amongst 6-12 year old boys with attention deficit -hyperactivity disorder in a clinic setting. The Interactive Metronome group significantly improved attention, motor control, and reading skills, compared to the video game and control groups after 15 hours of intervention. Other interventions, that also required concentration and movement, addressed atypical and

aggressive behavior outcomes. The Get Ready to Learn yoga program, facilitated with a group of children diagnosed with autism, resulted in significant improvements ($p<.05$) in atypical behaviors compared to the control group (Koenig, Buckley-Reen, & Garg, 2012). Lopez and Swinth (2008) created a proprioceptive program for boys identified with behavioral disabilities, and showed statistically significant improvements in the reduction of aggressive durations. As a result, the boys regulated their sensory system, which led to the engagement in academic activities with less aggressive behaviors after the intervention than at baseline (Lopez & Swinth, 2008). Furthermore, multiple other studies cited additional occupational performance skills that improved along with on-task behavior. Lin et al. (2012) and Vandenberg (2001) noted that students regulated their over-responsive behavior to participate in class instruction, and teachers reported that students interacted appropriately with peers.

Sensory interventions for sensory processing disorder. Quantitative studies conducted in various settings showed improvements in sensory processing and attention skills among children diagnosed with sensory processing disorders. Miller, Coll, and Schoen (2007) examined the effectiveness of sensory integration treatment with children diagnosed with sensory processing disorder in a randomized control study in a clinic setting. The sensory integration group made significant improvements on the attention section of an outcome measure and significant gains towards individualized goals, when compared to alternate treatment and control groups (Miller et al., 2007). A systematic review executed by May-Benson and Koomar (2010) studied sensory integration interventions conducted in hospital, school, and clinic settings amidst children with various diagnoses. The reviews indicated that sensory integration therapy may produce positive results for students who demonstrate sensory-motor, motor planning, attention and behavior difficulties (May-Benson & Koomar, 2010).

Movement based and physical activity programs. Movement and physical activity programs improved on-task behavior and academic outcomes in children (Ericsson, 2006, Hill et al., 2010; Krog & Kruger, 2011; Mahar et al., 2006; Oriel, George, Peckus, & Semon, 2011). Some programs utilized strategies that embedded exercise movements with teachers leading the movements (Ericsson, 2006; Krog & Kruger, 2011), while other movement programs incorporated neurological reflex poses and movements from programs around the world, such as educational kinesiology, Can Learn and Move to Learn (Inder & Sullivan, 2004; Krog & Kruger, 2011). Some programs were conducted for 10-15 minutes prior to a designated academic activity (Hill et al., 2010; Mahar et al., 2006; Oriel et al., 2011), and others were conducted for 30 minutes daily to develop student's sensory-motor systems and to enhance class performance (Ericsson, 2006; Krog & Kruger, 2011). Students made significant improvements for on-task performance (Hill et al., 2010; Mahar et al., 2006) and on cognitive assignments (Hill et al., 2010; Mahar et al., 2006; Oriel et al., 2011).

Teacher perspectives and collaboration. Mulligan (2001) found teachers used a quiet space, motor breaks, and sensory modulation strategies with students diagnosed and undiagnosed with attention deficit-hyperactivity disorder. These strategies ranked as the top three classroom interventions, and the strategies were statistically significant for effectiveness at the elementary grade levels (Mulligan, 2001). The teachers also reported needing special education and related services personnel for the classroom in order to provide the support students require to perform school activities (Mulligan, 2001).

A collaborative approach between occupational therapists and teachers resulted in improvement in student outcomes and clarified the role of occupational therapy in the school setting, broadening the professional relationship beyond casual exchanges. Barnes and Turner

(2001) and Reeder et al. (2011) found that teachers who willingly used sensory strategies recommended by occupational therapy in the classroom, noted positive student outcomes and acknowledged a greater understanding of therapeutic interventions. Ratzon et al. (2009) discovered that between three treatment methods (direct, collaborative and consultation, and both mixed), all made significant gains with the students' performance, and also noted that the collaborative and consultation approach was just as effective as direct intervention.

Evaluation and outcome measures. The literature appraisal revealed similarities in the evaluation measures used to identify sensory processing dysfunction, school performance, and time on-task. Throughout multiple studies, the Sensory Profile (Dunn, 1999) or Short Sensory Profile (Dunn, 2001), a shorter version of the Sensory Profile, was selected to identify students who had a sensory processing disorder (Dove & Dunn, 2008; Dunn & Bennett, 2002; Fedewa & Erwin, 2011; Kercood et al., 2007; Mangeot et al., 2001; Miller et al., 2007; Peck et al., 2005; Schilling et al., 2003). Momentary time sampling and observation checklists were conducted to measure the amount of time students were on-task while performing a given academic activity (Fedewa & Erwin, 2011; Hill et al., 2010; Kercood et al., 2007; Peck et al., 2005; Schilling et al., 2003; VandenBerg, 2001). Additionally, teachers completed formal (Social Validity Scale) and informal surveys expressing their perspectives regarding the sensory intervention used in the classroom (Fedewa & Erwin, 2011; Lin et al., 2012; Peck et al., 2005; Schilling et al., 2003; VandenBerg, 2001). Gaining an understanding from the teacher's point of view, can assist with teacher adherence when implementing recommended sensory strategies.

Chapter 3

Introduction

This chapter presents the conceptual model that aligns the sensory-based program to support on-task behaviors in at-risk students. The correlation of the evidence-based sensory intervention to the *Occupational Therapy Practice and Framework*, *3rd Edition* (AOTA, 2014), as well as the American Occupational Therapy *Centennial Vision* (AOTA, 2007) is described. The last section explains the author's professional qualifications and knowledge base to conduct the sensory-based intervention.

Occupation-Based Conceptual Model Guiding Evidence-Based Project

The Ecological Model of Sensory Modulation (Miller, Reisman, McIntosh, & Simon, 2001) reflects the continuous interaction between the theory of sensory integration, the resulting patterns of sensory processing disorders, attention, the environmental components, and the functional task. The Ecological Model of Sensory Modulation represents the dynamic interaction of multiple internal and external dimensions that affect emotion and attention. The internal dimensions are primitive sensations, such as vestibular, tactile, proprioceptive, visual, and auditory, and are processed in the central nervous system. The external dimensions are environment, task, relationships, and culture. Each dimension influences the other by either producing a 'good fit' (or adaptive response) to perform a given functional activity or an imbalance that disrupts the execution of the functional activity.

The Ecological Model of Sensory Modulation represents the relationship between at-risk children who have sensory processing difficulties and their inability to focus on the academic curriculum. It also reflects how children adapt responses to given situations in the environment, and engage in school tasks and assignments (Ayres, 1979). In the classroom, a child's sensory

modulation dysfunctional behavior may appear in three different ways: an over responsive reaction (withdrawal, avoidance, or irritability), an under responsive reaction (inattention, lazy, or uninterested), or a sensory seeking reaction (hyperactivity and impulsivity behaviors) (Chu & Reynolds, 2007; Dunn & Bennett, 2002; Mangeot et al., 2001). Sensory-based interventions provide the child with strategies and/or environmental modifications that are necessary to counteract these sensory processing impediments, which hinder student participation in academic activities (Watling, 2011). An adapted version of the ecological model of sensory modulation (See Figure 3.1, p. 20) is relevant to the use of sensory-based interventions with students who are at-risk of sub-optimal academic performance. Supporting these students' attention to engage in learning by matching their behavior to demands of school tasks, may prepare students for active academic performance within the natural class environment (Watling, 2011).

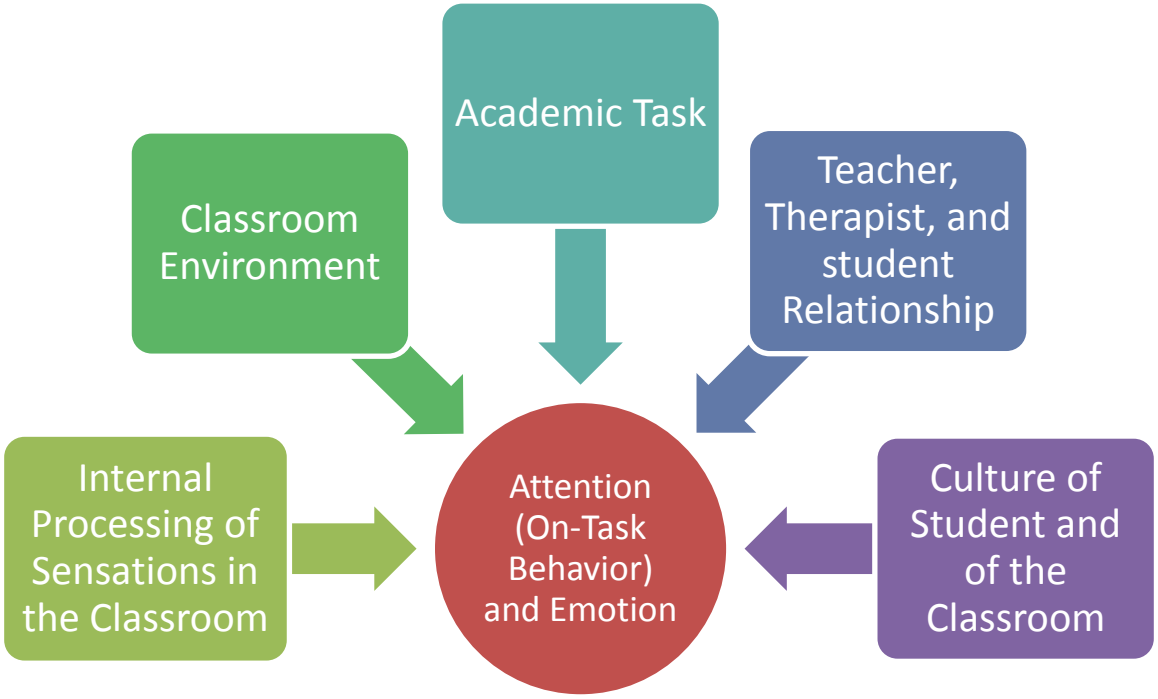


Figure 3.1 Adapted version of The Ecological Model of Sensory Modulation created by author

Correlation Between the EBOT, the OTPF, and AOTA's Centennial Vision

The Occupational Therapy Practice Framework 3rd Edition (AOTA, 2014) guides practitioners in the primary philosophy of the profession, promoting health and occupational performance by enhancing a person's execution of their role and routine in various settings. This capstone project focuses on improving student participation and school performance through active engagement in a sensory-based intervention program that includes a student-centered approach. The outcomes of this project will guide practitioners in future decision-making and intervention planning with at-risk students who display on-task behavior challenges. For this capstone project, students will actively participate in purposeful preparatory sensory-based strategies and activities to enhance on-task behaviors for learning, and classroom performance.

This capstone also contributes to the American Occupational Therapy's (AOTA, 2009) *Centennial Vision* in multiple ways. A collaborative approach will be utilized to strengthen the application of the sensory-based intervention in natural classroom environments. Through this collaborative method, teachers will gain a deeper understanding of occupational therapy in educational settings, while expanding knowledge of and utilization of sensory-based interventions to address off-task behaviors. As a result, the role of occupational therapy will broaden. Furthermore, Response to Intervention teams will understand how practitioners are stakeholders in assisting students in school participation.

This sensory-based programming will also add to the body of evidence-based practice to help meet the needs of at-risk students who display attention difficulties in class. School-based practitioners need to increase knowledge of effective, short-term sensory-based interventions that can be applied in the class environment with minimal interference to the student's daily routine. In summary, this capstone project may expand the image and understanding of occupational

therapy services in school settings, enhance the collaboration process with other professionals, and prepare school practitioners to provide evidence-based programming to assist struggling students.

Practitioner Professional Skills and Knowledge

My competency in sensory integration, sensory-based intervention treatment, and collaborative approaches has expanded my professional knowledge in school-based practice with urban youth over the past 18 years; and my experiences prepared me for conducting my capstone project. My previous experience includes working with students enrolled in preschool through high school grade levels and students with young adult status in post-secondary programming. The students I worked with had a variety of diagnoses such as attention deficit-hyperactivity disorder, cerebral palsy, learning disabilities, autism spectrum disorder, low vision, and hearing impairments.

The knowledge I acquired over the years, stems from continuing education, self-initiated and required readings, and the implementation of sensory processing assessments and programs with students in all grade levels. I delivered an in-service for special education teachers on sensory integration theory and sensory processing disorder to improve their understanding and willingness to trial sensory strategies with designated students in the classroom. When I facilitated two short in-services on sensory-based programs for regular and special education teachers, it resulted in half the teachers continuously utilizing at least one strategy with students within their daily class schedule.

My intrigue as a life-long learner led me to acquire the skills for applying sensory processing principles into the school and classroom setting. I am proficient in issuing sensory evaluations, such as Sensory Profile, Short Sensory Profile, and in 2002, I received certification

to issue the Sensory Integration and Praxis Test (Ayres, 1989). This has also led to my pursuit to attend conferences by experts in the field of sensory processing. Diana Henry instructed on consultation with teachers to utilize sensory strategies in the classroom setting, Mary Kawar taught multiple therapeutic interventions to improve visual and vestibular (movement) processing for academic performance, and Carol Kranowitz educated attendees on the necessity and methods of addressing sensory processing difficulties in children. I have read books written by the developer of sensory integration theory, Dr. A. Jean Ayres' *Sensory Integration and the Child* (1979), and pioneers in the field, Lucy Jane Miller's *Sensational Kids* (2006), and Carol Kranowitz's *The Out of Sync Child* (1998). I had the privilege of presenting my therapy experiences formally and informally at my school district, in multiple schools in various states, and at occupational therapy conferences in Ohio.

Through both trainings and readings, I have expanded my familiarity with a variety of popular sensory, brain-based, and self-regulation programs and activities, such as *How Does Your Engine Run?* (Williams & Shellenberger, 1996), *Brain Gym* (Dennison & Dennison, 1989), and *Ready Bodies, Learning Minds* (Oden, 2006). The trainings by Tere Bowen-Irish, who created *The Drive Thru Menus* (Bowen-Irish, 2004), and Deb Em Wilson, who created *S'cool Moves* (Wilson, 2000), introduced me to the utilization of visual pictures to integrate sensory-based strategies for calming, relaxing, and focusing into the student's learning environment. In order to be student-focused, I have combined sensory activities with evidenced-based visual-motor, fine motor and self-care programs to meet the individualized needs of my students and teachers.

My capstone project required the use of an observation checklist as the outcome measurement tool for on-task behavior. My occupational therapy experiences and training have

taught me how to observe behavior during participation in evaluations and functional occupations. I will need to research and educate myself on specific measurement tools for observing students with attention difficulties, such as the outcome measures utilized in the evidence-based literature.

Lastly, I have engaged in collaborative approaches with special education teachers to enhance student performance in the class setting. I witnessed a shift in how educators integrate the concepts of sensorimotor and fine motor development into their preschool and kindergarten instruction. This has led to positive differences in student and teacher relationships, student engagement in learning, and student outcomes. In order to support engagement and participation in academic occupations, my desire is to embed sensory processing strategies into general education classrooms to assist all students who struggle to manage their on-task behaviors.

Chapter 4

Introduction

This chapter begins with the proposed activities comprising the capstone project. The process guiding the selection and recruitment of at-risk students with on-task behavior difficulties is explained, and is followed by a list of the materials and equipment that are required. A description of the procedures is given, along with an identification of the outcome measure chosen to assess on-task behavior. Next, the assumptions, and limitations of the capstone project are given, with the last section highlighting the approach taken to support student-centeredness.

Proposed Activities of the Evidenced-Based Project

Participant selection and recruitment. Participants for this capstone consisted of two general education teachers and 12 eligible students from first, second, and third grade at River's Edge Montessori School (see Appendix B: Permission from River's Edge Montessori, p. 143). The students and teachers were on a volunteer basis and recruitment began immediately following IRB approval (see Appendix C: IRB Approval Letter, p. 144). Eligible students' demonstrated off-task behavior that interfered with their academic performance as defined in the inclusion criteria section. Only students in the classrooms of general education teachers' were recruited for the capstone project. Students and teachers, who did not volunteer for the project, continued to receive occupational therapy recommendations and services as outlined in the state laws and school district policies and procedures.

The recruitment process began by obtaining two general education teacher volunteers. The Teacher Informational Letter (see Appendix E: Teacher Informational Letter, p. 147) were placed in the mailboxes of general education teachers who educated first, second and third grade

students. The Teacher Informational Letter described the capstone project including, the expectations of the teacher before and during the six-week intervention, and it included the practitioner's contact information.

Once two teachers volunteered for the project, the teachers signed the Teacher Consent Form (see Appendix F: Teacher Consent Form, p. 149). The collaboration between the occupational therapy practitioner and the teachers identified potential student participants, using the inclusion criteria guidelines. The maximum number of 10 students to recruit for the project was due to the limitations of the physical space available to implement the small group sessions. If the teacher had a greater number of eligible students than allowed for the project, the teacher delineated the student choices by the greatest need in the students' overall class performance. After identifying 10 potential student participants, two eligible students were placed on a waiting list. The capstone project proposal reported that any eligible student, who did not make it into the project, would receive the intervention services from the occupational therapy practitioner at the conclusion of the project, with parent/guardian permission.

Once the potential students were selected, the practitioner provided each teacher with a Parent/Guardian Information Letter (see Appendix G: Parent/Guardian Information Letter, p. 153) and a Parent Consent Form (see Appendix H: Parent Consent Form, p. 155) in a sealed envelope for each student to take home. The parent letter included details of the project, expectations for their child, and the occupational therapy practitioner's contact information for questions and inquiry. After parent/guardian consent was obtained, the practitioner met with the student and his/her designated teacher in a private area to attain student/child assent (see Appendix I: Student/Child Assent Form, p. 159).

The teacher participants in the six-week capstone project spent a total of six hours in the project. Teachers received training (see Appendix J: Teacher Training Agenda, p. 162) to review the teacher expectations throughout the project, to learn the sensory-based intervention program, and to answer any questions regarding the six-week implementation phase. Project expectations of the general education teachers included:

- Participation in collaboration sessions and a training session prior to the actual intervention for approximately 4 hours total.
- Participation in collaboration sessions one time a week for 10 minutes.
- Assisting in the recruitment of student participants by issuing the Parent/Guardian Information Letters and Parent Consent Forms to eligible students.
- Supporting and guiding student performance of the sensory strategies in the class setting.
- Assisting with the completion of the Weekly Assignment Chart (see Appendix L: Weekly Assignment Chart, p. 164) at both pre and post-testing.
- Completing a teacher survey at post-testing (see Appendix O: Teacher Post-Intervention Survey, p. 167).

Students spent an estimated total obligation time of four hours in the implementation period of the capstone project. The students engaged in the six-week sensory-based intervention program (see Table 4.1: Six-Week Sensory-based Intervention Program Schedule, p. 33), completed the Daily Tracking Form (see Appendix M: Daily Tracking Form, p. 165), and engaged in a qualitative post-testing focus group (see Appendix P: Student Post-Intervention Questions, p. 168).

Inclusive and exclusive criteria. The inclusive criterion for teachers was to instruct first, second and third grade students in a general education setting. Exclusion criteria included

teachers who instructed special education students only, who taught subjects such as physical education and music, or teachers who had pre-planned long-term leave during the six-week implementation period of the project. Inclusion criteria for potential student participants were as follows:

- Students enrolled in the first, second, and third grade.
- Students who spent 80% or more of the school day in general education classrooms (Students who received special education services had the amount of time outside of the classroom written on their Individualized Educational Plans).
- Students that showed functional off-task class performance by completing 60% or less of class assignments for a two-week period, during the school quarter prior to project, as indicated from teacher recordings of assignments turned in and finished weekly.
- Students with special education services that had an IQ score of 70 or higher on the school psychologist's evaluation measure, *Wechsler Intelligence Scale for Children-Fourth Edition* [WISC-IV](Wechsler, 2003), recorded on the most recent Multi-factored Evaluation.
- Students who followed two-step directions given in English.

The exclusion criteria for potential student participants included:

- Students who received special education services under a categorization of autism spectrum disorder, visual impairment, hearing impairment, and severe emotional disturbance.
- Students who received special education services with an IQ at 69 or lower on the most recent Multi-Factored Evaluation on the school psychologist's evaluation measure, *Wechsler Intelligence Scale for Children-Fourth Edition* [WISC-IV](Wechsler, 2003).

- Students who spoke no English and were unable to follow two-step directions.

Materials and equipment. The materials needed for this sensory-based intervention program consisted of the following:

1. *S'cool Moves Minute Moves Manual* (Wilson,2000)
2. *S'cool Moves Beginning Level Posters* (see Appendix Q: S'cool Moves Beginning Level Posters, p. 169)
3. Blending bands -like rubber bands with theraband-type resistance
4. Figure 8 Butterfly Card (see Appendix R: Butterfly 8's Card , p. 180)
5. Focus Desk-Top Strip (see Appendix S: Focus Desk-Top Strip, p. 181)
6. Frog pencil toppers
7. Bounce balls and bean bags
8. Balance boards
9. Small carpet squares
10. Hand fidgets -for example, squishy balls and different textured manipulatives that make no sound
11. Small bags (to contain all of the student's sensory materials)
12. CD player and CDs of music to be played in classroom
13. Large white easel tablet and four different colored permanent markers
14. Ream of white paper
15. Teacher Information Letter (see Appendix E: Teacher Information Letter, p. 147)
16. Teacher Consent Form (see Appendix F: Teacher Consent Form, p. 149)
17. Parent Information Letter (see Appendix G: Parent Information Letter, p. 153)
18. Parent Consent Form (see Appendix H: Parent Consent Form, p. 155)

19. Student/Child Assent Form (see Appendix I: Student/Child Assent Form, p. 159)
20. Teacher Training Agenda (see Appendix J: Teacher Training Agenda, p. 162)
21. Momentary Time Sampling Observation Chart (see Appendix K: Momentary Time Sampling Observation Chart, p. 163)
22. Weekly Class Assignment Chart (see Appendix L: Weekly Class Assignment Chart p. 164)
23. Daily Tracking Form (see Appendix M: Daily Tracking Form, p. 165)
24. Collaboration Summary Sheet (see Appendix N: Collaboration Summary Sheet, p. 166)
25. Teacher Post-Intervention Survey (see Appendix O: Teacher Post-Survey p. 167)
26. Student Post-Intervention Questions for Focus Group (see Appendix P: Student Post-Intervention Questions, p. 168)

Procedures for the evidence-based project. The evidence-based capstone project was implemented for a six-week period, starting January 12, 2015 to February 20, 2015. In small group sessions, the occupational therapy practitioner instructed student participants in sensory-based strategies one time a week for 15 minutes. The students then performed the learned sensory-based strategies in class before or during a designated academic activity or assignment four days a week. For example, the students did a focusing activity five minutes prior to a reading lesson or a jumping -letter pattern on the floor to rehearse spelling words. The occupational therapy practitioner observed the students ‘performance of the strategies, per classroom, one time per week for 10 minutes; and the practitioner provided the teachers and students with support for accurate application of strategies.

This capstone project will consist of a pre-implementation phase, a six-week intervention implementation phase, and a post-intervention/follow-up. The procedures for this capstone project will be executed according to the following given guidelines.

Pre-implementation phase.

- Composed the capstone project under the direction of the faculty advisor.
- Obtained approval from school principal (see Appendix B: Permission Letter From River's Edge Montessori School, p. 143).
- Submitted IRB proposal to Chatham University Internal Review Board (see Appendix C: IRB proposal, p. 144).
- Obtained IRB approval of capstone project (see Appendix D: IRB Approval Letter, p. 146).
- Presented the capstone to two teachers and obtained written consent (2 weeks prior).
- Collaborated with teachers on recruiting students for the project, utilizing the inclusion and exclusion criteria (2 weeks prior).
- Issued teachers the Parent/Guardian Information Letter (see Appendix G: Parent Information Letter, p. 153) and the Parent Consent Form (see Appendix H: Parent Consent Form, p. 155) to send home to eligible students (2 weeks prior).
- Determined a day and time to collaborate with teachers weekly during the six-week intervention period (2 weeks prior).
- Scheduled a day and time with teachers to conduct the pre and post-testing student observation of on-task behavior (2 weeks prior).

- Collaborated with teachers on a designated schedule to conduct the small group sessions one time per week and to perform the intervention in the class setting four days a week (2 weeks prior).
- Completed the training session with teachers on the sensory intervention program for the six week period (see Appendix J: Teacher Training Agenda, p. 162) (2 weeks prior).

Intervention phase. The first week of the capstone project will commence with the practitioner conducting the pre-test data collection and initiating the implementation of the sensory-based intervention program. The pre-testing measures will focus on gathering quantitative data on student attention to task and engagement in classroom assignments and activities. The measurement tools utilized were the Momentary Time Sampling Observation Chart and the Weekly Class Assignment Chart.

The sensory-based program, S'cool Moves, was instituted during the first through the sixth week of the implementation phase. The sensory and movement strategies were provided to students in small group sessions for 15 minutes a week. The six-week schedule for the sensory-based intervention program (see Table 4.1, p. 33) describes the sensory strategies and activities introduced each week of the six-week intervention phase. Students did not miss any direct academic instruction given by teachers in order to participate in this capstone project.

The intervention phase also consisted of observing students perform the strategies learned in small group sessions, student adherence to using the strategy in class, and collaboration with teachers. The OT practitioner observed students performing the sensory strategies learned in the small group sessions for 10 minutes in each classroom. Recommendations were given as needed to perfect the execution of the strategies and/or to support the teachers and students in

performing the strategies in the classroom. The students marked the Daily Tracking Form, every time the sensory-based intervention was performed in class throughout the week; the form was collected at the end of every week. Consultation and collaboration with the teachers (see Appendix N: Collaboration Summary Sheet, p. 166) included a brief review of the week's activities, its' connection to classroom performance, and teacher thoughts and questions.

Table 4.1 *Six-Week Schedule for the Sensory-Based Intervention Program*

	Small Group Sensory Activity Lesson for 15 minutes:
Week 1:	• Conduct baseline pre-testing with each selected student using designated assessment tools Momentary Time Sampling Observation Chart (see Appendix K: Momentary Time Sampling Observation Chart, p. 163) and the Weekly Class Assignment Chart (see Appendix L: Weekly Class Assignment Chart, p. 164), approximately 20 minutes with each student. • Introduce calming, reflex, and postural stretches for posture and vestibular input. • Introduce how to complete daily tracking chart.
Week 2:	• Proprioception and tactile input: resistive and deep pressure exercises using blending bands and hand fidgets. • Review how to complete the daily tracking form.
Week 3:	Vestibular and bilateral coordination input with jumping patterns, balance boards, non-bouncy balls, and beanbags.
Week 4:	Vestibular and visual input with visual activities, exercises, and a visual card for class use. .
Week 5:	Students select sensory strategies to use prior to or during academic activity in class.
Week 6:	• Students select sensory strategy(s) to use in class. • Post-testing quantitative measures conducted at pre-testing. • Distribute Teacher Survey (see Appendix O: Post-Teacher Survey, p. 167). • Conduct student focus group (see Appendix P: Student Post-Intervention Questions, p. 168).

At the final sixth week, the post-test measures were conducted to collect quantitative and qualitative data for the intervention outcomes. The quantitative measures were repeated at post-testing for on-task behavior and weekly class performance two qualitative measures were implemented to obtain teacher and student perspectives on their experiences in the project, with a teacher survey and a student focus group.

Evaluation. A descriptive analysis and comparison of the quantitative and qualitative data collected at the pre and post-testing phases of the project will be conducted, revealing the project outcomes. The quantitative data consisted of the number of small group sessions attended, the frequency of student on-task and off-task behavior before and after the sensory-based intervention, and the number of assignments students' completed prior to and at post intervention. The qualitative data included the student and teacher participants' reflections on personal experiences in the capstone project through a teacher survey and student focus group. An analysis was conducted to determine themes from the participant's experiences in the project.

A follow-up process among the participants occurred at the conclusion of this capstone project. The outcome results were shared with the parents, and individually with all of the participants in a private, closed off area or room at River's Edge Montessori. Parents that could not come to the school were called at home after school hours.

Outcome measures. The occupational therapy practitioner created multiple outcome measurement tools to collect quantitative and qualitative data. Quantitative outcomes are comprised of the Momentary Time Sampling, an interval recording method, to determine the frequency of student on and off-task behavior (see Appendix K: Momentary Time Sampling Observation Chart, p. 163); and the second measure accounted the number of assignments each student completed for the week (see Appendix L: Weekly Class Assignment Chart, p. 164). The modified Momentary Time Sampling Observation Chart came from a form created by Tieghi-Benet et al., (2003). For the qualitative measures, the Teacher Post-Intervention Survey (see Appendix O: Teacher Post-Survey, p. 167) and a series of questions for students in a focus group format (see Appendix P: The Student Post-Intervention Questions, p. 168) were also designed by the practitioner to obtain the participant's perspectives of engagement in the project.

Time on-task was defined as the percentage of observed points in time when student behavior indicated visual contact with the individuals or materials of the designated assignment, physical engagement and performance in the class task. Off-task behavior was defined as eye contact away from the material(s) or people included in the assignment, fidgeting of hands with extraneous or non-related objects, out-of-seat or physical movement not required for the task, and discussing unrelated topics to peers.

The weekly class assignments consisted of the daily grade level activities assigned by the teacher for students to complete throughout the week. Students turned in all finished assignments to the teacher, and the teacher collected and reviewed each assignment for accuracy and completion. The assignments and activities varied in instructional presentation; some were performed independently at student desks or on the floor, in grade-level small group instruction sessions with the teacher or paraprofessional, and other assignments were completed in conjunction with peers.

The practitioner collected data on how frequently students performed the sensory strategies in the classroom with the Daily Tracking Form. A comparison of outcomes on student engagement in the sensory strategies with the pre and post-test frequency of on-task behaviors and the number of completed weekly assignments was executed. To analyze this, the percentage increase on the difference between pre and post-test percentage outcomes for each classroom was calculated. Percentage difference increase was determined by finding the difference between the two average percentages at pre and post testing for each classroom's on-task behavior and weekly class assignments; the difference was divided by the pre-testing percentage, and then multiplied by 100 to yield the percentage difference increase. For example, Class 11's

average on-task behavior time was 19% at pre-testing and 25% at post-testing; 25-19= 6; 6/19= .31578; .31578 x 100= 31.57% or 32% percentage increase.

Assumptions and Limitations of the EBOT Project

Assumptions. The assumptions of the sensory-based intervention program proceeded in the following manner.

- Children who display attention difficulties in the school setting are at risk for sub-optimal school performance (Basch, 2011; Fedewa & Erwin, 2011).
- Students in the general education classroom, who demonstrate inattention and hyperactivity behaviors, will also show a decrease in academic performance.
- Students who display inattention and hyperactivity behaviors in the mild range, often went undiagnosed and untreated (Peck et al., 2005).
- Approximately 5-10% of typically developing children in America had a sensory processing disorder that adversely affected student school performance (Ahn et al., 2004, p. 291).
- Students with sensory processing dysfunction, specifically under the category of sensory modulation, will display behaviors similar to inattention and hyperactivity disorders (Lin et al., 2012; Mangeot et al., 2001; Peck et al., 2005).
- Students will benefit from early interventions to improve access to academic activities and success for completion of schoolwork (Fisher & Duran, 2004; Munkholm & Fisher, 2008)
- At-risk students with attention difficulties will improve on-task behavior and academic performance in the classroom when using the selected sensory-based intervention strategies.

- The practitioner will minimize obstacles in the project administration by problem-solving potential hindrances, showing organization, and starting the IRB process as early as possible.
- Teachers who volunteer for the project will perform project expectations, and remain in the project until completion.
- Teachers will only refer students according to the eligibility criteria.
- At least six to ten students will volunteer for the project.
- Students will attend school regularly and remain in the project until completion.
- Teachers will select the same academic activity for the pre and post-test on-task observation.
- The OT practitioner will not disrupt class instruction and student concentration to given assignments during the pre and post-test on-task observation.
- The small group intervention sessions will fit into the student's schedule, without interfering with academic instruction.
- Students shall willingly rehearse the intervention during small group sessions upon request, and perform the strategies in class throughout the week.
- The student participants will be compatible and display respective behavior to each other and the OT practitioner during the small group sessions.
- Potential interferences to the implementation of the capstone project (i.e. school cancellations due to weather, fire and tornado drills, assemblies) may exist and adjustments will be made accordingly.
- Make-up sessions for student absences or tardiness will be held.

- Student participants will remember to do the sensory strategies and record it on the designated form throughout the week, with reminders.
- Teachers will support the students in performing the strategies in the classroom.
- Teachers will make time to collaborate with the OT practitioner one time a week.
- The capstone project will produce positive outcome measures, revealing that the S'cool Moves intervention program can improve on-task behavior of at-risk students.

Limitations. During the planning (and implementation) phase of this capstone project, a variety of limitations are anticipated. The author worked at River's Edge Montessori for nearly 10 years. This may impact the participant's engagement and feedback throughout the capstone process. Any unexpected changes in staff or student attendance due to personal reasons may affect the continuity of the intervention and thus the impact on student on-task behavior. Additionally, challenging circumstances that occurred outside of the school environment added stress to teacher and student participants' lives, however the teacher participants adjusted schedules to participate in collaboration sessions, and students readily performed the sensory strategies.

Another limitation was the six-week period devoted to implementing the intervention. This may not have allowed sufficient time for the intervention to demonstrate significant improvement in students. In addition, first through third grade students are still maturing their physical and emotional development, which may inadvertently affect the results. Lastly, there was a potential for false reporting by students and teachers. Student may have over or under stated engagement in using the sensory strategies each week in class; due to previous work

interactions, the teachers may have been biased on responses given throughout the collaboration sessions and on the post-testing survey.

Approach to student-centeredness. Since the formation of occupational therapy as a profession, client-centered approaches have been a strong intricate part of practice. In school-based practice, students are the 'client'. Whenever possible, pediatric therapists are committed to utilizing a student-centered approach throughout the therapeutic processes to ensure engagement in purposeful activities and to promote participation in academic contexts (Thorne, 2011). According to the *Occupational Therapy Practice Framework, 3rd Edition* (AOTA, 2014), practitioners should include the student when formulating an occupational profile to obtain a holistic picture of the student's functional abilities with the school context, which then guides the intervention processes. More so, when students are included in the therapy process and apply learned strategies within the classroom environment, achievement in outcomes improved (Maitra & Erway, 2008; Reynolds et al., 2008).

Multiple methods facilitated a student-centeredness approach throughout this evidence-based project. With the Ecological Model of Sensory Modulation (Miller et al., 2001) as a guide, relationships, the environment, academic demands, and student processing are involved throughout the capstone implementation. The portion of the capstone that focused on the classroom application of the learned strategies allows the practitioner to shift from a performance deficit approach, to a perspective that encompassed the student's context and occupations of importance. When the OT practitioner observed the students in the classroom setting, a comprehensive view of the student's responses within their natural class environment while performing designated academic demands was determined; and the practitioner then collaborated

with the teachers and tailored the intervention strategies to support student engagement during designated class activities.

Throughout the implementation phase, students gained insight into how the sensory systems contributed to on-task attention behaviors for learning. Additionally, the sensory strategies are adjustable to meet students at their current performance level, with *just the right* challenge. During the final two weeks of the intervention phase, students personally selected the sensory-movement strategies of interest to create an individualized program to use in the classroom. Once all of the sensory-based strategies were taught, students had a 'voice' in the intervention process to include the therapeutic elements of a student-centered approach.

Chapter 5

Introduction

This chapter gives a detailed description of the participants who volunteered for the evidence-based occupational therapy project. The author then explains the modifications to the project's plan, as well as the intervention process. Finally, this chapter displays and expounds upon the project's quantitative and qualitative outcomes, which evolved from the intervention process.

Description of the Participants

The participants in the project consisted of two teachers (T-11, T-12) and 12 of their respective students (S-1-12) at River's Edge Montessori School. Initially only 10 student participants were recruited to be included in the project due to the limited available space for conducting the intervention. However, during the recruitment phase, a rolling enrollment process was instituted to obtain 10 students. A few students returned the parental consent form late in the recruitment period, which resulted in 12 students providing parental consent instead of the 10 originally planned; no students were denied permission to join the project. Six student participants volunteered from each of the teachers classrooms.

The two teacher participants instructed 6.0-year-old -9.0 year old students enrolled in the first, second, and third grades. Both classrooms (Classroom-11 and Classroom-12) consisted of students in general education as well as students who receive special education and related services. Each teacher participant also had general education students who struggled with meeting grade level demands.

The first teacher participant (T-11) instructed a total of 25 students, with eight-first graders, nine-second graders, and seven-third graders. Of the 25 students enrolled in her class,

five students qualified for special education instructional and/or related services; -four students are identified as English as Second Language Learners (ELL), and three students were referred to the school's Response to Intervention Team. The second teacher participant (T-12) educated a total of 26 students, with eight-first and second graders, and 10-third graders. Of the 26 students in the class, five students qualified for special education instructional and/or related services, two were referred to the Response to Intervention team, and one student was in the gifted program.

Each teacher participant has instructed in a Montessori school setting for most of their educational careers. T-11 has taught for 27 years, and T-12 for 15 years. Both teachers possessed master's degrees in education and held elementary teaching certifications. Each teacher participant exemplified the *Accomplished* rating received on the principal's evaluation tool by utilizing school wide Positive Behavior systems, and the teachers implemented research-based pedagogy methods including differentiated instruction and integrating the arts with academic lessons.

The demographic information of the student participants consisted of their ages, grade levels, and if the student received school support services (see Table 5.1: Student Demographics, p. 43). The ages of the student participants ranged from 6.6 -9.4 years old. Three-grade levels (1st, 2nd, 3rd) were represented amongst the participants and included five girls and seven boys. Seven students were African Americans, one student was multi-racial, one was Caucasian, and three were Iraqi Americans.

Three students received special education services (S-1, S-2, and S-6). The classifications were under the categories of speech or language impairment, specific learning disability with a diagnosis of attention deficit-hyperactivity disorder, and autism. Two students received occupational therapy services.

Students in Classroom 11, including two students who received occupational therapy services, were familiar with four of the calming strategies from the *'I Can Calm Myself'* poster. No student had pre-exposure to any of the posters and sensory-movement activities associated with the six-week sensory-based intervention.

Table 5.1 *Student Demographics*

Participant n=12	Gender	Age	Grade	School Support Services
S-1	Male	8.2	2nd	ELL, SLP and OT
S-2	Male	7.2	1st	Special Ed Instruction, SLP and OT
S-3	Female	6.9	1st	ELL and RtI
S-4	Male	7.1	2nd	ELL and RtI
S-5	Female	7.7	2nd	**
S-6	Male	9.6	3rd	Special Ed Instruction, and SLP
S-7	Male	8.4	3rd	**
S-8	Female	8.3	2nd	**
S-9	Male	8.5	2nd	RtI
S-10	Male	6.6	1st	RtI
S-11	Female	6.1	1st	RtI
S-12	Female	7.6	2nd	**

The asterics (**) denote general education status with no school support services.

Modifications to EBOT Plan

A minimum number of modifications were made to the evidence-based project, and did not alter the fundamental execution of the intervention plan. Two adjustments occurred due to the delayed IRB approval (December 12, 2014). One alteration to the project plan occurred due to the tardiness of several students, and addendums were conducted to enhance the type of current data collected for analysis of the sensory-based intervention.

The first modification was the extension of the dates for recruitment into the second week of the implementation phase; a rolling enrollment process was applied, to attain as close to 10 student participants as possible. Obtaining IRB approval in mid-December limited the

recruitment to four days prior to the start of the school's two-week winter break. The intervention plan was scheduled to being on January 5, 2015, the first day back from school break. Two teachers and seven of the student's parents gave consent (see Appendix H: Parent Consent Form, p. 155) for participation during the initial four day recruitment period; with the rolling enrollment process occurring the first two weeks of the project (January 12-21, 2015), five additional students returned parental consent forms; resulting in 12 student participants (n=12).

The second modification was the beginning date of implementing the intervention program. Unexpected inclement weather delayed the starting date by one week, to January 12, 2015. On January 5, 2015, a small group session was held on the first day of the week, but no other sections of the project were conducted due to the cancellation of school. The first small group session was then revised as an introduction to the intervention program.

The third adjustment occurred with the teacher training method. The teacher availability to attend a one-hour training session during the last week of school prior to winter break was not feasible. The practitioner therefore altered the mechanism of the training to share the necessary information for participation and to enable convenience for the teachers. A face-to-face presentation was changed to combine a 15- minute direct meeting and a 45-minute audio Prezi presentation for the teachers to review at their own time over the school break. Teachers received an email on the work email address that included the training agenda and the web link to the Prezi presentation; a handout of the Prezi presentation was also issued in case of technical difficulties.

A fourth modification involved creating two small group sessions instead of one. Three to four students consistently arrived 10-20 minutes after the start of the group, which was at the

official start of school before formal instruction began. An alternate time was scheduled for the second group that did not interfere with academic lessons. The location for the second small group alternated between the library and a secluded area in the hallway depending upon the library availability. To promote consistency amongst both small group sessions, the practitioner monitored and employed the same instructional methods and materials as written in the six-week intervention chart (see Table 4.1 Six-Week Schedule for the Sensory-Based Intervention Program, p. 33) and used the S'cool Moves Manual as a guide.

The fifth modification was a change in use of sensory materials. Due to time-constraints, the hand-fidget sensory materials were not implemented; and the balance boards were only used with the therapist due to safety concerns with limited teacher supervision in the class setting.

The final modifications were two addendums decided upon at the start of the implementation phase, to allow for a more comprehensive analysis of the outcomes in relationship to the initial premises and to the intervention program. At week five, the addition of a review game (see Appendix T: Review Questions: A S'cool Moves Game, p. 182) occurred to review and determine informally the knowledge gained by the student participants during the first four weeks of the program. Students were briefly exposed to the purpose of each sensory-based strategy for weeks one through four of the program; the practitioner wanted to determine if students had made a connection between actively doing the sensory-based strategies and the reasoning behind the intervention (improve classroom performance). The students were asked three to four open-response and multiple-choice style questions and an informal recording of the responses were made and placed in the practitioner's reflective journal. The questions focused on comprehension of the sensory system, which sensory system the sensory-based interventions were targeting, and how the strategies supported their learning in the classroom.

The second addendum included recording the type of off-task behavior observed during the on-task observation period at pre and post-testing. One premise of the capstone is that some attention behaviors stem from sensory processing deficits. Determining the types of off-task behavior provided valuable data towards supporting the clinical observation of potential sensory modulation difficulties in the class setting. A recording box with a single letter to represent the observed behavior, was added onto the on and off-task observation chart (see Appendix K: Momentary Time Sampling Observation Chart, p. 163) to indicate the type of off-task behavior viewed.

Description of Implementation

Intervention phase. The sensory-based intervention program, S'cool Moves, was implemented January 12, 2015 through February 20, 2015. The small group sessions took place the first day of the week, at 9:15am. A second group, held at 2:00pm, was formed officially at week three because three to four students consistently arrived late to school, missing the original small group session.

Students signed the Student/Child Assent forms according to enrollment date (parental consent received), starting January 5, 2015 and from January 14-22, 2015. The administration of the pre-testing measures, Momentary Time Sampling Observation Chart (see Appendix K: Momentary Time Sampling Observation Chart, p. 163) and the Weekly Class Assignment Chart (see Appendix L: Weekly Class Assignment Chart, p. 164) were conducted according to the student enrollment, either the first or second week of the project. Students who joined in the second week of the intervention phase received instruction on the sensory-based strategies presented in the first and second weeks. The students were only responsible for performing and tracking the sensory strategies instructed upon for the second week.

At the beginning of every small group session, a brief discussion was given on the targeted sensory system of the presented posters (see Appendix Q: S'cool Moves Beginning Level Posters, p. 169) and how the strategy connected to student learning. A demonstration of the movements and activities followed and the students replicated each poster. Students received additional support as needed to perform the sensory movements and activities safely and accurately. The practitioner highlighted the names of the posters and activities presented on the student's Daily Tracking Form (see Appendix M: Daily Tracking Form, p. 165), and for a few poster names, pictures were drawn underneath the name to assist non-readers and increase the ease of locating the designated boxes for marking throughout the given week. Students who missed any of the small group sessions were instructed the following day.

Materials utilized for the program were introduced when the designated intervention was presented throughout the six-week period. Every week the student brought a folder and pencil to the small group sessions to hold the Daily Tracking Form, and wrote their 'code number' on the form. The practitioner highlighted and indicated which areas to mark on the Daily Tracking Form throughout the given week. Copies of the posters and sensory materials were placed inside two separate large cloth bags for each classroom. The posters, beanbags, blending bands, and ribbon wands were also placed inside the bags and then stored in designated areas of the two classrooms. The location of the program materials was shown to the students to promote easy access for classroom use.

Student observations of the learned strategies were conducted one day a week per class, at the same scheduled time (10:45am) and the teacher collaboration sessions (see Appendix N: Collaboration Summary Sheet, p. 166) mainly occurred during the teacher's planning period (2:00pm) or before school began. Collaborative sessions were held but at inconsistent time-

frames the last half of the intervention phase due to the teacher's work demands and alterations in their weekly schedule for state test preparation and training.

Students from T-11's class were familiar with the practitioner, while students in T-12's class were unfamiliar with the practitioner since no students from that classroom received occupational therapy services. To decrease the novelty of the practitioner's presence amongst the students, during the weeks of December 15, 2014 through February 20, 2015, the practitioner spent a half hour to two hours a week in the classroom. While in the classroom, students were provided with academic guidance and as necessary, behavioral support.

Week one. For the first session, the practitioner shared the structure of the small group sessions, along with an explanation for the purpose of the three posters shown. Each student chose a carpet square, a colored folder, and stickers to decorate. The posters shown focused on the vestibular system and the integration of the tonic labyrinthine reflexes (supine flexion and prone extension) for upright sitting posture; strategies to calm the body for focusing in class were also taught. The students observed and then replicated the sensory movements of the Focus Shapes and Belly Posters and then learned calming strategies (see Appendix Q: S'cool Moves Beginning Posters, p. 169). Instructions on marking the Daily Tracking Form throughout the week were provided and the form was placed inside the student's folders.

Week two. An introduction was given for the S'cool Moves posters (Wall Push Ups, and Twister Puzzle) and the blending bands, which addressed the proprioceptive and vestibular sensory systems. After performing the posters, instructions for safe use of the blending bands were provided, followed by teaching the students how to use the bands to practice grade level spelling words. Calming and focusing movements on the Focus Desk-Top Strips (see Appendix S: Focus Desk-Top Strip, p. 181) shown the previous week, were reviewed at the end of the

session. A blending band and focus desk strip card were issued to each student at the end of the session. A second session in the afternoon was held for three students who were tardy to school, missing the small group session.

As an outcome of a collaboration meeting with T-12, the practitioner led the teacher's entire class in a 10-minute sensory and movement-based strategy session for one day. The activities included focus floor stretches, blending bands, and calming strategies with music. This time was not included in the 1/2-2 hours the practitioner was in the classroom to assist the teacher.

Week three. Posters that addressed bilateral coordination and the vestibular system were shown and rehearsed in the small group session. The Hand and Foot, Smiley Jumps, and Jumping Feet posters were introduced to support spatial concepts, laterality, and body awareness. Calming movements selected by the students were performed afterwards.

Two separate sessions were now formally held as three to four students are late for school and miss the original small group session. A location was secured and a time scheduled with teachers. No teacher collaboration was conducted as neither teacher was available during their planning time. The practitioner with T-12 co-led the entire class in a 10-minute sensory and movement lesson, with blending bands and crossing midline movements with music.

Week four. Balance boards, beanbags, ribbon wands, and the visual posters that targeted the visual system were presented (Figure 8, Smiley Tracing, Vision Moves, Butterfly 8's card, and Shape Tracking). The posters specifically addressed figure ground, visual pursuits, and supported reading fluency -Rapid Automatic Naming with Shape Tracking poster (see Appendix Q: S'cool Moves Beginning Level Posters, p. 169). The balance boards were used only with the therapist to maintain safety. Collaboration with each teacher focused on how the visual cards

can support reading. The practitioner led T-12's entire in the same sensory and movement lesson learned the previous week.

Week five. The format altered slightly for week five. Students performed activities from three posters previously learned and then played a S'cool Moves game answering questions by identifying designated posters and materials or showing a movement strategy. After the game, the students selected and performed posters and activities of their choice to perform in class for the week. For two students only (S-3, S-9), the practitioner chose an additional sensory strategy to integrate into an academic activity after teacher consultations revealed specific challenges with a designated assignment. The two students learned the strategy separate from the small group session. Collaboration sessions included a discussion on several students' selection of strategies, the student's performance in the classroom, and the concluding plans for next week.

Week six. All of the posters and activities were displayed for the students to select, and perform for the week. A statement was given to the students on the plans for the remainder of the week, the focus group session (see Appendix P: Student Post-Intervention Questions, p., 168), and conclusion of the project. No formal collaboration session was held. Consulted with teachers on different day for a shorter period of time to review this week's plan and follow-up.

Post-intervention testing occurred with the students and the teachers. The evaluation tools from pre-testing were repeated to collect the quantitative data. The teacher participants completed the survey (see Appendix O: Teacher Post Survey, p., 167) and the students participated in the focus group.

Post-intervention phase. A follow-up session was conducted with both the teacher and the student participants individually. In a private area, each participant heard a brief synopsis of

the outcome, along with recommendations for future use if interested. Parents were contacted by phone after school hours to review their child's performance in the project.

Quantitative Outcomes

Two quantitative evaluation measures, Momentary Time Sampling (see Appendix K: Momentary Time Sampling Observation Chart, p. 163) and the amount of completed weekly class assignments (see Appendix L: Weekly Class Assignment Chart, p. 164), determined the effectiveness of the sensory-based intervention at pre and post-testing. The amount of completed weekly assignments was the number of assignments completed and turned in to the teacher at the end of the week. It is a teacher-based, data collection method (grade book) to monitor student's comprehension and performance of academic knowledge. Momentary Time Sampling, an observational interval recording method, was used to determine the frequency of on-task behavior. Every 30 seconds the practitioner recorded the student's behavior as on or off-task for 10 minutes and indicated the type of off-task behavior. The percentage was calculated for the amount of time students were on and off-task during the 10 minute observational period.

The time on-task observation was calculated for each student while performing a designated academic assignment. Each teacher selected an activity that was done during the week and supported the rehearsal of an academic "Common Core" skill. The task was the same for all grade level students in the teacher's class. T-11 selected a paper-pencil math fact worksheet and T-12 chose a writing comprehension activity. Although different, each of the tasks required similar mental and physical characteristics. The assignments required only paper and pencil materials, attention to accomplish the task, independence (no reliance on peers), handwriting, and visual scanning between pages to locate necessary information to accomplish the task.

Outcomes from the Momentary Time Sampling Observation indicated 100% of students improved their on-task behavior after the intervention (see Figure 5.1, p. 52). The percentage point difference of increase from pre to post-testing ranged from 15-55%. This is a potential indication that the intervention supported a positive change increase in the final post-test results.

The types of off-task behaviors given in percentages were compared with the on-task behavior percentage at pre-testing (see Figure 5.2, p. 53) and post-testing (Figure 5.3, p. 53). The off-task behaviors related to sensory modulation dysfunction (out of seat, fidgeting, staring off), all decreased after the intervention period. The sensory-based strategies reduced both the under and over-responsivity behaviors seen in the classroom.

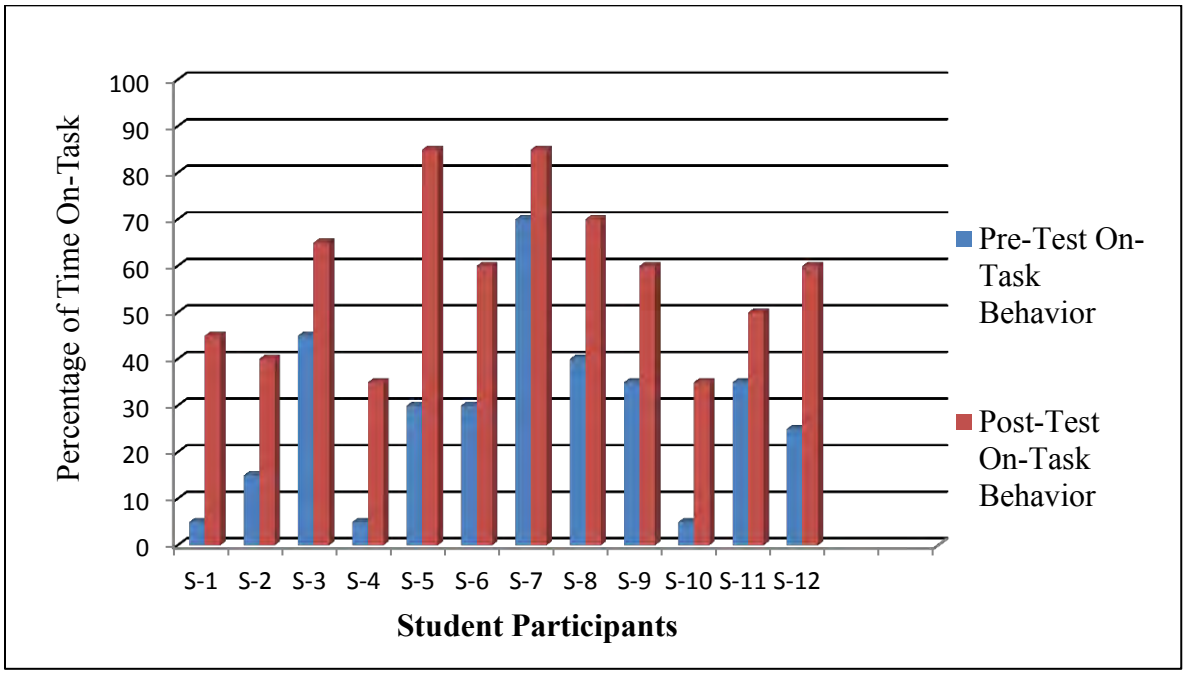


Figure 5.1 Pre-and Post-Test Outcome Percentages for On-Task Behavior

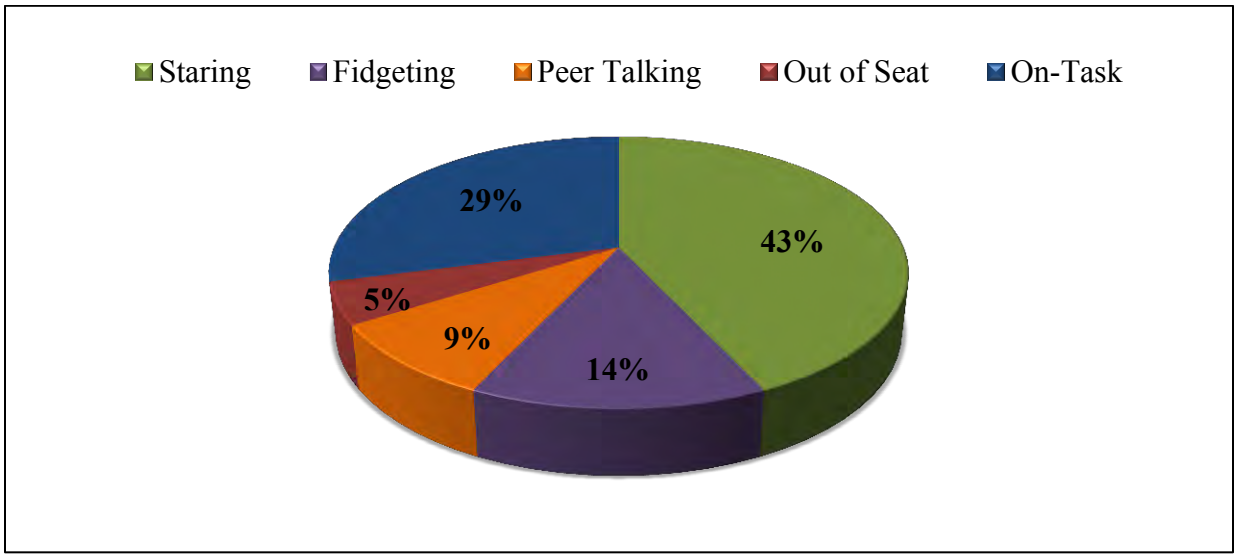


Figure 5.2 Pre-Test Percentage of Students' On-Task and Off-Task Behaviors

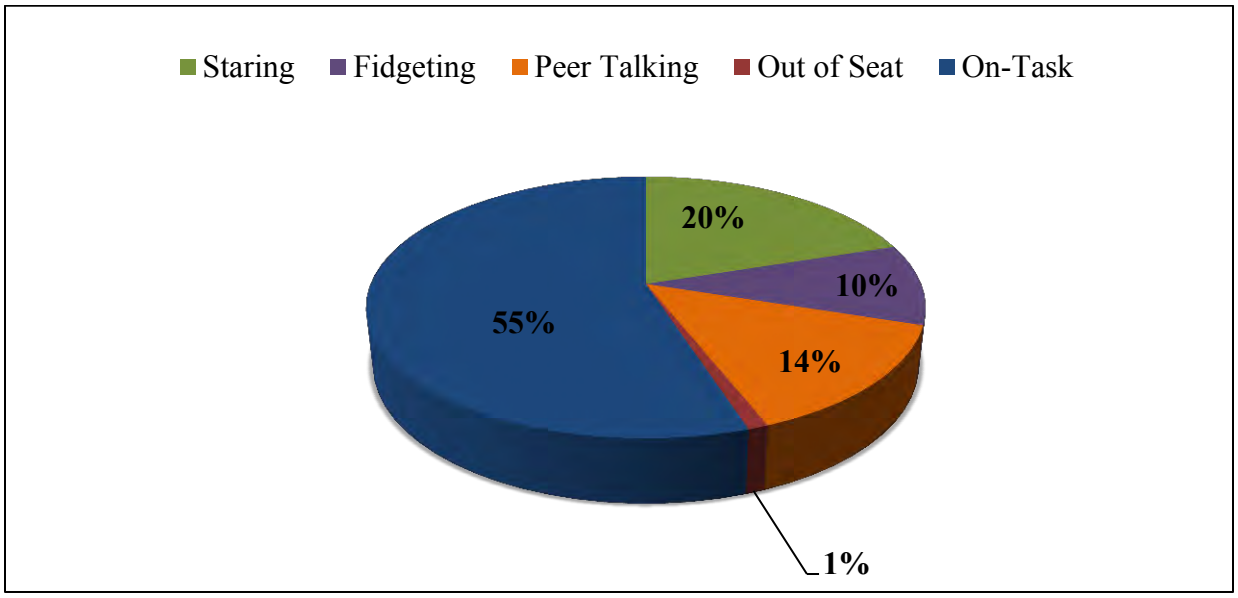
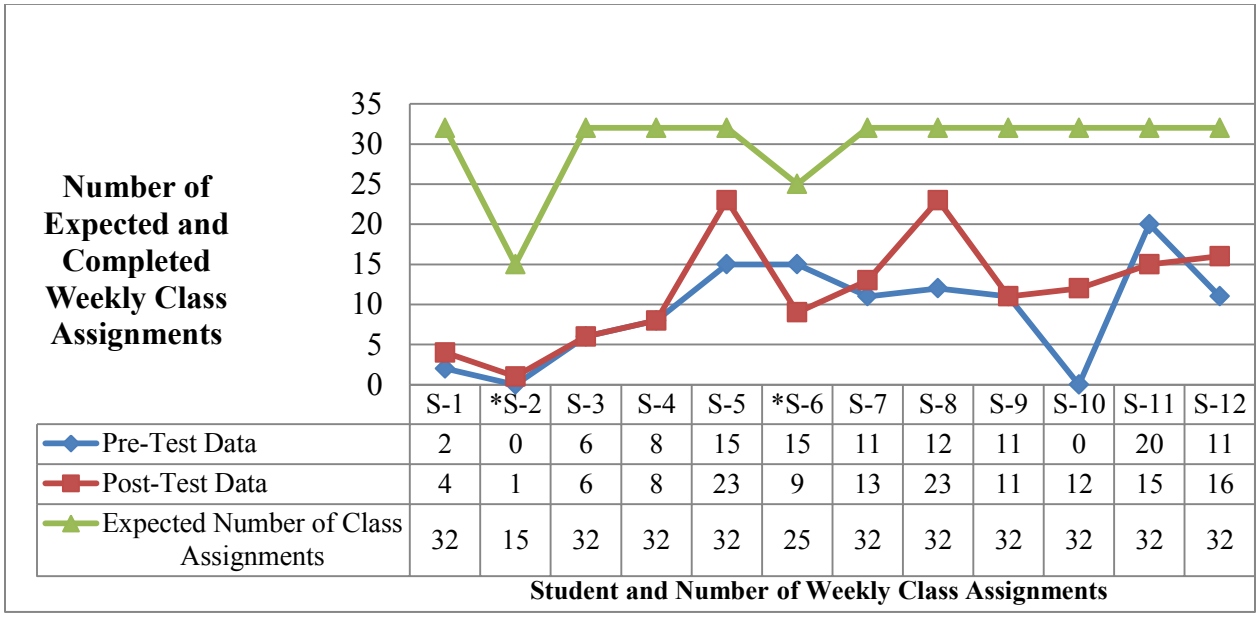


Figure 5.3 Post-Test Percentage of Students' On-Task and Off-Task Behaviors

The actual number of student-completed assignments at pre and post-testing were compared against the expected number of assignments for each student (see Figure 5.4, p. 54). Students were expected to finish 32 assignments except the two students with special education instruction who had modified weekly expectations (S-2 had 15 assignments and S-6 had 25 assignments). Seven students increased the number of completed weekly assignments (58%),

three students completed the same amount (25%), and two students decreased the number of completed assignments (17%). One student (S-6) who had fewer completed assignments, took his class folder home and returned only part of the assignments before the project's deadline requirements; the other student (S-11) had an unusually high number of finished class assignments at pre-testing (20) compared to the previous 16 weeks of school (average of seven).

Average percentages of pre and post-testing outcomes were calculated and determined for each classroom (see Figure 5.5, p. 56). The average percent for on-task behavior and weekly class assignments were calculated by determining each student's percentage point increase from pre-testing to post-testing; the percentage numbers for each student in the class were added and then divided by the number of students in the class (six).



	S-1	*S-2	S-3	S-4	S-5	*S-6	S-7	S-8	S-9	S-10	S-11	S-12
Pre-Test Data	2	0	6	8	15	15	11	12	11	0	20	11
Post-Test Data	4	1	6	8	23	9	13	23	11	12	15	16
Expected Number of Class Assignments	32	15	32	32	32	25	32	32	32	32	32	32

Figure 5.4 Pre and Post-Test Outcomes for Weekly Class Assignments. Note: Students expected to complete 32 assignments weekly, except *S-2 had 15 and *S-6 had 25.

When comparing the classrooms pre-and post-outcomes, percentile point changes were calculated from class averages; percentage differences (increases) in both of the measure's pre and post-test percentile point changes were determined (see Chapter 4, p. 35). The percentile

averages of the pre and post-testing results for on-task behavior and weekly class assignment were compared and yielded that each classroom made improvements between 6-32% point changes on both quantitative measures (see Figure 5.5, p. 56). The outcomes also ascertained that Class 11 had a percentage increase of 32% for on-task behavior and 150% percentage increase for the weekly class assignments; Class 12 had a percentage increase of 23% in on-task behavior and an increase of 84% in weekly class assignments (see Figure 5.6, p. 56). This evidence showed that the sensory-based intervention program contributed towards a positive influence on the student's on-task behavior and classroom performance.

The two classrooms were also compared against student adherence to the capstone's planned frequency of performing the sensory-based strategies in the classroom, four times a week. Students in Classroom 11 performed the strategies four times a week except for three times in week five, resulting in 96% compliancy. Students in Classroom 12 performed the strategies twice a week with 50% compliancy. In Figure 5.5 (p. 56), it revealed Classroom 12 made higher percentile point gains on the two post-test measures compared to Classroom 11. However when calculating the percentage difference between the percentile averages of the pre and post-test outcomes, Classroom 11 had a higher percentage increase difference than Classroom 12. The amount of time engaged in performing the sensory-based strategies had a positive impact on the amount of progress made in the short intervention period (see Figure 5.6, p. 56).

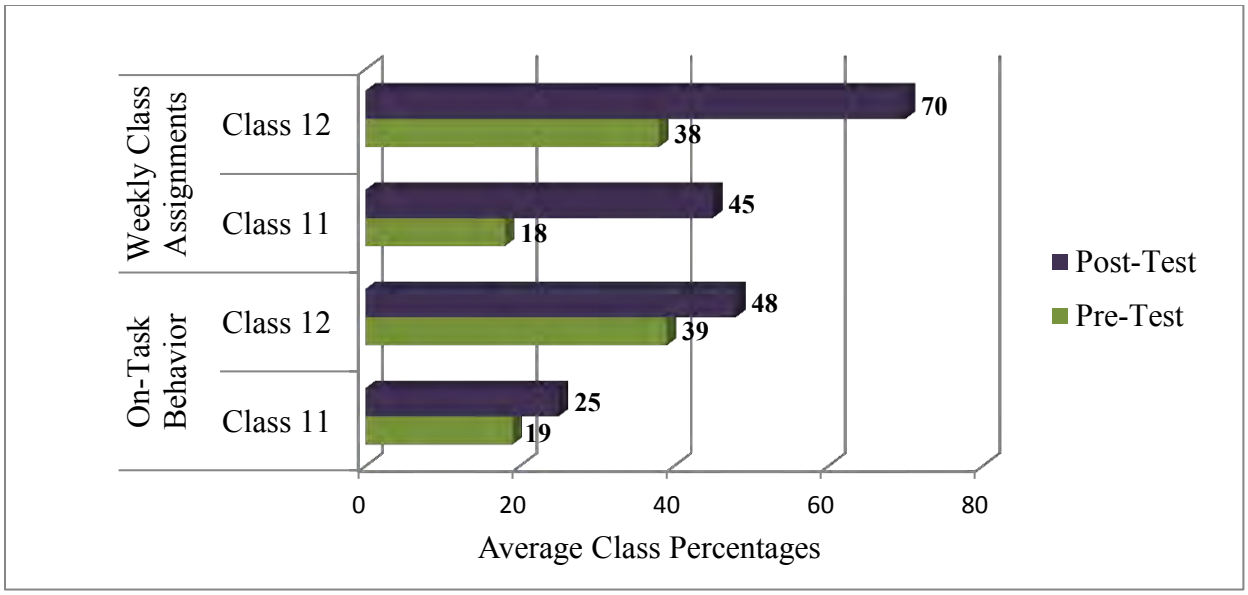


Figure 5.5 Classroom Comparisons of Pre and Post-Test Average Percentages for On-Task Behavior and Weekly Class Assignments

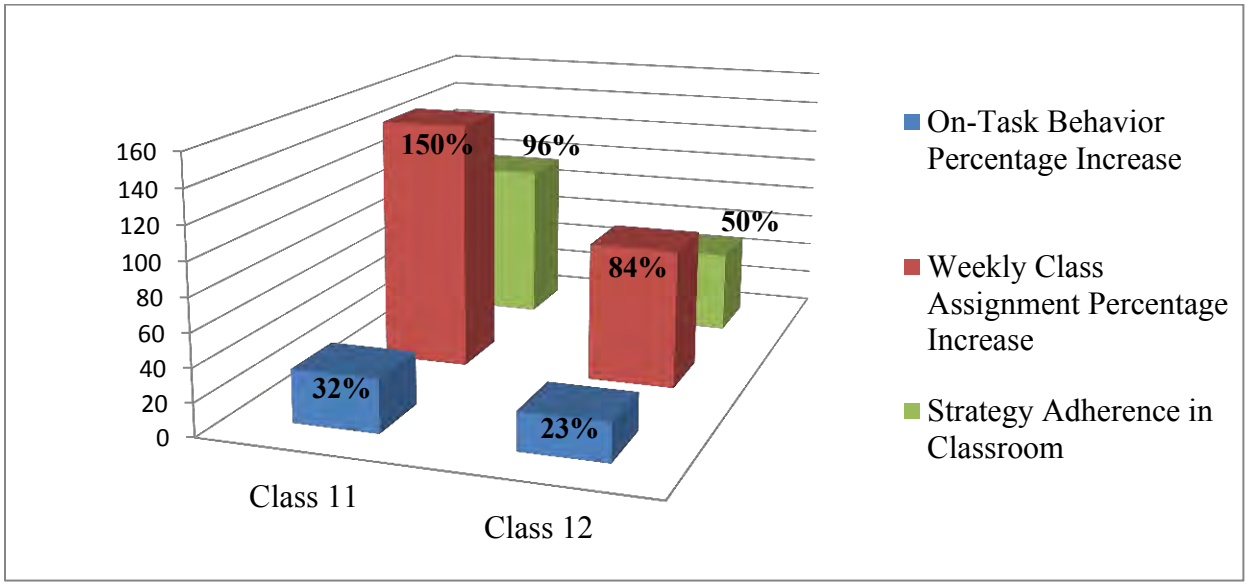


Figure 5.6 Classroom Comparisons of Strategy Adherence and Percentage Increases for On-Task Behavior and Weekly Class Assignments

Qualitative Outcomes

The measures used to collect qualitative data included an informal teacher survey (see Appendix O: Teacher Post-Survey, p. 167) and informal set of questions for the students

presented in a focus group format (see Appendix P: The Student Post-Intervention Questions, p. 168). Documentation of teacher statements were recorded during collaboration sessions (see Appendix N: Collaboration Summary Sheet, p. 166); and a reflective journal was also kept to record undocumented occurrences throughout the six-week project, such as observations and comments during the small group sessions, monitoring of student performance in the classroom, and outside consultations with teachers. Student and teacher responses were analyzed for themes, and the reflective journal was examined for supportive theme data and implications for future application.

Each teacher stated that the collaboration process was informative and learned more about the S'cool Moves program as a tool to promote student performance. The reflective journal established barriers in the project implementation, confirmation of the sensory-based strategies' support to the student's performance, and described student and teacher viewpoints of the sensory-based intervention.

Comments noted during collaboration sessions and in the reflective journal include the following:

- "The students really seem to be taking this seriously. They are acting responsible and performing the strategies on their own."
- "Some of the activities would be better conducted as whole group strategies, rather than in isolation or small group."
- Practitioner, "I observed two students helping the ones who forgot how to do the movement. This is really reinforcing to the students leading and for the one receiving."
- Paraphrased, 'A few of the activities distracted or gained the attention of other students. Setting aside a designated time and a place in the hallway for the students helped.'

- "I may try this strategy (Butterfly 8's and color dot card) with a few other students in my class."

On the Teacher Post-Intervention Survey, the teachers reported viewing similar student behavior in their classrooms prior to the intervention (see Appendix U: Table 5.2 Teacher Survey Responses, p. 183); for example students showed short attention and poor focusing behaviors (i.e. staring off for long periods of time, talking to peers, out of seat), minimal amounts of completed daily work compared to same-aged peers, and students required constant prompting to refocus to designated assignments. At post-intervention, both teachers reported that students' off-task behavior decreased slightly and some students produced more classwork.

At the focus group session, the students' revealed positive experiences overall with using the sensory-based interventions (see Appendix V: Table 5.3 Student Focus Group Responses, p. 184). The comments given to questions were mostly one word or short phrases; further inquiry obtained more detail from the older level students, for example, the sensory-based strategies made classwork "easier," "school was more fun", and it "helped me use my brain better". One student stated that prior to the capstone project, she received "a lot of color changes" (a school wide behavior system), "struggled to listen in class, and was not making good choices." During and after the project she noticed that she "felt better about school-was happier", was making better decisions to manage "her hyper-ness and choices" because she "had no color changes."

After analyzing the qualitative measures (teacher survey, student responses, collaborative record, and the reflective journal), multiple themes became apparent. The themes centered on promoting student growth in academics, life skills, and promoting a collaborative approach (see Figure 5.7, p. 59). For example, students were observed to teach peers how to do to the movements; Teacher 11 reported that one student obtained a 90% on a spelling test with

blending band integration. At week five, three students, two who showed hyperactivity and one student who was frustrated, independently and appropriately selected a sensory-based strategy to provide their sensory systems with input to calm and refocus prior to reentry into class.

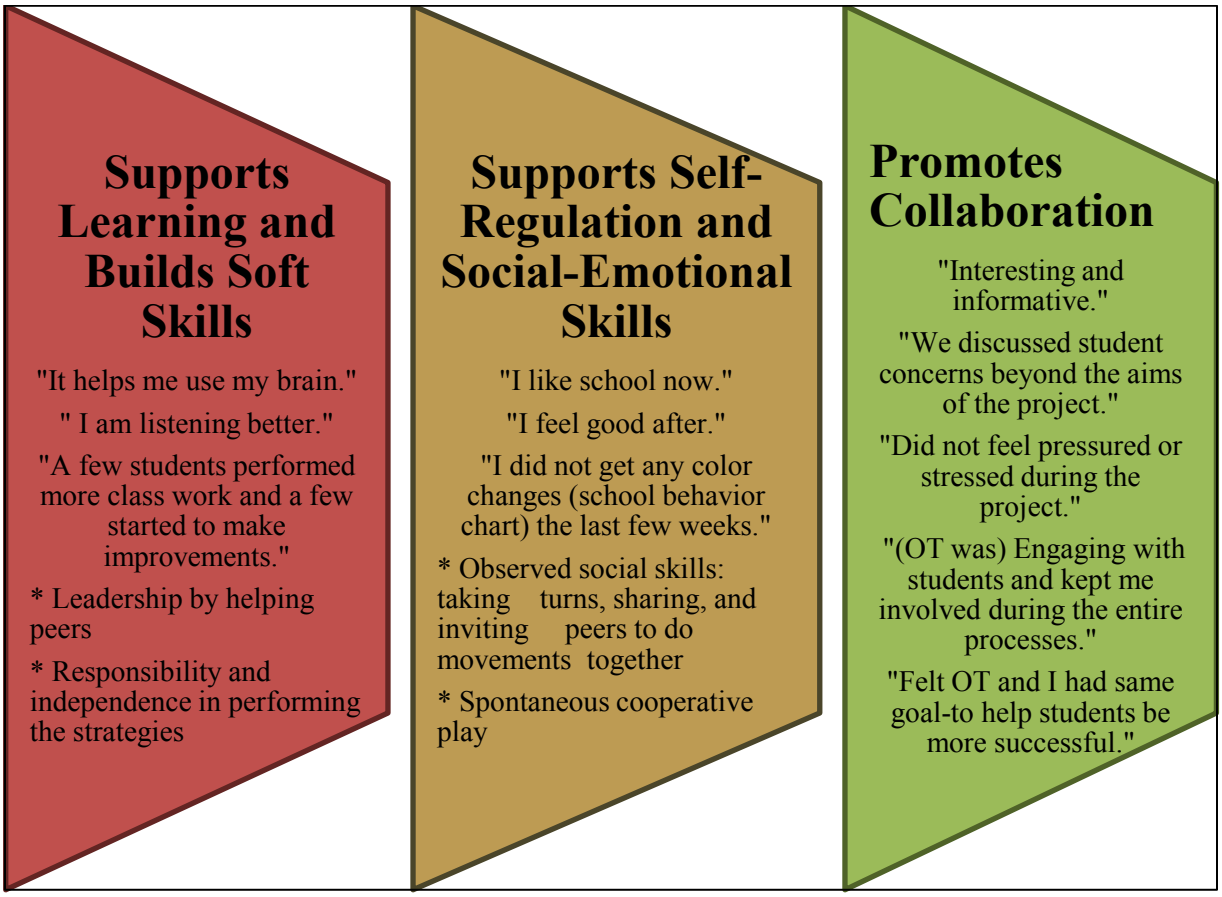


Figure 5.7 Themes from Qualitative Measures: Teacher Survey, Student Focus Group, and Reflective Journal

Chapter 6

Introduction

This chapter begins with an analysis of the evidence-based capstone project, which consists of a correlation of the supplementing evidence in the literature. An evaluation of the entire capstone process follows, along with recommendations for practice, policy and future education. In conclusion, a personal epilogue of the educational journey taken by the author will be discussed.

Evaluation of the Actual EBOT Project and Correlation with Literature

PIO question answered. Under the IDEA 2004 and the No Child Left Behind Act of 2001 (see Chapter 1, p. 6), occupational therapists utilize early intervention programming and services with at-risk students to minimize the risks associated with academic failure (AOTA, 2009; Reeder et al., 2011). The aim of this capstone project was to answer the PICO question: *Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?* Post-testing outcomes from this capstone project concurred with evidence-based practices in the CAT Portfolio (see Chapter 2, p. 12), showing that sensory-based interventions improved student on-task performance. In this capstone project, 100% of the students increased their on-task behaviors, and seven students raised the amount of completed class assignments post-testing.

At three weeks post-intervention, all student participants continued to perform sensory-based strategies voluntarily. The small group sessions continued for 10 minutes one time per week and the students' performance was observed at the end of the week for five minutes. Students in Classroom 11 only were monitored for progress, and all students had either maintained or increased their completion of class assignments three weeks past post-testing.

Outcome analysis for the evidence-based occupational therapy project. Under the Response to Intervention approach, school-based practitioners need sensory-based interventions that are effective and positively affect student performance when applied for short durations in classroom settings (Knippenberg & Hanft, 2004; Reeder et al., 2011). The results of this capstone project are similar to studies that conducted sensory and/or movement-based interventions in classroom settings for short durations (six to ten weeks), and produced significant outcomes for student on-task behavior and classroom performance (see Chapter 2, p. 15). Post-testing results revealed on-task behavior increased in 100% of the students, and for academic performance outcomes, seven students increased the number of finished assignments by 7-38% percentage points, three students produced the same amount (S-3=19%, S-4=25%, and S-9=34%), and two students decreased the number completed (S-6 from 48% to 24% and S-11 from 63% to 47%). This capstone project proved that this sensory-based intervention could be incorporated into the school day, improving student on-task class behavior and student engagement in class assignments.

In-attention and hyperactivity behaviors of at-risk students. Dunn and Bennett (2002) and Mangeot et al.(2010) found that children diagnosed with attention deficit-hyperactivity disorder displayed sensory over-responsivity and under-responsivity behaviors of impulsivity, fidgeting, inattentiveness (poor attention to detail and, carrying out of instructions), distractibility, and excessive movement during inappropriate situations. Students in the capstone project also demonstrated inattention and hyperactivity behaviors that hindered their school occupational performance (see Figure 5.3, p. 53). The post-test outcomes for the students' off-task behavior decreased in all three sensory-related areas: staring off for excessive periods of time, fidgeting, and out of seat behavior (see Figure 5.4, p. 54). These results are supported in

the literature as the students' inattentive and hyperactive behaviors diminished in the classroom setting with the use of sensory-based interventions (see Chapter 2, p. 14-15).

Awareness of sensory-based strategies for attention behaviors. According to a teacher survey conducted by Mulligan (2009), many teachers were unfamiliar with sensory-based strategies in the classroom setting. Mulligan's (2009) outcome was substantiated in this capstone project; on the teacher survey the teacher participants identified using classroom strategies prior to the intervention phase, to address student attention problems (see Appendix U: Teacher Survey Responses, p. 183). Also on the teacher survey, both teachers indicated that the capstone intervention was informative; the teachers learned about sensory-based strategies-and the program appeared to help some students during the short time frame, which affirmed the outcomes of collaborative and early intervention approaches utilized between educators and practitioners (see Chapter 2, p. 17-18a).

Additionally, students should learn how sensory strategies can manage their attention behaviors to expand application of strategies beyond the classroom environment. Dunn, (2008), Lopez and Swinth (2008), and Watling (2011) also recommended student acquisition of how sensory-based strategies regulate behavior and support learning for generalization to other contexts. During the intervention phase, the student participants were briefly instructed on how the sensory-based strategies supported learning. At the fifth week of intervention, 67% of the students were able to answer review questions correctly on the sensory systems and the purpose of the sensory strategies (see Appendix T: Review Questions: A S'cool Moves Game, p. 182).

Collaborative approaches. Collaboration has expanded in school-based practice as an essential component for successful student outcomes and assisted in clarifying the role of occupational therapy; however barriers such as scheduling conflicts and heavy work demands

frequently hindered collaborative sessions from occurring (Orentlicher et al., 2014; Reeder et al., 2011). Similar positive outcomes and challenges of collaboration emerged from this capstone project, such as work demands and schedule changes conflicted with designated meeting times. On the teacher survey and reflective journal, teachers recognized the benefits of consulting and made time to interact, even if briefly.

Building of additional occupational performance skills. Lopez and Smith (2008), Lin et al. (2012), and Vandenberg (2001) cited adjunct performance skills that emerged in children after implementing a sensory-based intervention beyond on-task behavior and academic performance. The studies revealed improvements in student social interaction and self-regulation skills (see Chapter 2, p. 16). Observations documented in the reflective journal, and the teacher collaboration sessions confirmed this finding. For example, students who had a reputation for lacking trustworthiness and responsibility initiated the instruction of learned strategies to students who missed the small group session; at post-testing one student reported enthusiastically that she did not receive any color changes (a school-wide behavior program) during the last few weeks of the project.

Evaluation of the Entire EBOT Process

The organization and planning of the capstone project required patience and refinement to obtain updated and relevant evidence related to the PIO. The initial search for evidence produced a scarce number of articles, which led to reframing the PIO question and seeking guidance from the Chatham librarian and course professor; this expanded the investigation with an improved, narrowed focus. The use of additional search procedures and resources resulted in an exhaustive search and produced an extensive literature portfolio.

Composition of the IRB proposal for approval assisted in foreseeing potential barriers and the feasibility of the evidence-based occupational therapy project. Although arduous, the IRB procedure was a crucial piece of the intervention plan and implementation process. Administration of the capstone project was the most compelling aspect of the entire evidence-based process because of the confirmation of previously held assumptions (see Chapter 4, p. 36), as well as the management of unexpected occurrences through modifications (see Chapter 5, p. 43). Furthermore, the interaction with the students made the capstone PIO 'real' as the purpose became more apparent with the conduction of the on-task behavior measure; the amount of educational time students lost from being off-task was salient. This capstone project reinforced existing evidence that occupational therapists can make a positive difference for at-risk students with attention deficits. Through collaborative approaches and the application of sensory-based interventions, students can improve on-task behaviors and participate in the learning process.

One limitation of the capstone project was the designing of certain aspects of the intervention phase based upon the practitioner's work schedule and the availability of the physical space. When more than 10 students returned parental consent and two groups had to be formed, the scheduling and space issues were resolved. Other limitations included student and teacher bias on post-testing measures; the use of informal, practitioner created quantitative and qualitative measures; and the short duration of the capstone intervention project.

The achievement of the capstone hinged upon the contributions made by the participants as well as the implementation plan. Post-intervention outcomes indicated success through the data and the participants' responses; the students asked to continue performing the sensory-based strategies and the teachers reported willingness to trial the strategies with other students.

Recommendations for Practice, Policy, and Education

Recommendations to expand the project also supplemented the need to alter current philosophy and execution of practice at the author's workplace and to contribute to the existing body of evidence supporting the use of sensory-based interventions in general education classrooms. There are students in general education settings that do not need special education services, however the students are struggling to focus in class and perform academic requirements. School-based therapists can begin supporting any student by selecting evidence-based practices that are effective in short, durations and that are not time demanding for the practitioner. Practice-based and evidence-based models that are implemented and documented can be shared amongst co-workers, and presented at regional association trainings to promote feasible and effective methods of servicing any student in need.

Another feasible recommendation includes the formation of a 'mini' reference sheet of occupational therapy sensory-based strategies (and other occupational interventions) teachers can use with struggling students under the Tier -1 Response to Intervention model. The resource sheet will list sensory-based techniques teachers can trial with students who display off-task behaviors. Finally, a resource web page can be created on the school website to enable teachers to access evidence-based interventions and additional website references at their convenience; another benefit of the resource web page is the opportunity for parents to view the information and obtain information on strategies to utilize at home.

Recommended alterations to the current implementation plan would target methods to enhance student performance of the strategies. Pictures would be added under the named sensory-based strategies on the Daily Tracking Form to assist younger students and non-readers; reducing the amount of available posters and materials would be conducted by storing the extra materials in an alternate location.

Final Epilogue of the Journey

The decision to begin this journey was based upon three key areas: an honest recognition that something essential to my clinical practice was missing, an urge to start investigating alternative future careers, and a desire to discover what I needed to do to assist my OT department in making positive changes. I had come to terms with the realization that no amount of continuing education was going to alter my knowledge base. Also at the forefront of my motivation, there was a strong desire to pursue an alternate future career in teaching or work in private practice.

My confidence at the beginning of this journey was marginal as I relied more upon the leadership aspects of my employment position, rather than the expertise of my profession. Now as I have (nearly) reached the final destination, my attitude has changed. Although I clearly recognize that I am not an expert and need to continue to advance my area of practice, the manner in which I conduct and deliver clinical services is now more sophisticated, realistic, and evidence-based.

Each step/course along the way has built my insight into not simply learning the methodologies but also connecting them into current practice. I realized that it does no good to simply expose myself to knowledge; I must apply it for effective change and growth to happen. A learning curve is expected and errors are now viewed as opportunities for growth and discovery.

Throughout the evidence-based occupational therapy project, many facets of practice led me towards positive changes professionally and personally. I am now more patient and sensitive to my struggling learners and with anyone acquiring new information. I recognize that life requires a daily dose of organized balance; work, play, rest, laughter, love, and things of personal

value. I have accepted that change may be hard and necessary to employ in my current work setting (i.e. applying evidence-based practice and altering current procedures); however I have learned methods to make the process easier.

Now, I select and utilize evaluation measures that provide data to the area of concern, and I use documentation that incorporates more OT 'terminology' to advocate and depict the role my profession fulfills to assist students in accessing and participating in their academic curriculum and school occupations. By incorporating strength-based practices and enhancing my repertoire of student-centered approaches, students will have opportunities to increase their involvement and advocacy in the OT evaluation and IEP processes. Finally, I recognize the importance of establishing collaboration with educators as a partnership, not a hierarchical relationship. My active listening skills have expanded to maintain the open lines of communication, to build and for each of us to grow from one another.

One of the concepts presented during the courses that resonated with me was that people pursue their dreams and make positive changes within their lives despite obstacles. Barriers are to be understood and acknowledged, and lack of mastery is not to be used as excuses to remain stagnate; rather as determinants igniting the pursuit of aspirations. Accomplishment takes determination and time, which in the end is always worth the effort.

I have come full circle; I am more knowledgeable, more willing, and more capable of representing my profession honorably. I am instituting learned philosophies and approaches that empower and promote the mental and physical health, well-being, and occupational justice of my students, teachers, families, and colleagues by using one evidence-based practice and practice-based evidence (PBE) approach at a time.

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Appendix A: Critically Appraised Topic Portfolio

CRITICALLY APPRAISED RESOURCE #1

Does use of a sensory –based intervention program improve on –task classroom behaviors of at-risk students in an urban elementary school setting?

Lin, H.-Y, Lee, P., Chang, W. D., & Hong, F.-Y. (2014). Effects of weighted vests on attention, impulse control, and on-task behavior in children with attention deficit hyperactivity disorder. *The American Journal of Occupational Therapy, 68*(2), 149-158.

Purpose of the Study	• Determine effectiveness of wearing weighted vest on attention, impulse control and on-task behavior (vocalizations, off-task, out –of-seat & fidgeting) during Continuous Performance Test (CPT-II) • Relation to PIO: This research article contains performance areas that are within my research question (attention, on-task behavior).
Setting	• Clinic therapy room
Participants/Sample	• N= 110, 93 boys and 17 girls • Diagnosed with ADHD • Recruited from multiple clinics • Randomly assigned and grouped by grade levels (1st-2nd, 3rd-4th, 5-6 years) • Inclusion: IQ above 80 from WISC, 4th ed. diagnosis of ADHD, normal or corrected vision, normal hand function. • Medications were suspended during treatments
Study Design/ Methodology	• Randomized two period cross-over design • Completed tasks on Continuous Performance Test-II (CPT-II) 2 x's within 4 wk period • Weighted vest 10% and non-weighted vest $\leq$ 1% of sample body weight • Conducted in clinic room no distractions for CPT-II • Videotaped behavior & scored through stringent process
Level of Evidence	Level 1
Outcomes/ Main Findings	• Treatment group: significant increase in attention, speed processing, responding and executive skills • No difference in impulse control & vocalization • CPT-II valid with inattention & impulsivity w/ADHD
Intervention Highlighted through the Research	Use of weighted vest on students w/ ADHD to determine the effective upon attention, on-task bx, impulsivity, and outcomes on academic performance.

Limitations	• Not performed in classroom, where more stimulation • Effects immediate and no delay in study • No control group with no weight • Research tool (CPT-11) tested 1 variable for impulsivity • Intervention not student selected
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Sensory-based intervention w/ positive impact on attention • Study participants same population in PIO • Data collected on attention, on-task behavior & impulsivity which are areas of focus for PIO question.

CRITICALLY APPRAISED RESOURCE # 2

Does use of a sensory –based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Inder, J. M., & Sullivan, S. J. (2004). Does an educational kinesiology intervention alter postural control in children with a developmental coordination disorder?. *Clinical Kinesiology: Journal of the American Kinesiotherapy Association, 58*(1), 9-26.

Purpose of the Study	• To analyze the effect of techniques from the Educational Kinesiology on postural responses of children with motor coordination difficulties, DCD. • Relation to PIO: Similar in use of a sensory-based intervention to address postural control, which maybe a sensory processing problem for students with hyperactivity.
Setting	A university –base,Movement Developmental Clinic
Participants/Sample	• N=4 kids between ages of 9-12 years • Convenience sample • Inclusion criteria: Motor coordination below age level (Bruininks-Oseretsky Test of Motor Proficiency-BOT), deficits in academic achievement or ADL, DCD not due to medical condition, neurological, mental or behavior disorder
Study Design/ Methodology	• Single subject design-A-B-C • Used Dynamic posturography, a Sensory Organization Test (SOT) to measure postural stability • Dependent variables: composite equilibrium scores, equilibrium scores, condition equilibrium and sensory ration scores and total number of falls • Child had movement goal, but not analyzed • Phase A: Baseline data gathered for 3-6 weeks • SOT conducted, 3 trials per 6 conditions, for 20-40 minutes 1x, a week, same time & day of week • Phase B: 6 weekly intervention sessions of PACE & the Dennison Laterality Repatterning (DLR) • During Phase B, had home program, PACE, in am and pm (1-2 minutes) • Phase C: 4 week break (one subject 7 week break) & then follow –up SOT conducted twice, one week apart • Data analyzed for autocorrelation-none determined
Level of Evidence	Level II

Outcomes/ Main Findings	• Two of four subjects improved SOT performance ($p<.05$) • Two subjects improved in composite equilibrium • All four children decreased number of falls ($p<.05$)
Intervention Highlighted through the Research	To determine effectiveness of Educational Kinesiology (Edu-K) techniques on participant's postural responses who had dx of DCD.
Limitations	• Small sample size • Interruptions in weekly sessions due to illness, holiday breaks • Monitoring of home programming, but no strict checks with adherence • Limited generalization • No relation to functional outcomes although mention as inclusion criteria
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Sensory based program with similar movements in PIO intervention • The Edu-K intervention supports client-centered approach • Includes SI information for postural control and vestibular functioning necessary for desk activities • Short term intervention relates to PIO • Participants age levels relate to PIO

CRITICALLY APPRAISED RESOURCE #3

Does use of a sensory –based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Koenig, K. P., Buckley-Reen, A., & Garg, S. (2012). Efficacy of the get ready to learn yoga program among children with autism spectrum disorders: A pretest-posttest control group design. *The American Occupational Therapy Journal, 66*(5), 538-546.

Purpose of the Study	• Examine efficacy of the Get Ready To Learn (GRTL) class program with students with autism spectrum disorder (ASD) • Relates to PIO w/ sensory-based intervention efficacy on behavior and academic performance
Setting	• NYC, NY special education building • 64% of children identified as economically disadvantaged • 6 special education classrooms & 2 inclusion classes
Participants/Sample	• N=48 students w/ASD • School admin selected classes for similar functioning • Inclusion criteria: ASD, 5-12 years of age, no medical condition prevent doing GRTL
Study Design/ Methodology	• Experimental pretest-posttest control group design • Vineland (VABS-II) done by parents • ABC-Community Checklist by teachers & parents • Teachers trained 2.5 hours by GRTL creator • Experimental & control group pretest videotaped with 1st structured lessons • Watched DVD 15-20 min, daily for 16 weeks, • Creator did wkly monitoring & consult; OT cued students • Control group: some did/did not physical exercise in routine • Data collected from video raters- 85% agreement, not blinded, & did no intervention
Level of Evidence	Level II
Outcomes/ Main Findings	• Significant differ. w/GRTL on ABC-Community score • Moderate effect on total maladaptive behavior (bx) • Stereotypical bx & inappropriate speech subscale no diff. • All classes improved in class mgmt. • No significant change in parent ratings ABC –Community Listed validity of measures
Intervention Highlighted through	• Students w/ASD present various behaviors that impact class performance & OT can intervene

the Research	• Yoga promotes improves bx of students w/ASD.
Limitations	• Convenience sample • Teachers not blinded • No randomization & selection bias • 77% of parents completed posttest ABC-Community
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• SB program easily integrated into class routine • Targets behavior that hinders task performance • Data promotes reduction in maladaptive behavior • Teachers found beneficial

CRITICALLY APPRAISED RESOURCE #4

Does use of a sensory –based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

May-Benson, T. A., & Koomar, J. A. (2010). Systematic review of the research evidence examining the effectiveness of interventions using a sensory integrative approach for children. *The American Journal of Occupational Therapy, 64*(3), 403-414.

Purpose of the Study	• A systematic review of literature that examines SI intervention of children with sensory processing difficulties, to guide practitioners by identifying, examining & combining effective research for improved application & reaching desired outcomes • Relevance to PIO: Provides clinicians with best practices in SI practices amongst children to engage in educational occupations
Setting	• Hospital, clinics and school settings
Participants/Sample	• 27 research literatures from 1972-2007 • Studies included children with variety of diagnosis: learning disability, ASD, sensory modulation disorder, developmental disorder, at-risk in reading, neurological problems and motor delays
Study Design/ Methodology	• Inclusion criteria: research based on A. Jean Ayres • Further info obtained in "Background and Methodology of the SI Evidence-based Systematic Literature Review" • Table 1 identifies components of each article • Target children in functional outcomes (motor, sensory processing, behavior, academic & psycho-educational, and occupational)
Level of Evidence	• Overall: Level I
Outcomes/ Main Findings	• 13 -Level I, 5 –Level II, 3 –Level III, 6 –Level IV • Motor performance: 10 of 14 positive outcomes • Sensory processing: 7 positive outcomes • Behavioral Outcomes: Level 1-SI improvement in attention and behaviors for 2 studies, 2 studies SI tx no significant difference over control group; Level III & IV w/significant gains in socialization & functional behavior • Academic & psycho-educational: 12 studies w/ 6 suggesting gains w/follow up, uncertain if better than alternate treatment • Occupational performance: 3 studies demo positive gains

Intervention Highlighted through the Research	Examine the efficacy of SI approach in previously conducted research, providing highlights of each literature selected.
Limitations	• Some studies had small sample sizes • Poor generalization • Only 6 conducted in 2000, 2003 or 2007 (most 1972-1999) • Decreased rigor, thus not conclusive • Poor detail of populations • Fidelity to SI approach • Evaluator bias • Questionability of standardized & outcome measures
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Provides all levels of evidence for SI approach • Gives information on studies directly related to topic • Provides further resources for PIO • Promotes the validity of past and current research to support and refute the efficacy of SI • Authors give recommendations for enhancing future SI research

CRITICALLY APPRAISED RESOURCE #5

Does use of a sensory –based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Fisher, A., & Duran, G. (2004). Schoolwork task performance of students at risk of delays. *Scandinavian Journal of Occupational Therapy*, *11*(4), 191-198.

Purpose of the Study	• Researchers sought to determine if the School AMPS evaluation tool revealed different scores for students identified at risk compared with typically developing students. • Relevance to PIO: Study identifies motor development between at-risk and typically developing students & impact on academic tasks; Need to address motor delays early in students to enhance current and later school performance
Setting	• Examined data within the School AMPS Database. • Participants tested in schools located in North America, United Kingdom, and New Zealand or Australia.
Participants/Sample	• N=95 typically developing & n=84 students at –risk • Equal boys (47) and girls (48) in typically developing area, with larger number of boys (56) than girls (28) in at-risk area • Inclusion criteria: Between 5-12 yrs, typically developing students no medical issues and at-risk students by criteria from a named author (W.L. Heward, 2003), showing academic problems
Study Design/ Methodology	• Non-consecutive cohort study • Examined data from School AMPS database • N=179 divided into groups by age (5, 6, 7, 8 and 9-12 yr) • At risk 5 and 8 year old students low participant number compared to typically developing students • ANOVAs' & post hoc tests to analyze if significant difference between typically developing & at-risk students.
Level of Evidence	Level II
Outcomes/ Main Findings	• Students aged 7 years and 9-12 at –risk, had lower motor skills than typically developing same -aged peers. • 6 to 12-year-old students show school process abilities below those of typically developing peers. • Post hoc t-tests indicate significant difference in motor skills of students 7 yr olds' & 9-12 yr old

	• Small differences noted in motor and school process skills of students in 5 -6 age groups • Post hoc t-tests significant diff for groups 6-12 years old.
Intervention Highlighted through the Research	The School AMPS evaluation can measure motor and school performance differences between typically developing students and students at –risk; thus supporting the need to intervene early.
Limitations	• Unable to determine reliability and bias of raters; although must be trained by AMPS to purchase and use their tools. • Subjectivity and interpretation bias. • No data available on the socioeconomic status and ethnicity of students • Student data from various countries, with varying academic requirements and expectations
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Evidence suggests at-risk students show diminished motor and process skills required to complete school tasks, compared to typical developing students (i.e. decreased motor, on-task behavior, sequence directions to complete grade level work) • Supports need for early intervention to prevent difficulties in future engagement of academic and motor performance

CRITICALLY APPRAISED RESOURCE #6

Does use of a sensory –based intervention program on-task classroom behaviors of at-risk students in an urban elementary school setting?

Worthen, E. (2010). Sensory-based interventions in the general education classroom: A critical appraisal of the topic. *Journal of Occupational Therapy, Schools, and Early Intervention, 3*(1), 76-94.

Purpose of the Study	• Determine the effectiveness of sensory -based interventions in general ed classes to improve attention & academic performance amongst pre-k thru elementary students. • Relevant to PIO: This systematic review contains resources on SI and academic engagement, which relate to my PIO.
Setting	Database search of studies conducted around the main topic Classroom settings
Participants/Sample	• 13 studies reviewed as critically appraised of topic • Preschool through elementary students • Students with & w/out disabilities who received SI or sensory-based interventions
Study Design/ Methodology	• Inclusion criteria: evidence w/ pre-k thru elementary kids with and without disabilities, general ed settings, SI and sensory-based interventions • Level I-2, Level 2-2, Level 3 and 4-6, Level 5-3 which focus on attention, academic performance & performance
Level of Evidence	Level II-B
Outcomes/ Main Findings	• Many sensory based approaches used single-interventions i.e. vestibular w/ seating, music for attention • 2 studies included sensory-based programming • Sensory-based interventions may improve attention & academic performance in students
Intervention Highlighted through the Research	Investigate the results of SI and SB interventions upon attention spans and academic performance of students in gen ed settings.
Limitations	• Author did not state any limitations • Minimal background & reasoning for review • Limited background information on method conducted • Limited # of searches, resulting in few # of articles reviewed
This study/paper was	• Provides synthesis of research conducted after 1990 on SI

identified as the 'best' evidence and selected for the portfolio for the following reasons:	and sensory –based interventions with children • Gives articles directly related to PIO, use of sensory-based interventions in classroom setting with children to address attention & on-task behaviors

CRITICALLY APPRAISED RESOURCE #7

Does use of a sensory –based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Kercood, S., Grskovic, J., Lee, D., & Emmert, S. (2007). The effects of fine motor movement and tactile stimulation on the math problem solving of students with attention problems. *Journal of Behavioral Education*, *16*(4), 303-310.

Purpose of the Study	• Determine if small tactile movements (physical activity) during an academic task, impacts student performance. • Relevance to PIO: Same intervention focus, sensory –based program, to target same outcome of attention to academic task
Setting	• Suburban elementary school • Empty classroom w/ no distractions & minimal furniture • Conducted in the morning between 10:00-11:00am
Participants/Sample	• N=4. 3 diagnosed with learning disability, 1 with spina bifida that affected upper extremity • 4th graders, 9 years, no meds in general education classes • No diagnosis of ADHD; teacher identify with difficulty completing class assignments • Inclusion criteria: T-score 60 or higher on Conner's Rating Scale
Study Design/ Methodology	• Single subject alternating treatment design • Pretest-posttest • Student engaged w/Tangle Puzzle Jr. prior & during math lesson • 30 word problems at 3rd-4th grade level • 20 min sessions, 10 x's • Video recording of behavior during activity • Scored behavior every 10.5 seconds • Interrater reliability for video observation (86-100%) & math scoring (100%) for 30% of tasks
Level of Evidence	Level III
Outcomes/ Main Findings	• 2 students improved on math task after intervention • 2 remained the same on math task • All had better on-task behavior during intervention
Intervention Highlighted through the Research	Use of fine motor physical movement w/tactile component to fulfill behavioral need for stimulation, thus reducing off-task behavior & promoting increased engagement in academic task.

Limitations	• Small sample size • Setting w/ intervention controlled, not natural environment • Author selected fine motor fidgets choice to participants • Managing tactile toy during task, may have distracted students • No control group • No standardized outcome measures
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Identify need to support students struggling in gen ed classes • Targets small movement and tactile stimulation to assist w/ completing academic task • Characteristics of students i.e. attention problems that hinder academic performance is part of PIO

CRITICALLY APPRAISED RESOURCE #8

Does use of a sensory-based intervention program on-task classroom behaviors of at-risk students in an urban elementary school setting?

Schilling, D. L., Washington, K., Billingsley, F. F., & Deitz, J. (2003). Classroom seating for children with attention deficit hyperactivity disorder: Therapy balls verses chairs. *The American Journal of Occupational Therapy, 57*(5), 534-541.

Purpose of the Study	• Investigate the effects of therapy balls on in-seat behavior & legible writing of students with ADHD. • Relevance to PIO: This study looks at how a sensory-based method improves attention for academic performance with class writing task
Setting	• Public school classroom in Washington state
Participants/Sample	• N= 3; 1 female & 2 males; all 24 students in class used balls • Convenience sample of 4th grade students in inclusion setting during language arts class. • Two were 9.11 years and one, 9.8 years • All demonstrated out of seat behavior & required multiple verbal or physical prompts from teacher • Students blind to purpose & who being observed • Each taking medication throughout study
Study Design/ Methodology	• Single subject A-B-A-B design • 12 week session, each phase 3 weeks in length • Inter-rater reliability 95-100% • 2 pediatric OT scored & discrepancy resolved thru a mean score • Momentary real-time sampling done every 10 sec to measure behavior • Did intervention 10 minutes prior and after tx for 10 min • Writing assessed with method from authors stated in article (p. 536). • Students sat on balls for 30 min • Teacher instructed no + or – feedback on behavior unless danger or destructive Legible writing assessed with 5 samples collected • Questionnaire to all students & teachers regarding perception of ball usage
Level of Evidence	Level III
Outcomes/	• Increased in-seat behavior while sitting on therapy balls

Main Findings	• Mixed results of improved out of seat behavior. Did better with attention to task with use of ball, than no use of ball with task. • Positive outcome with all subjects' legible word productivity; higher productivity when sitting on ball • On Social Validity survey, 3 study participants' responses and 21 general ed students' responses were all positive • Therapists and teachers also reported 'substantial' differences in student movement while seated on balls
Intervention Highlighted through the Research	Use of therapy balls with students identified with ADHD will improve out of seat behaviors and legible writing outcomes
Limitations	• Small sample size • Use of one classroom and no control group • Informal assessment conducted for academic performance while sitting on ball
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Intervention entire class used • Need to work in collaboration with teacher to address behavior • Targeted vestibular processing to support attention & off –task behavior • Positive outcome with improved attention and legible productivity with sensory –based intervention • Use of outcome measure –time sampling- to observe on-task behavior is similar to measure for PIO

CRITICALLY APPRAISED RESOURCE #9

Does use of a sensory –based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Vandenberg, N. L. (2001). The use of a weighted vest to increase on-task behavior in children with attention difficulties. *The American Journal of Occupational Therapy, 55*(6), 621-628.

Purpose of the Study	• Analyze on-task behavior of children with ADHD, wearing weighted vest specifically measured to child's body while performing fine motor tasks in classroom setting • Relevance to PIO: Study recognizes need to promote attention behaviors for academic participation & addresses on-task behavior, through modulation of sensory system with use of proprioceptive, sensory-based intervention
Setting	Rural school district in metropolitan area
Participants/Sample	• N=4 children receiving OT services in school • Ages 5.9 -6.10 years • 2 girls with SLP on IEP & high hyperactivity level (Conners' Teacher Rating Scale) & 2 boys w/ ADHD diagnosis • Students received special education or at-risk services year prior & 1 boy on medication • OT described sensory modulation issues in each child
Study Design/ Methodology	• Quasi-experimental, single-system AB design • Baseline data gathered for on-task behavior during fine motor tasks in class • Worn 5 min prior to task, during 20-30 min fm task • Participants & few other students in class wore vests • 2 observers-author, OT at school bldg. & OT student w/observation practice prior to study • 1 observer timed baseline, other during intervention-blinded to results • Students blinded to purpose of study • Observed for six 15 min periods in 15 days • Informal interviews done w/teacher & aides, with OT reflections
Level of Evidence	Level III
Outcomes/ Main Findings	• On-task behavior of all students increased 18-25% • 3 of 4 students asked to wear vest outside of observation

	time • 1 student –most hyperactivity-requested to wear weighted vest all day • Staff stated a recognizable difference in children's task engagement , social interaction w/peers & "organizing of body"
Intervention Highlighted through the Research	Use of weighted vest to improve child's attention & on-task behavior during class activities
Limitations	• Very small sample size with 5-6 year old children • AB design, no observation of class tasks after worn
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Students asked to wear the vest outside of observation times, indicating possibility children knew the benefits of wearing vest/having deep pressure • Teaching staff recognized difference in student overall behavior & interactions • Provides support for use of proprioceptive, sensory-based interventions to calm the body & enhance school work participation

CRITICALLY APPRAISED RESOURCE # 10

Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Lopez, M., & Swinth, Y. (2008). A group proprioceptive program's effect on physical aggression in children [Electronic Version]. *Journal of Occupational Therapy, Schools & Early Intervention*, *1*(2), 147-166.

Purpose of the Study	• To determine effect of proprioceptive exercise program amongst students with physical aggressive behaviors with sensory processing disorder, in special education classroom designed for students with behavioral disabilities. • Relevance to PIO: Sensory-based intervention for calming & focus in the classroom.
Setting	• Special education classroom designated for students with emotional and behavioral disabilities • Name of school not provided. • Convenience sample
Participants/Sample	• N=3, 9 year-old boys • Display physical aggression at least 2 x a month, but not necessarily identified with behavioral disability on IEP. • 1 student has ADHD also • Spent part of day in special education classroom • met inclusion criteria of SPD on the Short Sensory Profile- Definite Difference in at least 1 part; no home therapy, nor orthopedic problems • 3 other boys in class for intervention but no data collected. As part of whole class participation
Study Design/ Methodology	• Single subject A-B design • Consents signed for whole class & only data collected on participants. • Sensory Profile Caregiver Questionnaire, medical and behavioral history questionnaire completed by 2 of 3 parent • Short Sensory Profile by teacher • 8 days for baseline with a 2nd rater to collect data also • Intervention for 9 consecutive days, reward at 4th and 9th day for participating in most of exercises; could opt out • Collection of data before and after proprioceptive program
Level of Evidence	Level III

Outcomes/ Main Findings	• 2 of 3 students showed decrease in duration of physical aggression & one student also had decrease in number of aggressive acts • Teacher noticed difference in how students behaved in the morning-less aggressive behavior • One student improved desk posture and engagement in work • 2 asked to do exercises themselves
Intervention Highlighted through the Research	Proprioceptive exercises to decrease aggressive behavior and improve modulation of sensory system.
Limitations	• Very small sample size, no effect size determined • Although used standardized inclusion tools, no standardized collection measures selected. Only qualitative measures through observation and survey • Only one classroom • Potential bias of teacher not blind to study
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Use of sensory exercise program for short duration every day for 9 days similar with PIO intervention use in classroom on daily basis for short time • Use of exercises that are proprioceptive stimulation for same reasons to use in PIO-help calm and focus-affect arousal levels assist students over-aroused-stimulated. • Aim to help students use strategies to calm, similar to PIO in students learn sensory strategy to help focus in class • Exercises selected similar to those in PIO program • Exercises selected for use in study for safe, easy use and lack of equipment needed. All similar components of intervention of PIO

CRITICALLY APPRAISED RESOURCE # 11

Does use of a sensory –based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Pfeffer, B., Henry, A., Miller, S., & Witherell, S. (2008). Effectiveness of disc o' sit cushions on attention to task in second grade students with attention difficulties. *The American Journal of Occupational Therapy, 62*(3), 274-281.

Purpose of the Study	• Purpose to determine effectiveness of dynamic seating system for improving a student's attention to task within the classroom setting. • Relates by similar use of intervention, sensory approach population and performance area are similar, attention of 2nd graders, with proprioception system & in a school-based setting
Setting	Pocono Mountain School District-school setting
Participants/Sample	• N=61 -2nd graders total at end • 29 in intervention group and 32 control group • 45 boys, 16 girls, mean age of 98.82 months -8.2 years • 11 total students w/special support classes, 50 gen ed • Attention problems • Convenience sample from 6 total elementary buildings in district • General education students randomly assigned • Special education students w/stratified random sampling
Study Design/ Methodology	• Pretest-posttest experimental design • Screen for Inclusion/Exclusion thru BRIEF w/score of 15 & 2 sections of BRIEF: behavioral regulation index (BRI) & metacognition index (MI) • Global executive composite is combined score of each section • Completed by teachers 2 weeks prior intervention • Treatment group experiment w/cushion 1-wk prior 2-wk trial cushion filled to student liking • Sat on cushion for 2 hours a day, time scheduled varied for each class
Level of Evidence	Level II
Outcomes/ Main Findings	• No significant statistical difference in pretest scores on BRIEF between control & treatment groups. • One-way ANOVA used to calculate percentage of change between groups.

	• Significant difference found p <.05 between two groups with increased attention to academic task with cushion
Intervention Highlighted through the Research	Use of Disc O' Sit cushion to increase attention behaviors (easily distracted by noise, out of control behavior-defined as behavior not controlled or altered by 2-3 verbal cues or reminders, fidgetiness –unable to sit without extraneous movements)
Limitations	• Convenience sample & teachers not blinded • Time observed different for each child • Lack of generalization to other practice settings • Observation checklist used based upon BRIEF, but not standardized
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Study supports components of PIO: use of sensory –based intervention to target attention of students in class • Use of Observation Checklist as an outcome measure, same consideration for PIO • Delineation of on-task behaviors to be observed and measured which supports PIO • Both groups of participants benefited from the intervention, students in general education and with special education support (IEP) • Positive outcomes on attention to task with use of sensory-based strategy

CRITICALLY APPRAISED RESOURCE # 12

Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Peck, H., Kehle, T., Bray, M., & Theodore, L. (2005). Yoga as an intervention for children with attention problems. *School Psychology Review, 34*(3), 415-424.

Purpose of the Study	• Analyze effect of yoga on improved attention in elementary students • Relevance to PIO: Use of sensory-based intervention to target attention difficulties in 1st-3rd grade students
Setting	• Suburban middle-upper middle class town in northeastern US. in school psychologist's office
Participants/Sample	• N=20 students. 10 in treatment group, 10 in control group • Convenient sample-students in treatment grouped by grade level: 3 in 1st grade, 3 in 2nd grade and 4 in 3rd grade • Control group same demographics & gender of treatment group. No intervention • Referred to psychologist due to attention difficulties in class' none with attention diagnosis
Study Design/ Methodology	• Multiple baseline design across 3 grade levels • Baseline data with comparison against control group • Participated in Yoga Fitness for Kids (two versions for age level), 2x's a week for 30 minutes for total of 3 weeks • Pre-post morning observation of student in classroom with the Behavior Observation Form (BOF, momentary time sample-MTS) for time on –task • Observation done by psychologist and another observer • 10 second rating for 10 minutes observed with MTS • Social Validity survey amongst students
Level of Evidence	Level II
Outcomes/ Main Findings	• Effect sizes for each grade level large (1.51-2.72) • On-task behaviors improved in 3rd graders • Slight decrease for on-task behavior at follow-up • Students enjoyed program • Peer comparison with control group on-task behavior unchanged • At follow-up, intervention students on-task behavior commensurate to comparison peer's behavior
Intervention Highlighted through the Research	Use of yoga intervention to increase on-task behaviors for students with attention difficulties for class performance

Limitations	• Small sample size • Only students in special education • Teacher bias with students referred by teachers • Yoga conducted outside of regular classroom • Short duration of intervention (2 x's a week for 3 weeks)
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Use of sensory-based intervention improved on-task behavior, with large effect sizes for all groups • Improvement noted within the short time of intervention; may need to implement longer (throughout week, or longer time-frame-to integrate into daily routine • Easily implemented & not a lot of space required • Students enjoyed program • Discuss importance of small group intervention verses individualized to carry over and provide motivation

CRITICALLY APPRAISED RESOURCE # 13

Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Fedewa, A. L, & Erwin, H. E. (2011). Stability balls and students with attention and hyperactivity concerns: Implications for on-task and in-seat behavior. *The American Journal of Occupational Therapy, 65*(4), 393-399.

Purpose of the Study	• Does stability ball increase frequency of on-task & in-seat behavior and student & teacher perceptions of stability ball use. • Relevance to PIO: Use of sensory-based intervention to address student attention behaviors
Setting	Rural school in central Kentucky
Participants/Sample	• Convenient Sample-principal looking for class-wide intervention for off-task behavior • N=8 students –in 4 classes of 4th & 5th grades (3 in one class, 2 in two other classes & 1 in 4th class) with IEP. • 9.11 year mean age, 6 boys (4 African American, 2 Caucasian) & 2 girls (1 African American & 1 Caucasian). • 5 had formal diagnosis of ADHD, 3 symptoms of ADHD, none on medications • 76 students given balls, but only students identified with severe attention & hyperactivity levels were observed
Study Design/ Methodology	• Single-subject A-B continuum time-series design • ADHD Test on 76 students; those with severe ADHD chosen • Sat on stability balls for 2 days prior to baseline data collected • Data collect for 2 weeks prior to 12 week intervention • 3-hr training for 3 university students to observe with 4 trials of inter-reliability • Momentary Time Sampling (MTS) conducted on students at-above 92 on Attention deficit hyperactivity disorder test (ADHDT) • Baseline data collected 30 minutes, for 2 weeks, 3 x per week • Social Validity Scale created by 1 author & completed by teachers
Level of Evidence	Level III
Outcomes/	• Differences in mean ADHDT pretest scores p,.001,

Main Findings	treatment group differed in attention skills on ADHDT compared to control group • ADHDT for classrooms dropped to average quotient of 66; score possibly indicates improvement with cushion in attention for all students, even those with no attention difficulties • 8 students ADHDT post-scores decreased 2 weeks after intervention p<.001-close to average range for attention on test • 8 students 45% time on task prior, 80% of time on task with seating on ball 94% of time. • On social validity scale, teacher comments somewhat to strongly agree on all areas but one • Positive comments "helped calm down" , noise level improved, decrease in shift in the amount of moving/fidgeting" • Negative to intervention: cost to replace ball if break
Intervention Highlighted through the Research	Use of stability balls as alternate seating to improve attention and hyperactivity (on-task behaviors) during classroom instruction
Limitations	• Small size & convenience sample- limit generalization • Short introduction phase, novelty effect still in play • No student feedback • Expense of balls high
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Sensory-based intervention with same PIO focus • Integrated into general education classroom • Teacher perceptions positive for student behavior with Intervention

CRITICALLY APPRAISED RESOURCE # 14

Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Mahar, M. T., Murphy, S. K., Rowe, D. A., Golden, J., Shields, A. T., & Raedeke, T. D. (2006). Effects of a classroom-based program on physical activity and on –task behavior. *Medicine and Science in Sports and Exercise, 38*(12), 2086-2094.

Purpose of the Study	• Examined the effect of classroom physical activity program on student activity levels during school day and on-task behavior • Relevance to PIO: -Studied use of movement, sensory-based program for on-task/attention behavior
Setting	K- 4th grade classrooms in public school in eastern North Carolina
Participants/Sample	• N=243 K -4th grade students • 135 in intervention group, 108 control group • Convenient sample • 62 students observed for on-task behavior (37-3rd graders, 25 -4th graders , 8-11 years
Study Design/ Methodology	• Multiple-baseline across classroom design to examine Energizer program upon on-task behavior • Two-way period repeated measure analysis of variance compared on-task behavior between observations • Physical activity measured on all grade levels, 2 randomly chosen 3rd & 4th grade to assess on-task behavior • Energizer movements done 10 min/day for 12 weeks • Observed on-task behavior pre- & post intervention during academic activity
Level of Evidence	Level II
Outcomes/ Main Findings	• Physical activity increased in intervention classes significant difference p.<0.05 • Students on task less than half time, increased on-task behavior by 20% after intervention
Intervention Highlighted through the Research	Use of Energizer program to increase physical activity levels and on-task behavior of students
Limitations	• Possible teacher bias as student or teacher made recordings • Attempts to limit observers bias with intervention students by inter-rater reliability
This study/paper was	• Same population and classroom setting as PIO

identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Provides guidance on amount of time to possible reach outcome (10 minutes, daily) • Intervention in general ed. settings, same as PIO • Positive results for on-task behavior, greater increase amongst students with lowest on-task behavior • Increase in on-task performance for all students; greater class control & performance

CRITICALLY APPRAISED RESOURCE # 15

Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Oriel, K. N., George, C. L., Peckus, R., & Semon, A. (2011). The effects of aerobic exercise on academic engagement in young children with autism spectrum disorder. *Pediatric Physical Therapy, 23*, 187-193.

Purpose of the Study	• Aim to examine if participation in physical activity prior to class activities, would improve academic engagement & reduce stereotypical behaviors in young children with ASD. • Relevant to PIO: The study investigates the use of movement to improve on-task behavior for academic participation
Setting	• 4 early intervention classrooms designed for children with autism • Physical activity performed outside of regular classroom in unidentified location in school building
Participants/Sample	• Convenience sample of 4 early intervention class with support for children with ASD • N=9 children, ages 3-6 years-7 males & 2 females • 7 formal diagnosis of ASD, all met criteria for ASD for class placement
Study Design/ Methodology	• A Within subject cross over design • Randomly assigned by classroom to treatment & control group, 1st -3 weeks of study, then switched the last 3 weeks of study • 15 minutes of jogging/running prior to class task or mini-trampoline used to elicit 'strenuous activity" levels • Observation of stereotypical behavior, correct responses, on-task behavior conducted throughout study for comparison • Log kept for each session-time & motivation used • Began class activity immediately upon re-entry to class • Undergraduate students were blind observers, w/video training; 2 observers collected data each session on different kids
Level of Evidence	Level III
Outcomes/ Main Findings	• Statistical significant improvements in correct responses during academic tasks after exercise ($p<.05$)

	• No significant difference for on-task behavior or stereotypical behaviors; yet 5/ 9 children improved on-task behavior after exercise
Intervention Highlighted through the Research	The effect of physical exercise on improving academic engagement, on task behavior and in reducing stereotypical behavior of students with ASD
Limitations	• Lack of standardized measurement tools for determination of reaching 'strenuous activity levels' • Data collection method not specified, unclear validity ie. MTS • Wide range of inter-rater reliability during 50-100% of sessions • Only 5 of 9 children initially demo stereotypical behavior • Use of undergraduate students to collect data, with 2nd author, may have inaccurate responses
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Addresses effects of movement to promote on-task behavior & academic participation • Approx. half of students showed improvements for on-task behavior after physical activity • Intervention performed immediately prior to class task, similar set-up for project

CRITICALLY APPRAISED RESOURCE # 16

Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Ericsson, I. (2008). Motor skills, attention and academic achievements. An intervention study in school years 1-3. *British Educational Research Journal, 34*(3), 301-313.

Purpose of the Study	• Aim to examine effects of extension of physical education & motor training on motor skills, attention & cognition over 3 years • Relevant to PIO: Study relates importance of physical activity, motor development and attention skills to academic performance & achievement
Setting	Angslattskolan school in Sweden, years 1-9
Participants/Sample	• N=251 children, 152 in treatment, 99 in control group • Year 1-3 of school • Convenient sample from school in Sweden
Study Design/ Methodology	• Longitudinal study for 3 years (1999-2002), following 3 classes in Group 1 in 1st year, four classes 2nd school year (Group 2) & 5 classes in 3rd year (Group 3) • Group 1 and 2 intervention group & control group was Group 3 • Intervention groups had 3 PE lessons and 2 lessons with local sports club every week • Additional motor training per week if needed w/PE teacher • Group 3-control group-had regular PE classes • Interrater reliability .75 between 3 teachers • Teacher's rating of motor levels examined with psychiatrist's rating of same pupils, 22 of 23 same • Motor observations were videotaped for accuracy, with MUGI observation programme & Conner's abbreviated questionnaire for attention skill levels • Results were compared by same age levels, Cramer's index & values of eta squares used for size differences between groups
Level of Evidence	Level II
Outcomes/ Main Findings	• Motor skills improved with large difference at year 1 and more at 3rd year. • Control group had little differences from pre & post test results & indicating students with motor deficits did not

	improve with regular PE alone over 3 years • Significant correlation between motor skills and attention in year 2 only. • Intervention groups had better attention/hyperactivity & impulse control according to teachers, with significant differences compared to control group 1st and 2nd year with little changes; but did not remain in 3rd year.
Intervention Highlighted through the Research	To determine through experimental examination, if daily physical activity and motor training would have influence on attention and academic skills.
Limitations	• Participants not randomized • Length of PE not mentioned & the number of students who received additional motor training in intervention groups • Components of the MUGI programme, including the observation measure, is not standardized • Combined both intervention groups when comparing results, even though showed little differences between two • No graph for final results provided • Teachers conducting observations/data collection not blinded to study • Teachers awareness may have had higher expectations & encouragement for students who then are more motivated to do well • Parents more concerned with child's physical health, may have encouraged more participation in physical activity than others
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Discusses importance of early intervention to develop motor skills with little changes later in age with no intervention • Teachers reported positive student attention behaviors during class each year, compared to control group • Potential relationship of motor skills to attention behaviors in classroom

CRITICALLY APPRAISED RESOURCE # 17

Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Dunn, W., & Bennett, D. (2002). Patterns of sensory processing in children with attention deficit hyperactivity disorder. *Occupational Therapy Journal of Research, 22*(1), 4-15.

Purpose of the Study	• To compare sensory responses of children primary ADHD against children without disabilities on Sensory Profile • Related to PIO: Population of capstone same & article discusses existence of sensory processing issues in children who have attention behaviors (inattention, hyperactivity) or ADHD diagnosis
Setting	• Parents of children with ADHD completed questionnaire as waited for appointment in community-based ADHD clinic • Parents of typically developing children received questionnaire in mail to rate sensory processing of child
Participants/Sample	• N=70 children, 3-15 years who participate in community ADHD Clinic • Convenient sample, all children participated in clinic over 7-month period, half with additional disorder-LD, ODD, PSTD, adjustment disorder • 52 kids taking meds, 8 not taking, 10 parents did not report meds status • Matching typical group of 70 kids matched with other group by age & gender, randomly selected from national standardization sample
Study Design/ Methodology	• Descriptive Case Control Study • Parents of both children with ADHD & typically developing given Sensory Profile to complete on child. • Data was examined against responses from children identified as typically developing on national standardized database • Typical developing kids: no meds for attention, allergy or seizure disorder & no special ed services
Level of Evidence	Level IV
Outcomes/ Main Findings	• MANOVA revealed significant differences between typically developing kids & those w/ADHD, across all 14 components of Sensory Profile • Post hoc univariant analyses statistical significance differences ($p<.05$) on 118 of 125 items

	• Analysis indicates children w/ADHD have lower scores than typical developing children on Sensory Profile, with specific performance patterns • Evidence shows moderate to large effect sizes in all sections of Sensory Profile (1.0 for 13 of 14 sections & last section had .950 on Sensory Profile) • 57 items may be meaningful when consider real situations
Intervention Highlighted through the Research	Determine if kids with ADHD will display sensory processing difficulties with Sensory Profile & importance of addressing these patterns of sensory challenges for improved daily living.
Limitations	• Convenient sample already at specialized ADHD clinic • Outcome measure completed by parents at possible inconvenient time frame (waiting room) which may show inaccurate scoring • Did not consider medication effect on behavior (many children taking meds at time) • Some of population had additional diagnosis given by staff
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Applies to both the population & possible need to address sensory processing in children with ADHD • Offers additional OT perspective not covered by DSM-IV criteria for issues child may show with attention difficulties & to support children with sensory challenges • Considering use of Sensory Profile as a tool to consider sensory functioning

CRITICALLY APPRAISED RESOURCE # 18

Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Shaffer, R. J, Jacokes, L. E., Cassily, J. F., Greenspan, S. I., Tuchman, R. F., & Stemmer, P. J., Jr. (2001). Effect of Interactive Metronome training on children with ADHD. *The American Journal of Occupational Therapy, 55*(2), 155-162.

Purpose of the Study	• Aim of study to determine if Interactive Metronome (IM) influences aspects of motor & cognition for kids with ADHD • Relevance to PIO: Sensory –based intervention with similar components - motor planning, rhythm, & sequencing-which are involved with attention issues amongst same population
Setting	• Specific environment not stated. Simply setting and treatment dates were agreed upon by participant's parents & administrators of the treatment protocols (IM or video game group) • Metropolitan area of Michigan (authors from Ann Arbor & Grand Rapids)
Participants/Sample	• N=56 boys, 6-12.5 -years old, from Michigan area • Children recruited from local school districts, physicians, psychologists, psychiatrists & advertisements in newspaper • Randomly assigned to 1 of 3 groups: IM treatment, video game group and control group • 32% of children living in households earning less than $40,000 • Both parents & children given general info re: purpose of experiment to limit bias
Study Design/ Methodology	• Pre-posttest design with control group • 15 –one hour sessions, daily over 3-5 weeks • IM aim for child to selectively attend & tap exactly to heard metronome beat with hand or foot, as inhibit internal & extraneous stimulation • Each IM session had 4-8 exercises repeated designated times, from daily treatment (treatment) guide, 13 total treatments w/detail of phases • 5 common, nonviolent video games selected w/eye-hand coordination, mental planning & sequencing; played

	against computer w/increasing difficulty • Test of Variables of Attention, Conner's Rating Scale, Wechsler Intelligence Test for Children 3rd Ed., behavior checklist, Short Sensory Profile, Bruininks-Oseretsky Test for Motor Proficiency & academic tests • Pattern analysis of pre-post test results to determine improvement or decline for each test area
Level of Evidence	Level II
Outcomes/ Main Findings	• IM group significant improvement in attention, motor control, language processing, reading & regulating aggression than video and control groups • IM and video group improved on 3 areas of SSP • IM & video group improved in sensory processing on Short Sensory Profile& parental report on impulsivity & hyperactivity • IM parent group report on behavior checklist with less aggression & IM group improved on 5 reading tests whereas video & control groups declined.
Intervention Highlighted through the Research	Determine the effect of IM on motor and cognitive skills amongst children with ADHD
Limitations	• Only boys in study • Long treatment sessions-1 hour, not conducive to school practice • Assessments measured only parts of attention, motor control, language, cognition, and learning.
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Use of sensory-based intervention with emphasis on motor planning, sequencing, rhythm & timing components involved with attention components & population similar to PIO • Intervention provided in 3-5 week span, relatively short time frame, with marked improvements in attention, motor control, language processing, reading skills. • Use of Short Sensory Profile to assess sensory functioning; may use as a pre-test for capstone

CRITICALLY APPRAISED RESOURCE # 19

Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Mulligan, S. (2001). Classroom strategies used by teachers of students with attention deficit-hyperactivity disorder. *Physical and Occupational Therapy in Pediatrics, 20*(4), 25-44.

Purpose of the Study	• Survey to add to literature ADHD strategies used by teachers & their perception of most effective strategies • Relevance to PIO: Provides information on current strategies used by teachers with students with ADHD.
Setting	Public general education classrooms in northern area of New England
Participants/Sample	• N=151 General education teachers in 13 school districts • K-high school teachers • Random sampling except 2 districts of author selected for interest & further study
Study Design/ Methodology	• Survey Research Design • Teachers completed survey with Likert Scale on frequency of using15 educational strategies 1-never to 5-always & strategy effectiveness 1-not effective to 5-highly effective • Analyzed 5 categories of strategies: Behavioral, environmental, curriculum modifications, modification in delivery of curriculum, & sensory-motor strategy
Level of Evidence	Level IV
Outcomes/ Main Findings	• Preferential seating, frequent contact, routine & structure rated highest; sensory modulation technique, quiet area & assistance during transitions less frequent • Enforcing routine & structure at 76% -highest mean effectiveness rating; peer tutoring, time out & sensory modulation at 26% -lowest mean effectiveness • Chi-analysis to rate strategy with grade level: statistically significant ($p<0.05$) for 3 strategies: quiet space, motor breaks & sensory modulation techniques high at k-2 and 3rd-5th grades and lower at 6-8th and 9-12th grades • Strategies used most were rated most effective
Intervention Highlighted through the Research	Determination of prevalent classroom strategies used by general education teachers amongst students with ADHD & teacher perceptions of techniques
Limitations	• Small return rate 27% thus decreases validity • Unclear if any collaboration in past with special education

	or related services staff for knowledge & use of strategies • Unable to determine additional treatment programs children also receiving to influence strategy effectiveness • Unsure of teacher rating of ADHD issues as each child different & responds differently to given strategy; how many strategies trialed with given student • Only one sensory modulation strategy category provided & motor breaks placed under "modify delivery of curriculum"; some confusion with terms
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Identified strategies some K-12th grade teachers currently using & techniques most frequently implemented in primary grades amongst the participants • Need to educate teaching staff on sensory integration techniques & purpose-only one sensory strategy to rate on study and motor break was not placed under area as a sensory strategy • Teachers used & stated strategies that benefited all students • Motor breaks used most often amongst K-2nd and 3rd-5th grades

CRITICALLY APPRAISED RESOURCE # 20

Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Hill, L., Williams, J. H. G., Aucott, L., Milne, J., Thomson, J., Greig, J., Munro, V., & Mon-Williams, M. (2010). Exercising attention within the classroom. *Developmental Medicine and Child Neurology, 52*(10), 929-934.

Purpose of the Study	• To study if increased physical exercise during school day influence cognitive performance • Relevance to PIO: Investigates if motor movements have impact on attention & influence on academic participation
Setting	• 6 primary schools in Aberdeen, northeast Scotland
Participants/Sample	• N=1074 did 3 or more tests • 4th-7th grades with students 8-11 years old
Study Design/ Methodology	• Random cross-over design, with counterbalance design • 2 weeks-1 week intervention, 1 week no intervention, 30 min after lunch for 10-15 min • Exercises designed to be done behind their chairs in class • Every day, end of day, took mental tracking test • Moderate intensity, but some students short of breath & perspiring
Level of Evidence	Level III
Outcomes/ Main Findings	• Significance determined from exercise improved cognitive -performance $p<0.001$ • Student performance on attention demanding cognitive tasks improved after physical exercise
Intervention Highlighted through the Research	Use of physical exercise program, Classroom exercise programme, for 15 minutes, led by teachers to improve cognitive performance
Limitations	• Intervention only done one week • Afternoon school activities not high cognitive demands (i.e. art, music) • Cognitive test not be tailored to meet kid's needs, as some did not recognize verbal directions
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Classroom based intervention that teacher can lead easily • Sensory-based movement intervention for short time • Intervention requires no equipment & small space • Some of age level same as PIO

CRITICALLY APPRAISED RESOURCE # 21

Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Krog, S., & Kruger, E. (2011). Movement programmes as a means to learning readiness. *South African Journal for Research in Sport, Physical Education, and Recreation, 33*(3), 73-87.

Purpose of the Study	• To determine if movement program with sensory motor development activities, improves student-learning readiness. • Relevance to PIO: The study utilizes activities that target sensory –motor development to prepare students for school learning.
Setting	Primary school in Gauteng Province of South Africa
Participants/Sample	• N=14, 8 boys & 6 girls (10 middle class, 4 low economic status) • Between 7.0-9.5 years old & in 2nd grade • Assigned to special class due to academic performance 1st year of school: poor spatial awareness, coordination, crossing midline, short-attention, span, reading & spelling problems • None received OT • Instruction & expectations in English language
Study Design/ Methodology	• Quasi-experimental-one group pre &-posttest design • Convenient sample, no randomization • Measures used: Bender Visual-Motor Gestalt Test II for visual – motor integration skill levels; Three -1 minute tests from Individual Scale for General; Scholastic Aptitude-to assess reading of sight words, math., & UCT spelling test. • For motor development, combined tests for neurological status from Institute for Neuro-Physiological Psychology (Sensory systems, primary reflexes, muscle tone) • Pre & posttest individually in private area, 10 week intervention for 30 minutes daily in classroom, & teacher led visual activities for 5 minutes • Movement Program combination of programs worldwide: HANDLE (Holistic Approach to Neurodevelopment and Learning Efficiency), Institute for Neuro-Physiological Psychology (INPP reflex programme, Move to Learn & CAN LEARN • Week 1-3 basic of program, weeks 4-10 built upon

	previous weeks, increasing difficulty
Level of Evidence	Level III
Outcomes/ Main Findings	• T-test used with no significant differences in overall pre-& post-test results • Significant differences p>0.05 on IQ, Bender Gestalt, one minute math scores, muscle tone & body awareness • Teachers report significant improvements in sensory – motor skills, handwriting & language abilities
Intervention Highlighted through the Research	A motor program that targets the development of the lower level systems (vestibular, proprioception, primary reflexes) may improve the higher level systems to function for learning readiness
Limitations	• Small sample size & no control group • Combined neurological tests, not a single standardized measure • Combined motor programs, which may make replication difficult • Students in a special education program with small group instruction specifically for deficit areas • Short time for intervention & some target areas may need longer periods of exposure
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Elements of the program are designed to improve sensory-motor development-attention, balance and coordination • Intervention targeting outcome of learning readiness • Authors created short test from reflex screening used by Institute of Neuro-Physiological Psychology. May use similar components to assess sensory processing skills • In class movement program

CRITICALLY APPRAISED RESOURCE # 22

Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Lin, C.-L., Min, Y.-F., Chou, L.-W., & Lin, C.-K. (2012). Effectiveness of sensory processing strategies on activity level in inclusive preschool classrooms. *Neuropsychiatric Disease and Treatment, 8*, 475-481.

Purpose of the Study	• To examine effectiveness of consultation method in use of sensory processing strategies to decrease activity level of pre-k children with sensory integration dysfunction • Relevance to PIO: This study uses sensory–based interventions to target activity levels of children in classroom to improve academic participation & also includes consultative service delivery
Setting	• 4 public & private kindergarten classes in 3 towns in central Taiwan
Participants/Sample	• N=36 final total, 3-6 years olds • Random assignment to control & intervention group • 18 in each group, w/ even boys & girls in intervention group, 10 boys & 8 girls in control) • 326 preschool students did screening & only 38 met criteria • Inclusion criteria: 73rd percentile or higher Test of Sensory Integration Function with no SI treatment before or during study & match -able to intervention & control group; no medical disability
Study Design/ Methodology	• Pre-test- Post-test control group (matching groups) • Sensory intervention for 8 weeks, 9-11:00am, for 5 days, & control group had no sensory strategies • The Actical physical activity monitor placed on right ankle of each participant to measure 4 activity levels: activity level, energy expenditure, activity intensity & feet –swinging episodes • 4 Types of sensory processing strategies implemented in classroom: vestibular, proprioception, tactile and mixed; Sensory diet for some students • Two month intervention • Teacher recorded student reactions & OT made adjustments to sensory input provided after consultation • Teachers completed survey on perception of strategy

	effect one week post treatment
Level of Evidence	Level II-B
Outcomes/ Main Findings	• Activity levels in treatment group had decreased, with more focus in class, improved emotional behavior, longer attention span, sitting quieter longer & less hyperactive behavior-swinging feet, rocking of chair • Energy expenditure & activity level improved but not at statistical significance • Changes in physical activity levels higher in intervention group but did not reach statistical significant levels. • Paired one-tailed t-test showed significant difference in intervention group after 2 months in activity levels P=0.03 and foot swinging P=0.02
Intervention Highlighted through the Research	Determine effectiveness of sensory processing strategies in theme based curriculum to reduce activity levels of preschool children
Limitations	• Young sample & developmental maturation may influence results • No data collected on student activity levels during teacher –led activities
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Sensory-based interventions used in classroom on daily basis • Similar to PIO in use of sensory –based interventions to address hyperactivity levels in students • Sensory –based strategies targeted the vestibular, proprioceptive and tactile systems similar to sensory systems in PIO • Teacher response positive & constructive for sensory strategies & effectiveness within class setting • Provides supportive evidence for use of sensory integration strategies in relation to student activity levels in classroom

CRITICALLY APPRAISED RESOURCE # 23

Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Mangeot, S. D., Miller, L. J, McGrath-Clarke, J., Hagerman, R. J., & Goldson, E. (2001). Sensory modulation dysfunction in children with attention –deficit –hyperactivity disorder. *Developmental Medicine and Child Neurology, 43*, 399-406.

Purpose of the Study	• To investigate the presence of sensory modulation difficulties in children with ADHD. • Relevance to PIO: The PIO uses sensory based strategies to target improvement of attention behaviors in students identified and not identified with ADHD
Setting	Children's hospital in Denver, Colorado
Participants/Sample	• N=26 children diagnosed with ADHD and N=30 typically developing children • Recruited thru flyers & word of mouth at Children's hospital in Denver, Colorado, local clinics focusing on treatment of children w/ ADHD in Denver • All participants had primary diagnosis of ADHD, with confirmation of ADHD –functional behavior problems w/ 2 additional attention tests (ACTeRS & Attention, Activity Level & Impulsivity subscales) & parent rating Subscales • 8 children taking meds but discontinued 24-48 hours prior to physiological tests. • Control group volunteers, typical development from screen, w/no significant difference w/treatment group
Study Design/ Methodology	• Case Control Study • A series of sensory processing tests & compare results of children with ADHD to typically developing children • Participated in Sensory Challenge –Protocol w/ exposure to 5 different stimuli: olfactory, auditory, visual, tactile & vestibular, for 10 x's, 3 seconds • Parents completed Child Behavior Checklist (CBC), Leiter International Performance Scale & Short Sensory Profile (SSP) • Experimenters blind to group assignments
Level of Evidence	Level IV
Outcomes/ Main Findings	• Children with ADHD had higher levels of sensory modulation abnormalities for physiologic & parent test

	measures, than typically developing children • Children w/ADHD showed lower scores on SSP-6/7 & lower scores on Leiter categories of emotion & attention • Children w/ADHD showed marginal significance in reaction to sensory stimuli than comparison group
Intervention Highlighted through the Research	Increase awareness among OTs' of potential presence of SMD with students diagnosed with attention disorders.
Limitations	• Sample from volunteers in one main area of Colorado • The electrodermal responses gained a measure not readily available to purchase & use for replication of study • Sample too small to examine symptoms within ADHD group: i.e. those w/functioning sensory processing reactions against those w/dysfunctional sensory processing
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Study implies children with ADHD have greater chance of having sensory processing dysfunctions • Variability in sensory processing amongst kids w/ADHD compared w/typically developing children • Study uses Short Sensory Profile in determining sensory processing levels, which may be outcome measure in capstone • Emphasizes the need to assess for sensory processing issues in children with ADHD & provision of effective interventions

CRITICALLY APPRAISED RESOURCE # 24

Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Dove, S., & Dunn, W. (2008). Sensory processing in students with specific learning disabilities: Findings and implications for assessment and intervention planning. *Journal of Occupational Therapy, Schools and Early Intervention, 1*(2), 116-127.

Purpose of the Study	• Two purposes: To examine any differences between students with a learning disability (SLD) compared to typically developing students & to determine if students with SLD, with & w/out ADHD have differing sensory processing functioning • Relevance to PIO: Population for capstone may include students in special education who have ADHD & learning disabilities
Setting	Two unidentified school districts, chosen because broad family backgrounds & employ aptitude achievement model for determining SLD
Participants/Sample	• N=120 students • 5-11 years old, with diagnosis of SLD or SLD and ADHD • Exclusion criteria: no other medical diagnosis • Comparison group from national data sets for Sensory Profile by age & gender
Study Design/ Methodology	• Descriptive Case Study • Examination of data from the Sensory Profile, a questionnaire sent to 120 parents to complete, then compared with participants from the national standardization data sets for Sensory Profile • Created demographic form & sent consent information • Student file verified psychological diagnosis of SLD, special education services & documentation of ADHD • MANOVA done to analyze purpose questions & post hoc analyses to examine each dependent variable
Level of Evidence	Level IV
Outcomes/ Main Findings	• MANOVA analysis indicates significant difference between students w/ & without SLD ($p < .0001$) • Post hoc analyses-students w/SLD significantly different on 3 of 4 sensory processing quadrants on Sensory Profile. • Students w/SLD engage in behaviors on Sensory Profile more frequently than students w/out disability

	• No significant difference in sensory processing when compare students w/SLD and SLD & ADHD
Intervention Highlighted through the Research	Use of Sensory Profile to differentiate between students with sensory processing deficits and SLD and students typically developing; and to compare students with sensory processing deficits and SLD only and students with SLD and ADHD
Limitations	• Sample used taken from years prior in database • Sample may not represent SLD nationally as subcategories not considered in selection (i.e. written expression, math deficits, reading delays or combination)
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Uses highly familiar evaluation used by school-based OTs' to measure to determine sensory processing concerns issues in school- setting • Poorly functioning sensory processing skills may influence engagement in class instruction & work completion • Population may include students with SLD & article examines possible sensory processing issues w/students with SLD & ADHD

CRITICALLY APPRAISED RESOURCE #25

Does use of a sensory –based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Munkholm, M., & Fisher, A. G. (2008). Differences in school work performance between typically developing students and students with mild disabilities. *Occupational Therapy Journal of Research: Occupation, Participation, and Health, 28*(3), 121-132.

Purpose of the Study	• To investigate if school work performance differs between students with mild disabilities and students with no disability & if so what were the performance areas • Relevant to PIO: This study supports the PIO in revealing the motor and process skills students need to achieve school demands & the recognition for early intervention services to assist students who lack the motor skills
Setting	• None specifically as database used to collect & compare examination results • Students were initially evaluated in school settings across the North America, Australia or New Zealand, Europe
Participants/Sample	• N=350 students, 175 typically developing and 175 with mild disabilities randomly selected from the School Assessment of Motor and Process Skills (School AMPS) Database, between ages 4-11 years • Inclusion for mild disability: a) Diagnostic criteria from medical, educational or occupational therapy, of ADHD, Developmental Coordination Disorder (DCD), learning disability (LD) or sensory integrative disorder (SI) & no other neurological disorder (i.e. CP, mental retardation, psychological) b) Data had to have no rater scoring errors • 51 diagnosed with ADHD, 34 w/DCD, 70 w/LD, 20 w/SI
Study Design/ Methodology	• Non-consecutive cohort study • The School AMPS is an evaluation tool that assesses student school task performance within classroom; scores inputted into database • 16 raw school motor skill items & 20 process skill items • Examined data from School AMPS database according to age levels, & motor skills and process skill scores • Participants grouped by age 4-5 years, 6-7 years, 8-9 years & 10-11 years.

	• Many-faceted Rasch analyses used to convert scores into linear measures & to determine the difficulty of the school motor & process task items
Level of Evidence	Level III
Outcomes/ Main Findings	• T-tests-significant mean differences for motor and process skills of two groups • Students with mild disabilities performed lower on both motor and process skills, displaying difficulty with completing school tasks than non-disabled peers • Attends, Continues, Initiates, Sequences subtest items were all performed lower than non-disabled peers
Intervention Highlighted through the Research	To investigate if students with mild disabilities perform school work tasks differently than typically developing students and if there is a difference, what performance skills differ
Limitations	• Rater error in scoring with perhaps a misinterpretation of a category; for example Endures results were low for typically developing students & this category only reflects physical not mental capacity • Limited demographic data on the students & school location, family background • No information on raters other than OTs' • Mild disability is a broad category, with ranges of skill levels within each diagnosis; not accounted for with selection process
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Results indicate that students with a mild disability struggle with participating & completing school work • Students with mild disability may not have OT services & would benefit from early intervention support to target performance and motor development to reduce academic failure & enhance school success

CRITICALLY APPRAISED RESOURCE # 26

Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Miller, L. J., Coll, J. R., & Schoen, S. A. (2007). A randomized controlled pilot study of the effectiveness of occupational therapy for children with sensory modulation disorder. *The American Journal of Occupational Therapy, 61*(2), 228-238.

Purpose of the Study	• To conduct RCT level of research on effectiveness of occupational therapy sensory integration approach with children diagnosed with sensory modulation disorder; & to develop fidelity by use of manual protocol for SI therapy & id outcome measures that target SI intervention. • Relevance to PIO: Use of sensory integration theory & evidence to support the sensory-based program as intervention with students w/attention difficulties
Setting	Outpatient, occupational therapy department at Children's Hospital in Denver, Colorado
Participants/Sample	• 50 children referred for occupational therapy at Children's Hospital from 1999-2001. • N=24 total consented for study with sensory modulation disorder (SMD) • 5 diagnosed with ADHD, though with screening, 15 met criteria for ADHD, 3 SLD, 1 with notable anxiety symptoms, 15 no previous diagnosis • Inclusion: SIPT, Miller Assessment or FirstSTEP, and hyperactive electrodermal activity • Exclusion: IQ<85, previous OT, serious life event, younger than 3, older than 11.6 years. • Other medical conditions, i.e. PDD, genetic orthopedic, neurologic disorder, psychiatric disorders
Study Design/ Methodology	• Randomized control pilot study, experimenters & participants blinded • Children assigned randomly to 1 of 3 groups: OT-SI, Alternate Treatment, no treatment • OT-SI given 2 x week for 10 weeks • Therapy designed around needs of child, parent priorities, sensory responsivity, social behavior, motor competence & participation in meaningful experiences • Alternate treatment=Activity Protocol conducted with non-OT personnel & graduate students, table -top play

	activities (arts & crafts, games, puzzles etc.) & No treatment control group on waiting list • Outcome measures: Attention & Cognitive/Social subtests only of Leiter International Performance Scale-R, Short Sensory Profile (SSP), Vineland, Child Behavior Checklist (CBCL), Goal Attainment Scale (GAS) & electrodermal reactivity • For fidelity of both treatment approaches, viewed video tapes & discussion of participants 2 x's month
Level of Evidence	Level II
Outcomes/ Main Findings	• One –way ANOVA used to analyze treatment OT-SI group significant gains than other 2 groups on Goal Attainment Scale (GAS) $p<0.001$; & improvement trends on Attention ($p=0.03$ no treatment group, $p=.07$ & Cognitive/Social composite of Leiter Scale. • Change scores greater on SSP & CBCL Internalizing Composite for OT-SI group, but not significant • SI approach may be beneficial in addressing SMD difficulties in children
Intervention Highlighted through the Research	Determine effectiveness of sensory integrative intervention on reduction of attention, cognitive, social, sensory, or behavioral problems than a placebo treatment.
Limitations	• Sample convenient from metropolitan area where research conducted • Small sample size • Improvements made, but lack of statistical power for indicating some results
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Attempts to provides additional higher level evidence support for use of SI with children w/ SMD • Shows significant gains in GAS –achieving parent goals & shows significant trends in improvements with attention • Notes that 62.5% of sample also displayed symptoms of ADHD • Discusses need to address co-morbidity of these 2 medical conditions in future research

CRITICALLY APPRAISED RESOURCE # 27

Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Ratzon, N. Z., Lahav, O., Cohen-Hamsi, S., Metzger, Y., Efraim, D., & Bart, O. (2009). Comparing different short-term service delivery methods of visual-motor treatment for first grade students in mainstream schools. *Research in Developmental Disabilities: A Multidisciplinary Journal*, *30*(6), 1168-1176.

Purpose of the Study	• To examine short –term delivery service methods for 1st grade students with visual -motor deficits in mainstream schools. • This study analyzes the consultative approaches amongst students & teachers, which is related to the process within my PIO.
Setting	• Six Arab and Jewish mainstream elementary schools, from low socio-economic population in Jaffa, Israel. • Interventions conducted in OT rooms
Participants/Sample	• N=147 children, randomly assigned to interventions or control grp • Mean age 76.63 months • Completed all parts of inclusion-i.e parent permission, score of 21% or less on VMI • Exclusion criteria: medical condition, severe sensory loss (hearing, visual), emotional or behavior problems, students on IEP who integrated into class & those failing to meet study process
Study Design/ Methodology	• Cohort Study Design • 2 year study: data for DT 1st year, other 3 groups 2nd year • VMI given to entire class at once & students scoring 21% or below age level, randomly assigned to 1 of 4 groups of delivery models (Direct treatment -DT, Combined tx-CT, Collaborative-Consult treatment-CC and control group) • No significant diff between grps on gender, ethnicity, age • Four of the DVPT-2 test given (eye-hand, copying, spatial relations & v-m) pre and post test • 97% correlation between 2 OT's on 10 tests • 10 OTS provided direct tx after finished pediatric train'g to DT, 8 OTS did CT group under pediatric OT • DT group (n=29)-12 sessions 45 min/wk by 10 OTS

	• CC group (n=38)- treatment 12 weeks, entire class & treatment (tx) based on school curriculum w/teacher • CT group (n=24)- DT given by 8 OTS & monitoring by 4 teachers w/OT consult. Tx=45 min/wk & 15 min/3xwk
Level of Evidence	Level III
Outcomes/ Main Findings	• MANOVA used for effectiveness & repeated MANOVA to compare study & control groups w/DVPT-2 scores • ANCOVA was used to detect diff between groups • Significant interaction p<.001 of group & intervention • All children involved improved significantly performance compared to control group, who showed no significant. • One way ANOVA determined significant diff between study & control on total score of DTVP-2. • Post-hoc on total score between groups revealed signify improvement in performance compared to control group • All 3 intervention groups improved 3 of 4 areas (not v-m speed) on DVPT-2
Intervention Highlighted through the Research	Compare various service delivery methods for short-term treatment in inclusion school settings to provide evidence based recommendations for addressing visual –motor deficits in elementary students.
Limitations	• Did not analyze treatment impact on functional outcome • Use of OTS to provide intervention • In different country
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Demo short term OT services in various models can improve visual -motor integrative deficits • Addition of 15 w/ teachers, no increase in effectiveness • All 3 methods effective & teachers approved of CC & CT methods • Targeted students not typically seen by OT due to mild deficits • Supports early intervention to prevent problems in future • This study incorporates many elements of PIO (population, short –term delivery method, collaboration w/educators)

CRITICALLY APPRAISED RESOURCE # 28

Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Barnes, K. J., & Turner, K. D. (2001). Team collaborative practices between teachers and occupational therapists. *The American Journal of Occupational Therapy, 55*(1), 83-89.

Purpose of the Study	• Aim of study to describe collaborative methods between OTs' & teachers, considering OT goal & amount of OT time on IEP • Relation to PIO: Collaborative services will be provided in project to support classroom implementation of intervention
Setting	• Public school district in metropolitan area
Participants/Sample	• N=40 (of 47 initial randomly selected) students with an IEP & OT services and their teachers
Study Design/ Methodology	• Descriptive research design correlational with survey & record review as instruments • 4 part questionnaire was developed by authors & completed by teachers to
Level of Evidence	Level IV
Outcomes/ Main Findings	• As collaboration between team members increased, the more understanding of OT role & contributions in school setting • Scheduling time to meet & discuss team concerns was difficult • When could meet, goals were achieved
Intervention Highlighted through the Research	Exploration of collaboration and consultation approaches between OT and teachers
Limitations	• Only in one school district limiting generalization • Results are only foundational for further research
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Reviews the benefits and areas of concern when providing OT consultative & collaborative services within school district • Provides teacher perspective of collaborative process with OT services • In order for PIO to be successful, will need support from teachers & to collaborate with staff

CRITICALLY APPRAISED RESOURCE # 29

Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Reeder, D. L, Arnold, S. H., Jeffries, L. M., & McEwen, I. R. (2011). The role of occupational therapists and physical therapists in elementary school system early intervening services and response to intervention: A case report. *Physical and Occupational Therapy in Pediatrics, 31*(1), 44-57.

Purpose of the Study	• Discuss the inclusion, role, responsibility & workload demands of OT's & PT's in the Response to Intervention (RtI) process at suburban district • Relevance to PIO: The occupational therapy delivery of service to general education students in the study will fall under the guidelines of the RtI model
Setting	• 5 Elementary public schools in suburban area of Texas • Entire school district comprised of: 3 high schools (9-12th grades), 5 middle schools (6th-8th grades) & 17 elementary schools with total of 20, 807 students • Student demographics are diverse with increasing number of Hispanic families
Participants/Sample	• N=9 OT's and PT's (Four and half full-time OTs, 2-full-time COTAs'; 3-full-time PTs
Study Design/ Methodology	• Qualitative case report study • Collected data and followed OT & PT personnel who initiated RtI process of: screening 60 pre-k students at 1 building only, provision of therapeutic strategies to students & staff, educating staff & referring students & evaluated impact of RtI process on workload • In-service on referral process to special ed & related services, demo on class strategies for common issues reported by staff • Issued resources, gathered evidence-based & best practice strategies & sent intervention info via school Intranet • Established guidelines by state & licensing laws, for RtI levels of consultation & collaboration w/teachers for role & responsibility delineation (p.49)
Level of Evidence	Level V
Outcomes/ Main Findings	• Higher number of referrals made to OT once staff across district discovered OT providing RtI services to students

	in general education • Only 1 pre-k student needed special education referral after follow-up • 21 referrals for OT, 13 received Level 1 & 2 RtI supports & 8 Level 3. None referred for special education • Referrals for: attention & focus (3), fine motor skills (6), self-regulation (3), scissor skills (1) • With poor after-school training, more 1:1 training w/intervention • Increased awareness of need across district, to explain OT role & intervention techniques for staff & students • Additional hours overall were added to full-time & part-time OT staff's workload; discussed ideas to manage increase demands
Intervention Highlighted through the Research	Description of OT & PT department's inclusion in a school district's RtI model to identify roles, participation and potential impact upon workload.
Limitations	• Only one school district involved, limiting generalization • Lacked formal or informal method to collect data from OT & PT personnel involved in process
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Provides information & insight on OT's role in RtI process • Describes potential barriers may encounter during project implementation: 1. Specifically the workload demands involved with addressing needs of general ed students, may experience with PIO 2. Identified need to look at outcome measures that are effective, quick & target performance areas & occupations due to high number of students to screen - pre-k & referrals • Importance of addressing the needs of all students to decrease OT referrals & empower staff & students with classroom strategies for success in classroom, similar aims of PIO

CRITICALLY APPRAISED RESOURCE # 30

Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Bar-Shalita, T., Vatine, J., & Parush, S. (2008). Sensory modulation disorder: a risk factor for participation in daily life activities. *Developmental Medicine & Child Neurology*, *50*(12), 932-937.

Purpose of the Study	• To describe engagement in daily life performance of children with sensory modulation disorder (SMD) • Relevance to PIO: Evidence to prove that children with SMD will have difficulties with performing school related activities
Setting	Clinic at Reuth Medical Center, Tel Aviv, Israel
Participants/Sample	• N= 78 children-n=44 in intervention group, 34 in control • Convenience sample recruited from pediatric clinics throughout Israel. Study sample recruited peers from classroom-match grade and age-to be in control group • Mean age: study group 7.6 years, control group 7.8 years • Inclusion for all: between 6.0-10.11 years and no medical or developmental deficits, speech, vision, hearing or behavioral disorders or family history of psychopathology • For study group: 141 or higher (Definite Difference) on Short Sensory Profile (SSP) & diagnosis of SMD with Sensory Profile-(took later to verify SSP score) • Had to have at least 2 of 9 factors on Sensory Profile & control group had to have 156 or higher on SSP
Study Design/ Methodology	• Case Control Study • Outcome Measures: Use of Short Sensory Profile, Sensory Profile (Full) and Participation in childhood Occupations Questionnaire (PICO-Q), medical and demographic questionnaire to parents • Parents completed SSP. Once scored & included in study, researchers met with parents to complete the full SP, the PICO-Q and medial and demographic information sheet • Pearson correlation coefficients to determine relationship between 3 elements of participation on PICO-Q: Daily care, academic activities, play & leisure, habits & routines within each category-1. Level of activity 2. Enjoyment of activity 3. Frequency of activity
Level of Evidence	Level IV

Outcomes/ Main Findings	• The scores on the PICO-Q were lower in each area for the study group than control group • Statistical significance in association between SSP total score and the total score of PICO-Q • Correlation between SSP and Level of performance (quality of child's performance) section on PICO-Q
Intervention Highlighted through the Research	To analyze and compare the participation levels of children with sensory modulation disorder in daily activities to typically developing children's participation levels in daily activities
Limitations	• Convenient sample • PICO-Q is a parental questionnaire, with some subjectivity to the results and lack of factual confirmation of child's ability level outside of home or community environments • Questions on PICO-Q do not provide expansive list of daily activities to rate within categories; therefore may not be able to generalize participant's overall success and/or difficulty with frequency, enjoyment of personal daily activities
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Provides a statistical significance relationship between sensory modulation disorder and a child's performance in daily activities • Having SMD may affect the quality and level of participation in daily activities for a child • Emphasize early detection and intervention for children with SMD to adapt or modify environments and provide treatment to increase frequency, level and enjoyment of daily required activities (school and home)

CRITICALLY APPRAISED RESOURCE # 31

Does use of a sensory-based intervention program improve on –task classroom behaviors of at-risk students in an urban elementary school setting?

Basch, C.E. (2011). Inattention and hyperactivity and the achievement gap among urban minority youth. *Journal of School Health, 81*(10), 641-649.

Purpose of the Study	• To discuss the wide existence of inattention and hyperactivity of minority urban children, causations that impede academic performance and interventions and approaches for schools to assist students • Relevance to PIO: Provides information on prevalence and issues surrounding urban youth with ADHD, including early intervention and equipping students with coping skills to manage behavior in classroom
Setting	• Literature review performed at Columbia University in New York • Hospitals, schools
Participants/Sample	• Population focus on urban minority youth • N=70 literature articles and other resources (books & executive summary paper). • Literature includes: 13 quantitative (systematic review, meta-analysis, quasi-experimental) and 53 qualitative studies (case control, case studies, cohort, literature review, longitudinal, descriptive) and 4 books and executive paper
Study Design/ Methodology	• Literature review on inattention and hyperactivity amongst minority, urban youth • Main points from the literature discussed in topics related to prevalence, symptoms, functional hindrances due to abnormal behaviors (absenteeism, poor connection with peers & adults, poor sustained attention, easily distracted, impulsivity, decreased ability to sit still, and current treatment
Level of Evidence	Level V
Outcomes/ Main Findings	• Approximately 4.6 million American children 6-17 years received diagnosis of ADHD • Children with ADHD struggle with academic performance and outcomes that affect quality of life in future • Students have multiple problems in school: poor sustained attention, behavior stops instruction, impulsivity, difficulty completing assignments

	• Difficulty processing sensory information, decreased balance, motor coordination and visual processing may hinder completion and engagement in school activities
Intervention Highlighted through the Research	Many urban minority youth children have greater chance of having ADHD, yet are also less likely to receive medical treatment.
Limitations	• Literature review with no inclusion/exclusion criteria • Lack of quantitative studies to support evidence presented
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Provides data on ADHD prevalence in urban minority children & uses literature to back up symptoms of ADHD, in children with inattention and hyperactivity behaviors that interferes with academic success and may negatively affect quality of life in future • Includes information on sensory processing skills (balance, motor coordination, visual processing, time perception) that adversely affect school performance, easily distracted, impulsive, difficulty completing assignments, sustaining attention, following directions • Some children will show inattention and hyperactivity levels on the mild range of ADHD, will less likely chance to receive medical treatment

CRITICALLY APPRAISED RESOURCE # 32

Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Froehlich, T. E., Lanphear, B. P., Epstein, J. N., Barbaresi, W. J., Katusic, S. K., & Kahn, R. S. (2007). Prevalence, recognition, and treatment of attention –deficit/hyperactivity disorder in a National Sample of U.S. children. *Archives of Pediatric and Adolescent Medicine, 161*(9), 857-863.

Purpose of the Study	• To analyze prevalence of children diagnosed with attention deficit –hyperactivity disorder with DSM-IV, in national population-based sample of American children, socio-demographic predictors of ADHD and treatment selections • Relevance to PIO: Provides information on national occurrence of ADHD amongst economically disadvantaged children
Setting	• Survey analysis at Cincinnati Children's Hospital • Survey conducted amongst US population between 2001-2004
Participants/Sample	• N=3082 children 8-15 years old • Split into two age group ranges, 8-11 years, 12-15 years • Sample demographics: racial factors, parental income, and health insurance provided
Study Design/ Methodology	• Survey Research • The Diagnostic Interview Schedule for Children (caregiver section) issued to parents • Author assessed prior diagnosis of ADHD by professional and history of medication therapy
Level of Evidence	Level IV
Outcomes/ Main Findings	• 8.7% of participants ages 8-15 years met DSM-IV criteria for ADHD, year prior to survey • 3.3% did not meet criteria but parents reported diagnosis & medical treatment • Poverty stricken children more likely to have diagnosis of ADHD compared with wealthiest children • Boys higher chance of ADHD diagnosis compared to girls • Children ages 8-11 years from lower income families, higher prevalence of ADHD-Hyperactivity subtype than older children

	• Poor children with DSM-IV criteria 3-5 times less likely to receive medical treatment related to other income levels
Intervention Highlighted through the Research	To examine the prevalence of ADHD amongst sample of US children, the socio-demographic factors and us treatment
Limitations	• Lacks uniformity with ADHD diagnosis-differences in how diagnosis determined-American Academy of Pediatric recommends 2 different reporters, DSM-IV only requires child to show impairment in 2 settings • Parental bias –interpretation of ADHD symptoms rather than verification of diagnosis from medical professional
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Provides data on potential prevalence of ADHD amongst poor children compared with national sample of children • Supports that economically disadvantaged children have higher tendency to be diagnosed with ADHD, and receive less medical treatment options • Reinforces need to support students with attention problems with treatment options due to decreased likelihood of or consistent use of medical intervention

CRITICALLY APPRAISED RESOURCE # 33

Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Ben-Sasson, A., Carter, A. S., & Briggs-Gowan, M. J. (2009). Sensory over-responsivity in elementary school: Prevalence and social –emotional correlates. *Journal of Abnormal Child Psychology, 37*, 705-716. doi: 10.1007/s10802-008-9295-8.

Purpose of the Study	• Examine the prevalence of sensory over-responsivity (SOR) behaviors of elementary children, and relationship with socioeconomic status, social –emotional skills and risk factors. • Relevance to PIO: Investigates a pattern of sensory modulation in elementary children at –risk (low income status, prematurity) which may hinder academic performance
Setting	• Participants lived in one of 15 towns forming regional metropolitan area of Connecticut • Surveys sent to families homes
Participants/Sample	• N= 925 children • Randomly selected parents who gave birth from July 1995-1997 at Yale New Haven Hospital • Demographics of children and parents given in table (i.e. sex, ethnicity, birthing factors, employment & education) • Exclusion: likely to have developmental delays, had a sibling in sample, deceased, adopted, child of investigator • Inclusion: 1 parent speaking English, custody of biological parent, living in state of test.
Study Design/ Methodology	• Longitudinal Study, following same subjects • Surveyed parents 3 times-when child between 11-42 months, 22-56 months, and 7.0-11.0 years • Measures: The Infant Toddler Social and Emotional Assessment and demographic info 1st two surveys (1998 and 2002-2003). Third survey included: Sensory Over-Responsivity Scale, Child Behavior Checklist, and The Adaptive Social Behavior Ratings when child in 2nd-3rd grades • Sensory Over-Responsivity Scale added after 3rd/last survey began • Small payment given to parents
Level of Evidence	Level IV

Outcomes/ Main Findings	• Sensations most bothered by children, tactile, with 50% of school-aged children bothered by 1-3 sensations • 16.5% of children had 4 or more bothersome tactile or auditory sensations • Children with socio-demographic risk factors, i.e. significant low birth weight, gestational duration, minority status, living with single parent or non-employed parent & low socioeconomic status, increased chance for over responsivity • Children with sensory over responsivity, had higher likelihood of adaptive social behavioral difficulties and social-emotional problems
Intervention Highlighted through the Research	Determine and analyze the prevalence of sensory over-responsivity amongst children comparing association with demographics and social-emotional problems
Limitations	• Outcome measure relies on parental information • No control group • Only two sensory areas (tactile & auditory) addressed with sensory measure • Longitudinal effects i.e. deadline, lost some participants • Participant maturation
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Provides data that at-risk factors elevate chance of having sensory processing-modulation difficulties • Socio-economic status may increase prevalence of SMD in children • Children with SMD, appear to lack adaptive skills to counteract maladaptive behavior during daily activities • Sensory over-responsivity impacts appropriate adapted response to others and situations that occur in daily life • Schools are stimulating with auditory, tactile and visual stimulation; when children have over responsivity they may display maladaptive behaviors during school activities that impair learning, ie. fear, distraction, avoidance, high alert levels

CRITICALLY APPRAISED RESOURCE # 34

Does use of a sensory-based intervention program improve on-task classroom behaviors of at-risk students in an urban elementary school setting?

Reynolds, A., Shepherd, J., & Lane, S. (2008). Sensory modulation disorders in a minority head start population: Preliminary prevalence and characterization. *Journal of Occupational Therapy, Schools, and Early Intervention, 1*(3), 186-198.

Purpose of the Study	• To determine the prevalence of sensory modulation disorder in African –American children enrolled at Head Start. • Relevance to PIO: Population in project are similar to study, urban youth and economically disadvantaged, who may also show signs of sensory modulation disorder (SMD)
Setting	• Large urban metropolitan area • Head Start program
Participants/Sample	• N=105 children at Head Start program, 3.1-4.9 years • Convenient sample • 90% of families below poverty level • 80% children lived in single parent homes • 98% African American • On average of any school year, 10% of children in program qualify for special education services
Study Design/ Methodology	• Case Study • Short Sensory Profile (SSP) given to parents & analyzed • Children were categorized as with and without SMD • Cut point method used same as similar study (Ahn et al., 2004) & measured prevalence at Head Start • Compared children with SMD with published norms on SSP.
Level of Evidence	Level IV

Outcomes/ Main Findings	• 17- 35.2% of the students met the criteria for SMD • 22.9% of total sample had scores in Definite Difference range of Short Sensory Profile, indicating sensory deficits • Results indicate potential areas of touch and movement sensory deficits high in sample, suggesting need for OT to support with sensory input for school learning • Movement (41%) and tactile sensitivity (1/4th) notably high scores in probable and definite difference ranges
Intervention Highlighted through the Research	Determine if children living in low-economic conditions, attending an urban Head Start program show prevalence in sensory modulation disorder
Limitations	• Convenience sample • No control group • Short Sensory Profile has no scores for 3-4 year olds thus caution with interpretation
This study/paper was identified as the 'best' evidence and selected for the portfolio for the following reasons:	• Provides data on possible prevalence of SMD in urban, economically disadvantaged youth • Emphasizes at-risk children have higher risk of sensory difficulties, which may affect performance in school and daily living • Outcomes consistent with other study results showing medical (sensory, cognitive, health) problems amongst children with socioeconomics, race and geographic factors • Particularly high scores in tactile and movement sensitivities that may impact behavior in classroom-excess movement, poor completion of tasks, following of directions, difficulty with transitions, social interactions and managing class materials • Study promotes early identification, education of staff on managing behavior, adapting and modifying environment to increase school engagement and performance

Appendix B: Permission Letter From River's Edge Montessori School

River's Edge Montessori School
108 Linwood Street * Dayton, Ohio 45405 * (937) 542-4640
Holli T. Gover, Principal
Alice Coulter, Secretary * Fax (937) 542-4641 *
Email: htgover@dps.k12.oh.us

May 30, 2014

To Whom It May Concern,

This letter is to serve as permission for Amy Spence, MsEd., OTR/L to conduct her evidence –based capstone project at River's Edge Montessori School. Amy Spence will be permitted to implement an evidence-based occupational therapy program focusing on the utilization of a sensory-based program, with students displaying at-risk behaviors that interfere with academic engagement and performance.

The project will be executed for approximately six weeks amongst students and teachers, during Spring 2015 (Chatham University semester). The capstone project will focus on providing sensory -based interventions and strategies to students demonstrating difficulties with attention-on task behaviors that hinder academic performance. Students and the teachers will participate in the project voluntarily and Ms. Spence will adhere to the confidentiality and consent guidelines.

I understand that the purpose of the OTD capstone project will be to answer the following evidence-based practice question: Does the use of a sensory –based program improve attention behaviors of at-risk students in an urban elementary school setting?

Holli T. Gover 5-30-14

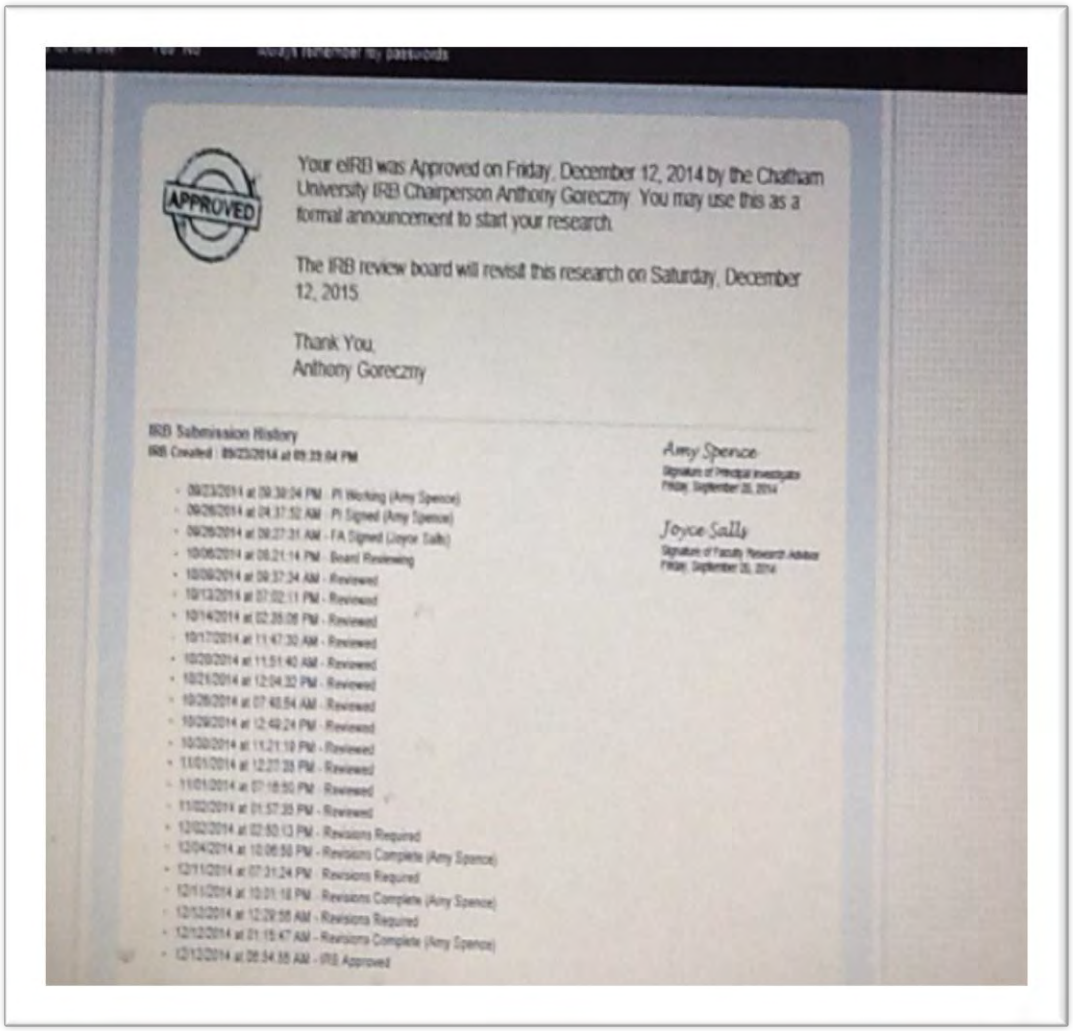
Holli Gover, Principal of River's Edge Montessori School Date

Appendix C: IRB Proposal

(To view entire document, double click onto the proposal.)

Amy Spence (eIRB ID: 1086) OTD a.spence@chatham.edu	
Complete	**Faculty Research Advisor** Dr. Joyce Salls (eIRB ID:) Degree: Doctorate Discipline: Occupational Therapy
Complete	**Other Investigators**
Complete	**Title of the Research Project** Use of a sensory-based intervention program to improve on-task classroom behavior of at-risk urban elementary school students.
Complete	**Previous or similar IRB Project** Not related to another IRB submission
Complete	**Funding** Not Funded
Complete	**Type of Research** Graduate research
Complete	**Description of the proposal** An independent study/Tutorial
STATUS	**PROJECT NARRATIVES**
Complete	**The purpose of the proposed research, including specific research objectives.** The purpose of this evidence based practice project is to apply the evidence stating that sensory-based strategies may improve on-task classroom behavior of students at-risk for optimal academic performance. This project will also provide valuable insight into the collaborative relationship between occupational therapists and teachers, determining the qualitative and quantitative aspects of the relationship upon teacher and student application of the program, and ultimately the sensory –based program's effect on student on-task behavior in the classroom setting. *The PIO Question is: Does use of a sensory-based intervention program improve on-task classroom behavior of at-risk students in an urban elementary setting?*
Complete	**Evidence to support the need for this study through a brief narration with citations.** Attention skills are an essential component for engaging in school activities and for learning. According to Mulligan (2001), general education teachers in the United States and Canada report that 50% of the student referrals made for special education stemmed from inattention and aptitude factors in the classroom setting. Additionally, attention difficulties are one of the fastest growing and prevalent "mental health and behavioral problems that affect youth" (Basch, 2011, p. 641). Children displaying attention difficulties in the school setting are at-risk for school failure, which leads to fewer vocational opportunities and a lower quality of life (Basch, 2011; Fedewa & Erwin, 2011). This particularly is observed among urban minority children (Basch, 2011). Froehlich et al. (2007) conducted a cross-sectional survey across the U.S. determining underprivileged children ages 8-15, met the criteria for attention deficit-hyperactivity disorder two times greater than wealthier families and are less likely to receive and maintain medical and behavioral treatment. The medical and behavioral interventions children receive primarily

Appendix D: IRB Approval Letter



APPROVED

Your eIRB was Approved on Friday, December 12, 2014 by the Chatham University IRB Chairperson Anthony Goreczny. You may use this as a formal announcement to start your research.

The IRB review board will revisit this research on Saturday, December 12, 2015.

Thank You,
Anthony Goreczny

IRB Submission History
IRB Created | 09/23/2014 at 09:39:04 PM

- 09/23/2014 at 09:39:04 PM - PI Working (Amy Spence)
- 09/26/2014 at 04:37:52 AM - PI Signed (Amy Spence)
- 09/26/2014 at 09:27:31 AM - FA Signed (Joyce Sally)
- 10/06/2014 at 08:21:14 PM - Board Reviewing
- 10/08/2014 at 09:37:34 AM - Reviewed
- 10/13/2014 at 07:02:11 PM - Reviewed
- 10/14/2014 at 02:35:06 PM - Reviewed
- 10/17/2014 at 11:47:30 AM - Reviewed
- 10/20/2014 at 11:51:40 AM - Reviewed
- 10/21/2014 at 12:04:32 PM - Reviewed
- 10/28/2014 at 07:40:54 AM - Reviewed
- 10/29/2014 at 12:49:24 PM - Reviewed
- 10/30/2014 at 11:21:19 PM - Reviewed
- 11/01/2014 at 12:27:35 PM - Reviewed
- 11/01/2014 at 07:18:50 PM - Reviewed
- 11/02/2014 at 01:57:35 PM - Reviewed
- 12/02/2014 at 02:50:13 PM - Revisions Required
- 12/04/2014 at 10:06:50 PM - Revisions Complete (Amy Spence)
- 12/11/2014 at 07:31:24 PM - Revisions Required
- 12/11/2014 at 10:01:18 PM - Revisions Complete (Amy Spence)
- 12/12/2014 at 12:29:55 AM - Revisions Required
- 12/12/2014 at 01:15:47 AM - Revisions Complete (Amy Spence)
- 12/12/2014 at 06:34:35 AM - IRB Approved

Amy Spence
Signature of Principal Investigator
Friday, September 26, 2014

Joyce Sally
Signature of Faculty Research Advisor
Friday, September 26, 2014

Appendix E: Teacher Information Letter

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Teacher Information Letter

Dear Teachers of 6-9 year old students (1st-3rd graders),

As some of you know, I am currently a student at Chatham University, pursuing my doctoral degree in occupational therapy, under the direction of Dr. Jennifer Lape, and Dr. Joyce Salls. I am writing to inform you that I will be conducting my capstone project at River's Edge Montessori School for six-weeks beginning in January 2015. The purpose for my capstone project is to assist a maximum of 10 at-risk students in the first, second and third grades who are struggling to remain on-task during class lessons and activities. The project will include both teachers and students in the first, second and third grades.

I am writing to request the assistance of two teachers who would be willing to participate in my capstone project, for the six-week period. Teachers will spend approximately six hours in the project. The project requires the teacher who volunteers, to sign a consent form. Then before the start of the capstone project, the teacher will assist the investigator, me, in selecting students from your class who meet the eligibility criteria, to participate in the capstone. I will issue the teacher parent consent forms to send home with the students, that contains information to contact the investigator regarding the capstone project. The teacher will also participate in a 45-minute training session learning about the sensory-based strategies (S'cool Moves program) that the investigator will conduct with students each week. In the first week of the capstone project, the teacher, with the investigators assistance, will complete a short pre-testing form that will take approximately 10 minutes. During the six-week intervention phase, the teacher will also support students in using the strategies four days a week in the classroom. The investigator will collaborate with the teacher for 10 minutes one time a week, to provide support and guidance. During the final sixth week, the teacher will complete a short survey and assist with filling out a post-testing form (same one as at pre-testing).

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The sensory activities and movements that the students will be performing are from the S'cool Moves program and consist of, but are not limited to, activities performed in physical education class, such as push-ups, jumping patterns like hopscotch, ball tasks, and massages to the arms and hands. The sensory strategies will be performed before a given academic lesson or assignment. The investigator will provide instructions on safety measures for both the teacher and the students.

The teacher's participation is voluntary. At the conclusion of the project, the results will be shared with the teachers and the parents will be notified. All information throughout the project will be confidential. Names of participants will be excluded from the project and participants will have number codes to maintain confidentiality. The investigator will follow the privacy and confidentiality policies of both Chatham University and Dayton Public Schools.

If you have any questions about this project or are interested in volunteering, please feel free to contact me at, (937) 542-4645 or (937) 542-3488 or send me an email at, aspence@dps.k12.oh.us.

Thank you for your consideration in assisting me in this endeavor,

Amy Spence
Investigator's Name (Print)

Amy Spence 12-3-2014
Investigator's Signature Date

Joyce Salls
Faculty Advisor Name (Print)

Joyce Salls 12-3-14
Faculty Advisor Signature Date

The Chatham University IRB has approved the solicitation of participants for this project until (one year from approval date)

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Appendix F: Teacher Consent Form

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TEACHER CONSENT FORM

INVESTIGATOR(S) NAME:

Amy Spence, OTR/L

EVIDENCE BASED PROJECT TITLE:

Does use of a sensory-based intervention program improve on-task classroom behavior of at-risk students in an urban elementary school setting?

PURPOSE OF THE EVIDENCE BASED PROJECT:

The purpose of this evidence-based project is to determine if using sensory-based interventions will improve on-task classroom behavior of students at-risk of not participating in and completing grade level academic activities. Conducting this capstone project will also fulfill my degree requirement for the doctoral occupational therapy program at Chatham University.

DESCRIPTION OF THE EVIDENCE BASED PROJECT:

This capstone project will consist of using a sensory-based intervention program, S'cool Moves, with **first, second and third** grade students. Several of your students will participate in small group lessons with me, the investigator, for 15 minutes one day a week for six weeks, to learn the strategies. Your students will then utilize the sensory strategies prior to one designated academic lesson or activity, at least four days out of the week. The sensory-based strategies will consist of movement activities and exercises including but not limited to wall push-ups, arm and hand massages, deep breaths, and dance and rhythm patterns. The investigator will provide you with all materials and supplies prior to performing the sensory-based strategies in your classroom.

The teachers will spend approximately six hours total in the project. If you agree to participate in this project, you will:

1. Engage in a short training for approximately 45 minutes to learn the sensory intervention program, review safety measures, and the format for the six-week capstone project.
2. Assist the investigator with the selection and recruitment of eligible students for the capstone project.
3. Allow and assist the student participants, to perform sensory strategies five minutes prior to one designated academic activity four days a week.

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4. Meet with the investigator one time a week for at least 10 minutes, to collaborate and discuss any questions or concerns with implementing strategies into the classroom.
5. Complete a short survey at the end of the six -week intervention period.

RISKS AND DISCOMFORTS:

The discomfort you may experience is the extra time you will commit to the project outside of your existing teaching responsibilities. To minimize risks and discomfort with the actual performance of the sensory-based program S'cool Moves, you and your students will receive detailed instruction from me, the occupational therapist/investigator, on how to perform the sensory movements accurately before using them in the classroom throughout the week. The removal of all objects in the area prior to performing any activities will also maximize safety and reduce the risk of injury. You can discontinue doing any sensory strategy causing discomfort and you can refuse to answer any questions on the survey.

BENEFITS:

The benefits from the project consist of improving our understanding of how evidence-based, sensory-based interventions may influence the attention and hyperactivity behavior of at-risk students in our school setting.

ALTERNATIVE PROCEDURES:

The alternative procedure for teachers not interested in participating in this project would be not to sign the consent form. **Standard procedures for the provision of occupational therapy services will continue for teachers and their students who currently receive and do not receive occupational therapy services. The practitioner will continue to offer recommendations for all students, to address any occupational therapy concerns the teacher may present.'**

CONFIDENTIALITY:

This signed document and all of the information you provide for this project will be concealed in a locked area at Amy Spence's, the investigator's, office. **Number codes** will be placed on documents instead of names to increase confidentiality. I will also adhere to the privacy and confidentiality guidelines designated by Chatham University and by the Dayton Public School district.

TERMINATION OF PARTICIPATION:

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You, as the teacher participant, can withdraw from the project at any time. The decision to withdraw will not have any negative consequences for the participant. **For example, occupational therapy services will continue to be provided to your students who currently receive occupational therapy; and the practitioner will offer recommendations to support any student concerns the teacher may present.**

COMPENSATION:

Teachers and students will not receive any compensation for participation in the project.

INJURY COMPENSATION

Neither Chatham University nor any government or other agency funding this project will provide special services, free care, or compensation for any injuries resulting from this project. I understand that treatment for such injuries will be at my expense and/or paid through my medical plan.

QUESTIONS

All of my questions have been answered to my satisfaction and if I have further questions about this project, I may contact Amy Spence at (937) 542-4645 or Dr. Salls and/or Dr. Provident at (412) 365-1193. If I have any questions about the rights of project participants, I may call the Chairperson of the Chatham University Institutional Review Board at **412-365-1886.**

VOLUNTARY PARTICIPATION

I understand that my participation in this project is voluntary, and that refusal to participate will involve no penalty or loss of benefits to me. I am free to withdraw or refuse consent, or to discontinue my participation in this project at any time without penalty or consequence.

I voluntarily give my consent to participate in this project. I understand that I will be given a copy of this consent form.

Signatures :

_____

Participant's Name (Print)

_____ _____

Participant 's Signature Date

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I, the undersigned, certify that to the best of my knowledge, the subject signing this consent form has had the project fully and carefully explained by me and have been given an opportunity to ask any questions regarding the nature, risks, and benefits of participation in this project.

Amy Spence

Investigator's Name (Print)

Amy Spence 9-23-14

Investigator's Signature Date

Joyce Salls 9-23-14

Faculty Advisor Name (Print)

Joyce Salls 9-23-14

Faculty Advisor Signature Date

The Chatham University IRB has approved the solicitation of participants for this project until (one year from approval date)

Appendix G: Parent Letter of Consent

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PARENT LETTER OF CONSENT

Dear Parent or Guardian,

My name is Amy Spence and I am an occupational therapist at River's Edge Montessori School. I am also a student at Chatham University, pursuing my doctoral degree in occupational therapy, under the direction of Dr. Jennifer Lape, and Dr. Joyce Salls. I am writing to inform you of my capstone project that I am planning with selected students who are enrolled in the first, second and third grades. The purpose for my capstone project is to assist students who are struggling to remain on-task during class lessons and activities.

The classroom teacher has identified your child as a student who may benefit from participating in the six-week intervention program beginning January 2015. Student participants will spend a total time of approximately four hours in the project. I am asking you to allow your child to join a small intervention group that will meet one time a week for 15 minutes during the school day. The small group session will be guided and led by me during non-instructional time and will not interfere with academic lessons presented by the teacher.

The sensory activities and movements included in the program are similar to activities performed in physical education class, such as push-ups, jumping patterns like hopscotch, ball tasks, and massages to the arms and hands.

Your child's participation is voluntary. Declining to participate will not have any negative consequences. If you give permission for your child to participate in the project, I will need you to sign the parent consent form and return it to your child's teacher. After the consent form has been received, a student assent form will be read to your child, and he/she will sign the consent if he/she agrees to participate. Next, I will perform pre-testing during the first week of the project and post-testing at the sixth week to gather information on your child's on-task and

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off-task behavior while performing a class assignment or activity. At the end of the six weeks, your child will also provide comments on their experience with the program.

Results will be shared with you and your child at the conclusion of the project. All information throughout the project will be confidential. No names will be used. I will follow the privacy and confidentiality policies of both Chatham University and Dayton Public Schools.

Attached to this letter is the parental consent form. If you are interested in having your child participate in this project, please sign the form and return it to your child's teacher. If you have any questions about this project, please contact me at (937) 542-4645 or (937) 542-3488. Thank you for your consideration in permitting your child to participate in this project.

Amy Spence 9-23-14
Investigator Name Date

Amy Spence 9-23-14
Investigator's Signature Date

Joyce Salls
Faculty Advisor Name (Print)

Joyce Salls 9-23-14
Faculty Advisor Signature Date

The Chatham University IRB has approved the solicitation of participants for this project until (one year from approval date).

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Appendix H: Parent Consent Form

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PARENT CONSENT FORM

INVESTIGATOR(S) NAME: Amy Spence, OTR/L

EVIDENCE BASED PROJECT TITLE:

Does use of a sensory-based intervention program improve on-task classroom behavior of at-risk students in an urban elementary school setting?

PURPOSE OF THE EVIDENCE BASED PROJECT:

The purpose of this evidence-based project is to determine if using sensory-based interventions will assist students who are struggling to demonstrate attention or on-task behavior during academic activities and assignments. By conducting this capstone project at River's Edge Montessori School, I will fulfill my requirement for the doctoral occupational therapy program at Chatham University.

DESCRIPTION OF THE EVIDENCE BASED PROJECT:

This sensory-based intervention project will be performed for six weeks beginning January 2015. Students will spend a total time of approximately four hours in the project. First, second and third grade students will participate in small group lessons with me, an occupational therapist one day a week for 15 minutes. The sensory-based strategies your child will do, consist of simple movement activities and exercises that are performed while sitting, laying on the floor, and standing upright. The sensory activities require using the entire body, eyes, ears, arms, and legs, to prepare for learning. The large movement sensory activities are similar to tasks performed in physical education class, such as but not limited to push-ups, dance moves, and hopscotch-like jumping patterns. The small sensory activities are performed while sitting at a desk area, such as but not limited to, moving eyes to up and down, and arm massages.

If you agree to allow your child to participate in this project, I will observe your child's on-task and off-task, attention behavior while performing one classroom activity before and after the sensory-based intervention project. During the six weeks of the program, your child will be asked to:

1. Participate in the small group lessons for 15 minutes, one time a week.
2. Perform the sensory activities before doing one academic lesson or activity, four days a week.
3. Mark a daily chart to indicate that he/she has performed the sensory activity that day.

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4. At the end of the project, your child will participate in a focus group sharing thoughts regarding his/her experiences with the sensory intervention program. I, the investigator, will record the focus group session to listen to the responses again and collect information potentially missed while initially directing the questions in the session. The audio will be destroyed after the analysis is completed.

RISKS AND DISCOMFORTS:

The risks and discomfort from participating in this evidence-based project are minimal, and are similar to the risks and discomfort for any child who engages in the physical education class and classroom activities in a school-based environment. Your child will need to mark a chart and perform sensory activities four days a week. To maintain safety and minimize discomfort for your child, the teacher and your child will receive detailed instruction from me on how to perform the movements accurately before using them in the classroom throughout the week. Additionally, objects will be removed from the area prior to performing any movements. Your child can discontinue doing any sensory strategy causing discomfort and can refuse to answer any questions on the survey.

BENEFITS:

Although there is not direct benefit from participating in this capstone project, the indirect benefits may include enhancing your child's ability to identify and use sensory strategies to support their on-task behavior during instruction. This project will improve the investigator's understanding of how sensory-based activities influence the attention and hyperactivity behavior of students who are struggling to focus and complete schoolwork.

ALTERNATIVE PROCEDURES:

Standard procedures for occupational therapy services will be in place for students who chose not to participate. If you deny consent for this project and your child receives occupational therapy services under their individualized education plan, he or she will continue to receive occupational therapy services, with an alternative method to support their identified goals. If you child does not receive occupational therapy services, your alternative procedure will be to refuse participation and obtain educational support from your child's classroom teacher.

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CONFIDENTIALITY:

All information collected from your child during this project will be concealed in a locked area at Amy Spence's office, located at the Ludlow Administrative Building. A number code will be placed on documents for this project, instead of full names, to increase confidentiality.

TERMINATION OF PARTICIPATION:

Your child can withdraw from participating in this project at any time. The decision to withdraw will not have any negative consequences for your child. For example, your child will not be treated any differently by the occupational therapist and will receive the same educational support as any other student in the classroom setting. If your child currently receives occupational therapy services under their individualized education plan (IEP), then the services will continue to be provided; if your child does not receive occupational therapy services, educational support will be offered from the teacher.

COMPENSATION:

Teachers and students will not receive any compensation for participation in the project. There will not be any cost to the either the teacher or the student's family during the project.

INJURY COMPENSATION

Neither Chatham University nor any government or other agency funding this project will provide special services, free care, or compensation for any injuries resulting from this project. I understand that treatment for such injuries will be at my expense and/or paid through my medical plan.

QUESTIONS

All of my questions have been answered to my satisfaction and if I have further questions about this project, I may contact Amy Spence at (937) 542-4645 or Dr. Salls and/or Dr. Provident at (412) 365-1193. If I have any questions about the rights of project participants, I may call the Chairperson of the Chatham University Institutional Review Board at 412-365-1886.

VOLUNTARY PARTICIPATION

I understand that my participation in this project is voluntary, and that refusal to participate will involve no penalty or loss of benefits to me. I am free to withdraw or refuse consent, or to discontinue my participation in this project at any time without penalty or consequence.

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I voluntarily give my consent to participate in this project. I understand that I will be given a copy of this consent form.

Signatures :

_____
Participant's Name (Print)

_____ _____
Participant's Signature Date

I, the undersigned, certify that to the best of my knowledge, the subject signing this consent form has had the project fully and carefully explained by me and have been given an opportunity to ask any questions regarding the nature, risks, and benefits of participation in this project.

Amy Spence
Investigator's Name (Print)

Amy Spence 9-23-14
Investigator's Signature Date

Joyce Salls
Faculty Advisor Name (Print)

Joyce Salls 9-23-14
Faculty Advisor Signature Date

The Chatham University IRB has approved the solicitation of participants for this project until (one year from approval date)

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Appendix I: Student/Child Assent Form

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Child Assent For Evidence Based Capstone Project

TITLE OF PROJECT:

Does a sensory activity program help students who attend an inner city school, remain focused in class?

PRINCIPAL INVESTIGATOR:

Amy Spence, OTR/L

CO INVESTIGATOR(S):

None

INTRODUCTION:

My name is Amy Spence and I am an occupational therapist at River's Edge Montessori. The information written below is to help explain about a project I am doing with your teacher and some of your classmates. The information explains what you will have to do, if you choose to join the project. Please make sure to read this form carefully and feel free to ask me any questions if something is not clear. I can read this form to you if you ask.

THE REASON FOR DOING THE PROJECT

I am doing this project as part of a class I am taking at Chatham University. I also want to show students who have a hard time paying attention, some movement activities and exercises that may help them focus better when doing schoolwork.

WHAT YOU WILL HAVE TO DO IN ORDER FOR US TO DO THIS PROJECT

If you chose to join the project, then you will be required to do the items below:

1. Sign this assent form agreeing to be in the project for six weeks, starting January 2015.
2. You will attend a small group session with a few of your classmates and with me (the occupational therapist) for 15 minutes, one time a week.
3. You will do the sensory activities and movements in class before a school lesson, which will be chosen by your teacher. You will do the movement activities four days a week. These movements are similar to the activities you do in physical education class, such as

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push-ups, jumping patterns- like hopscotch, stretching your body out like an airplane, and arm massages (squeezes up and down your arm).

4. You will mark a chart to tell me if you did the sensory activity or movement that day.
5. You will get to choose sensory activities you like the best and do those movements the last two weeks of the project.
6. At the end of the six weeks, you will participate in a group that will talk about your experience while doing the sensory activities.

You will spend approximately four hours total doing all of the activities in the project.

POSSIBLE DISCOMFORTS AND RISKS

The word risk means something unpleasant may happen. When doing these movements, your risk or chance that something unpleasant may happen is minimal. I will show you exactly how to do the movements so that you remain safe. You may feel a little discomfort initially with a few of the movements if your body is not use to exercising. You do not have to do any activity or movement and you can refuse to answer any questions on the survey.

YOUR RIGHTS, WELFARE AND PRIVACY WILL BE PROTECTED IN THE FOLLOWING MANNER

I will keep all of your personal information and all the information collected for this project confidential. What this means is, no one will know who you are except for me. Your names will not be used in this project. A number code will be used instead of your name, on all of the papers. All of the information I gather from you and your teacher, will be kept in a locked area at my office.

I will write up a report when the project is over and share the information with my professors and classmates at Chatham University. The report will remain at the Chatham University library. No private information about you will be included in the final report.

*****NOTE: PARTICIPATION IS TOTALLY VOLUNTARY AND YOU ARE FREE TO WITHDRAW THIS CONSENT AND TO DISCONTINUE PARTICIPATION IN THIS PROJECT AT ANY TIME.**

I have read this assent form and I understand what will be doing in this project. I understand the

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possible risks, inconveniences and/or discomforts that may be happen. All of my questions have been answered. I choose all by myself to join the project. I understand that I may leave the project at any time.

SIGNATURES

Name of Participant (please print): _____

_____ Participant Signature

_____ Date

_____ Witness Signature

_____ Date

Amy Spence
Investigator's Name (Print):

Amy Spence
Investigator's Signature

9-23-14
Date

Joyce Salls
Faculty Advisor Name (Print)

Joyce Salls
Faculty Advisor Signature

9-23-14
Date

The Chatham University IRB has approved the solicitation of participants for this project until (one year from approval date)

Appendix J: Teacher Training Agenda

I. Greetings and Review of Agenda

II. Purpose of Capstone Project and PIO Question

III. Procedure for the Six-Week Sensory-Based Intervention Program

A. The sensory-based intervention program

1. S'cool Moves strategies:

a) What are they?

b) Strategies target: movement, body awareness and body force, touch, rhythm, and vision for reading

2. How do students and teachers integrate the strategies in the classroom?

3. Safety Measures

B. Six-Week Intervention Phase

1. Small group sessions with the OT practitioner

2. Sensory strategies in the classroom

3. When students will use strategies in class

4. Observation by practitioner

1. Collaboration and Consultation

IV. Last week of Intervention Phase

V. Questions and Answers

Appendix K: Momentary Time Sampling Observation Chart

Assigned Number Code: _____ Teacher Code: ____

Date(s): _________

Behavior Definition: ____

Total Observation Time _________ Length of each interval: _________

Date:	Interval #	Total Times Behavior Occurred:

	1	2	3	4	5	6	7	8	9	10	
O or X											

Date:	Interval #	Total Times Behavior Occurred:

	1	2	3	4	5	6	7	8	9	10	
O or X											

Date:	Interval #	Total Times Behavior Occurred:

	1	2	3	4	5	6	7	8	9	10	
O or X											

Off-task Behavior Codes:
S=Staring off/away from materials and/or people with activity
P= Peer talking
F= Fidgeting
O= Out of seat movements

Modified from: Tieghi-Benet, M. C., Miller, K., Reiners, J., Robinett, B. E. Freeman, R. L., Smith, C. L., Baer, D., Palmer, A. (2003). Encouraging Student Progress (ESP), Student/ team book. Lawrence, KS: University of Kansas.

Appendix L: Weekly Class Assignment Chart

PRE-TESTING

Teacher Code: ___
January: Week of _____

Number Code of Participant:	Total Number of Possible Assignments:	Number Turned In:	Prompting or Cueing:	Comments:

POST-TESTING

February: Week of ____

Number Code of Participant:	Total Number of Possible Assignments:	Number Turned In:	Prompting or Cueing:	Comments:

Appendix M: Daily Tracking Form

Put an X on the activity that you do, under the day you performed it. If you do not do it on a certain day, leave the square for that day blank.

Name of Sensory Strategy/Activity:	Monday	Tuesday	Wednesday	Thursday	Friday
Focus Floor Stretches					
Belly Stretches					
Twister Puzzle					
Push-ups: chair or wall					
Smiley Jumps					
Therabands					
Balance Boards					
Ball or Bean Bag Tasks					
Hand Fidgets					
Hand & Feet Moves					
Crossing Patterns					
Jumping Feet Moves					
Figure 8 Patterns					
Vision Moves					
Frog Pencil Task					
Eye Tracing					
Shape Tracking					

Appendix N: Collaboration Summary Sheet

Six-Week Intervention Phase

Teacher Number Code:	Date:	Collaboration Comments:

Teacher Number Code:	Date:	Collaboration Comments:

Teacher Number Code:	Date:	Collaboration Comments:

Teacher Number Code:	Date:	Collaboration Comments:

Appendix O: Teacher Post-Survey

Assigned Number Code _____
Post-Survey
Thank you for taking the time to participate in this six-week capstone project. This survey is the final activity. Please respond to the following questions.

1. Describe the types of behaviors you observed from students prior to the intervention strategies, that kept them from completing classroom assignments.

2. What strategies have you used with students to target on-task behavior concerns prior to the intervention strategies?

3. Describe the behaviors you observed in students after the intervention strategies were implemented.

4. Discuss your thoughts on the following phrases:

   a) The intervention strategies used by students in the classroom were ….

   b) If I have a student who shows difficulty with on-task behavior, I will …

   c) The collaboration process with the occupational therapist was …

5. Additional comments you would like to share.

Appendix P: Student Post-Intervention Questions

Student Focus Group

Thank you for participating in this six-week capstone project. This group discussion/talk is the final activity. Please answer the following questions honestly.

1. Talk about how you participated in class work before you did the strategies.

2. Talk about how you participated in class work after you did the strategies.

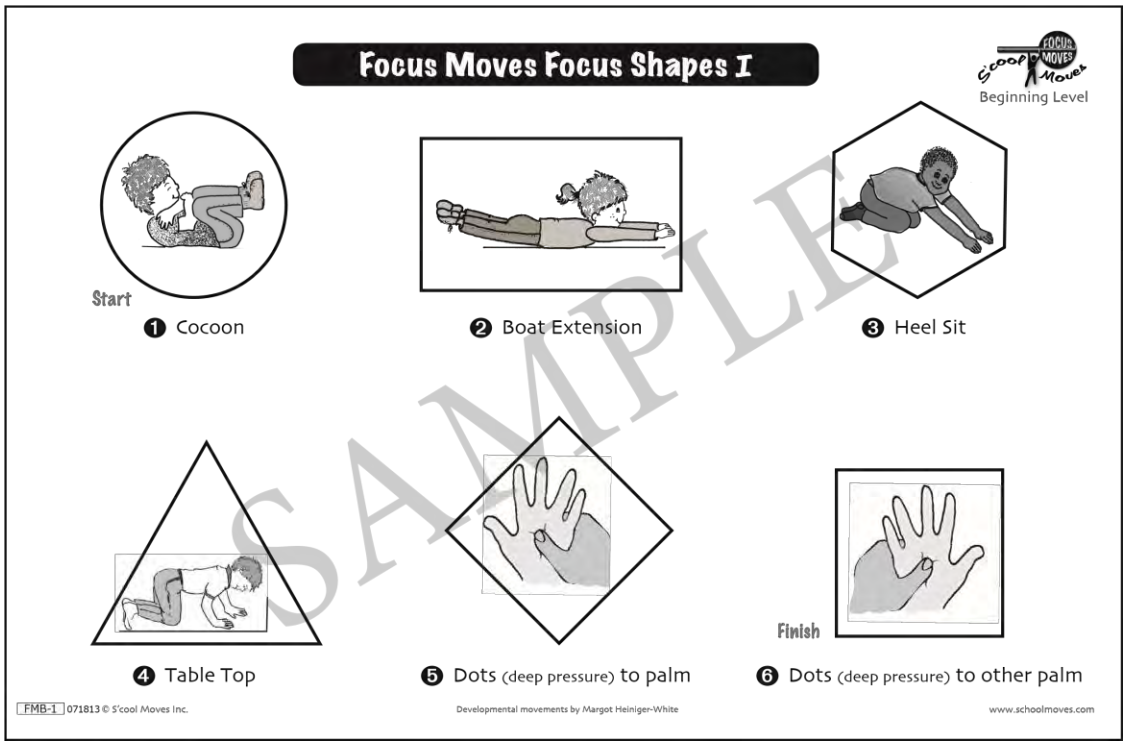
3. How would you finish these sentences.

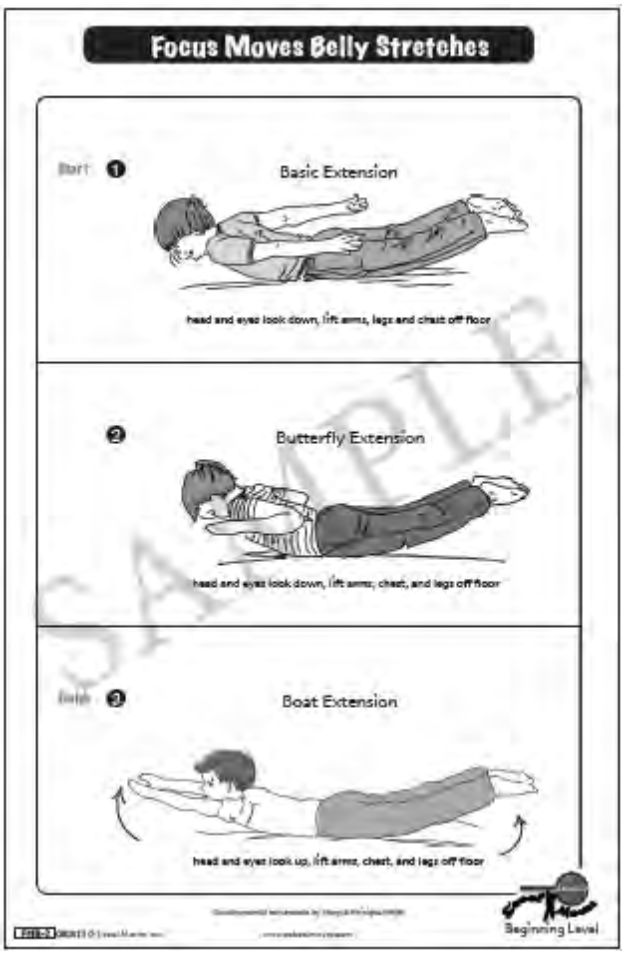
    a) The strategies I used in class were …

    b) The strategies make me feel …

4. Anything else you would like to share with the group?

Appendix Q: S'cool Moves Beginning Level Posters




Focus Moves Belly Stretches
Start ❶
Basic Extension
head and eyes look down, lift arms, legs and chest off floor
❷
Butterfly Extension
head and eyes look down, lift arms, chest, and legs off floor
Finish ❸
Boat Extension
head and eyes look up, lift arms, chest, and legs off floor
Beginning Level
SAMPLE

Power Up! Academic Posters

I Can Calm Myself

Start and end with this poster

I can do Dots.
Use the thumb to press firmly all around the palm of the opposite hand for a count of 10. Take a deep breath before switching hands.

I can do Squeezies.
Firmly squeeze up the forearms, upper arms, and shoulders. Take a deep breath before switching arms.

I can do Listening Ears.
Gently massage and unroll the ears, moving from top to bottom.

I can do Pretzels.
Interlock fingers in front of the chest. Relax shoulders. Cross legs. Place tongue on the roof of the mouth. Hold for one minute. Uncross legs. Take a deep breath.

I can do Heart To Home.
Place one hand over the heart, the other over the belly, and take three deep breaths. Come to a quiet, focused place in the body.

I can do Calming Taps.
Cross arms across chest. Alternate tapping the right shoulder and then left shoulder with a slow, rhythmic beat.

PUP-1 020813 © S'cool Moves Inc.

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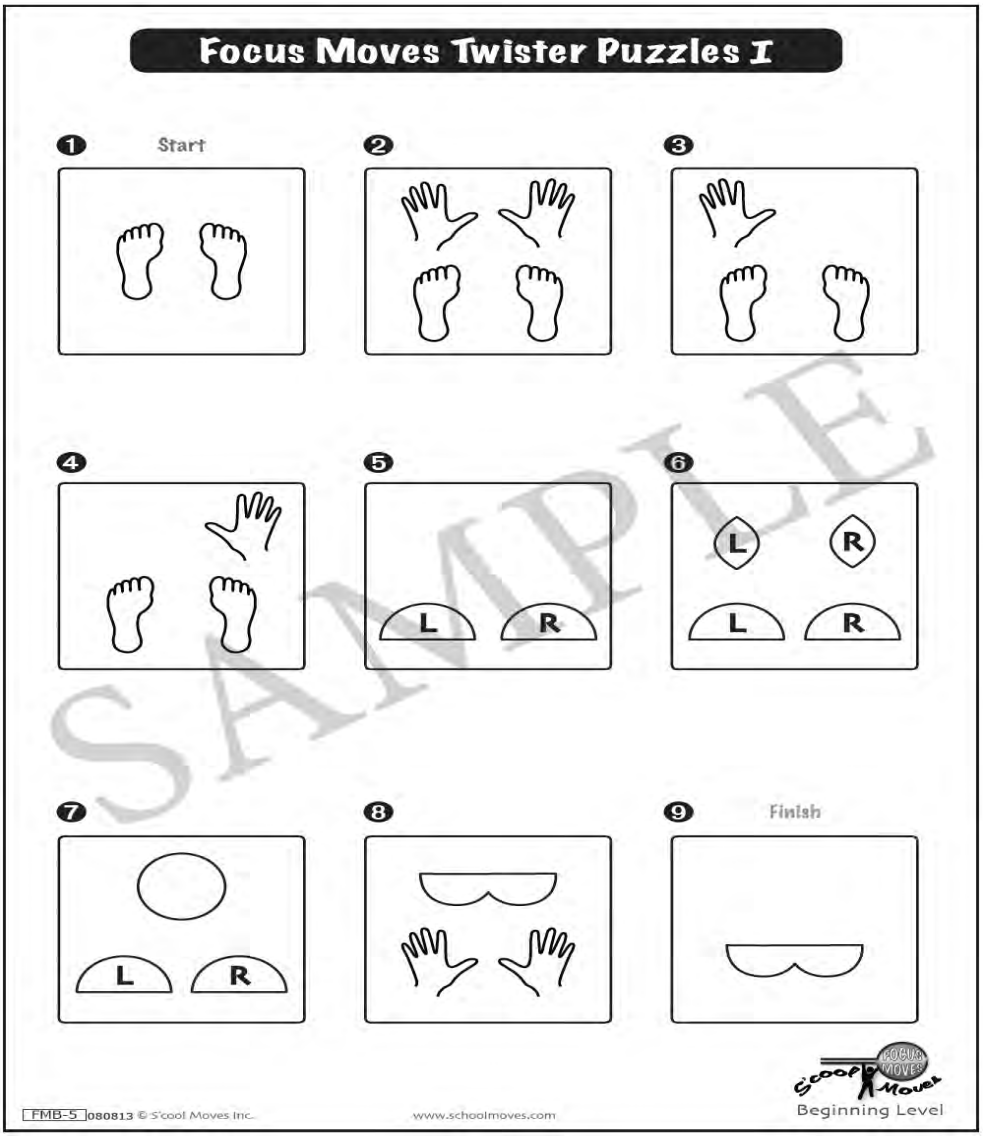
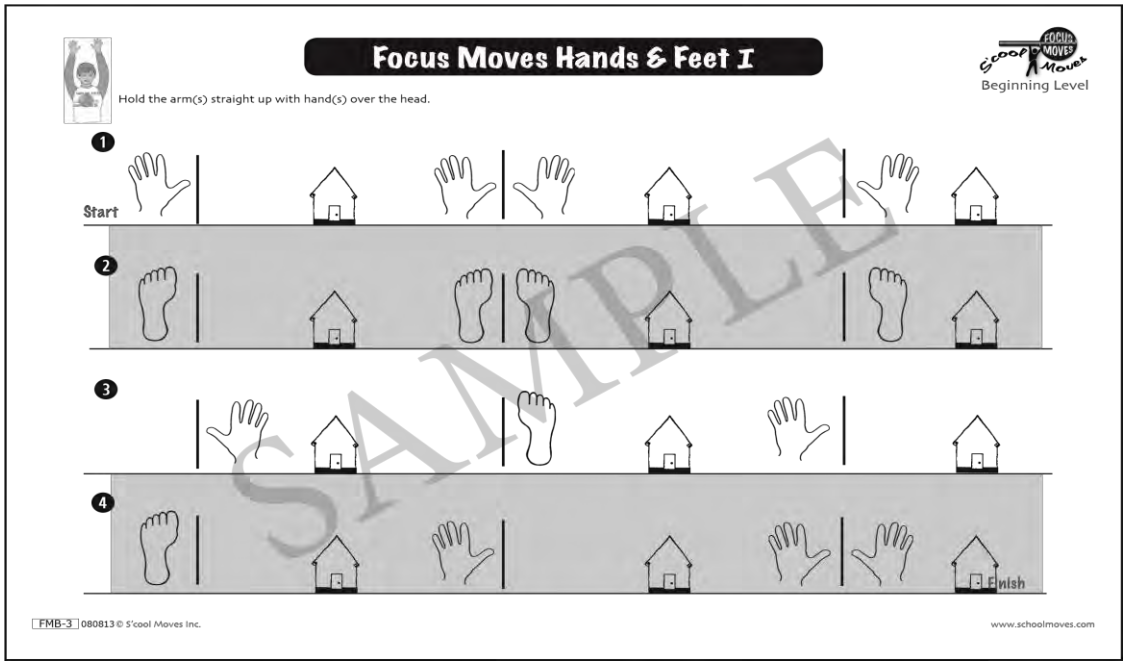
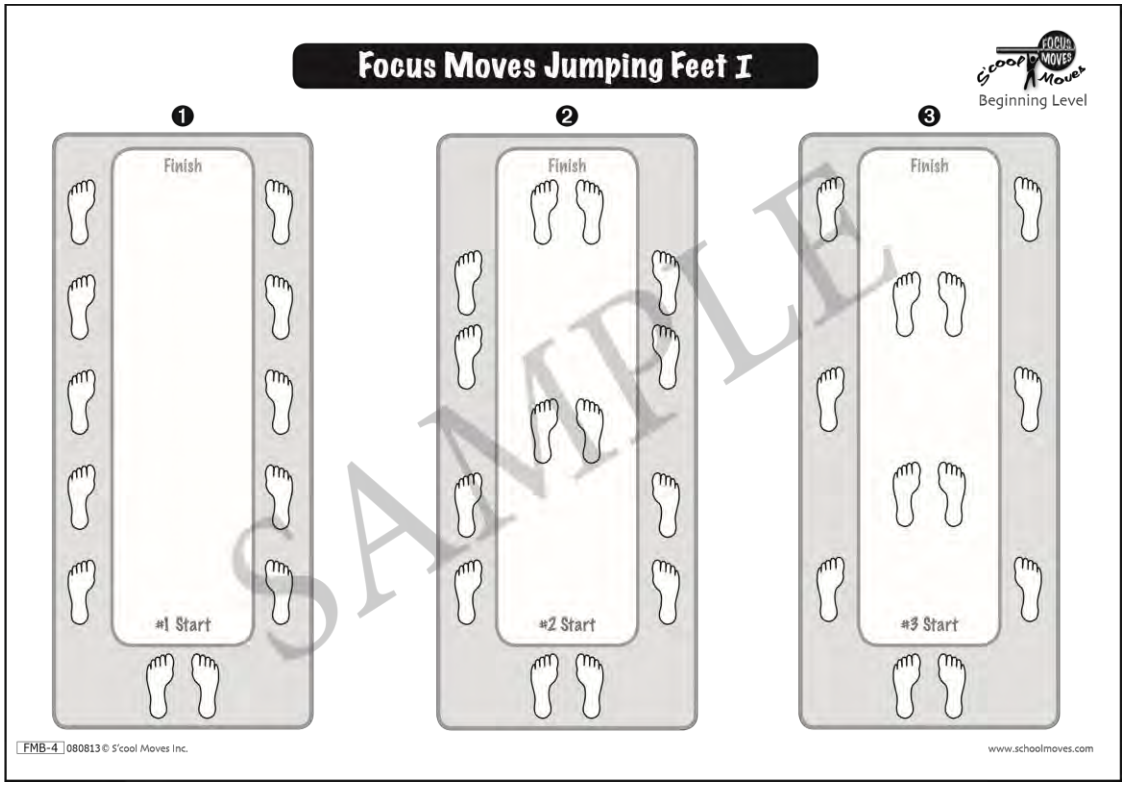
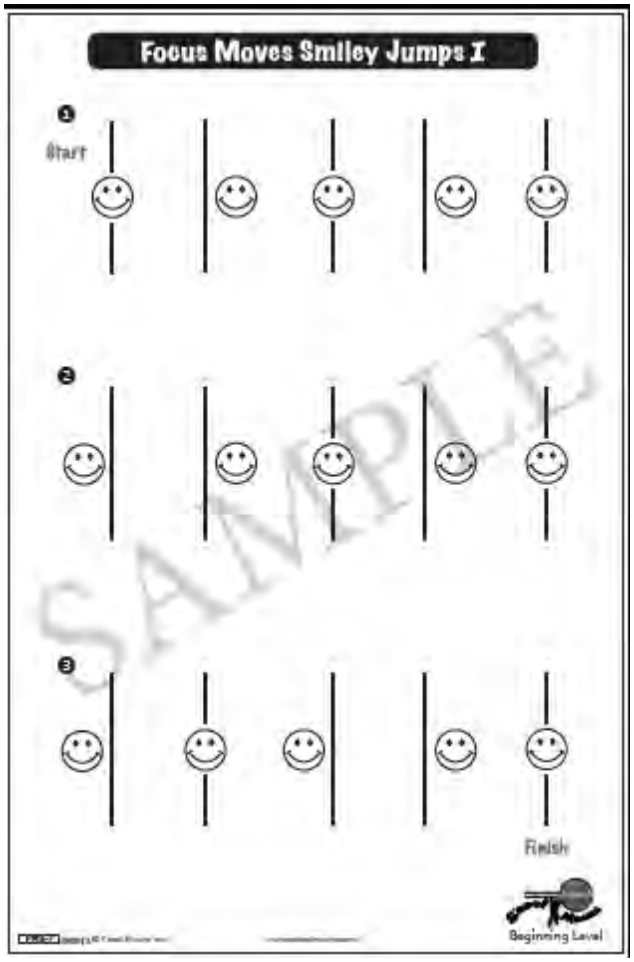
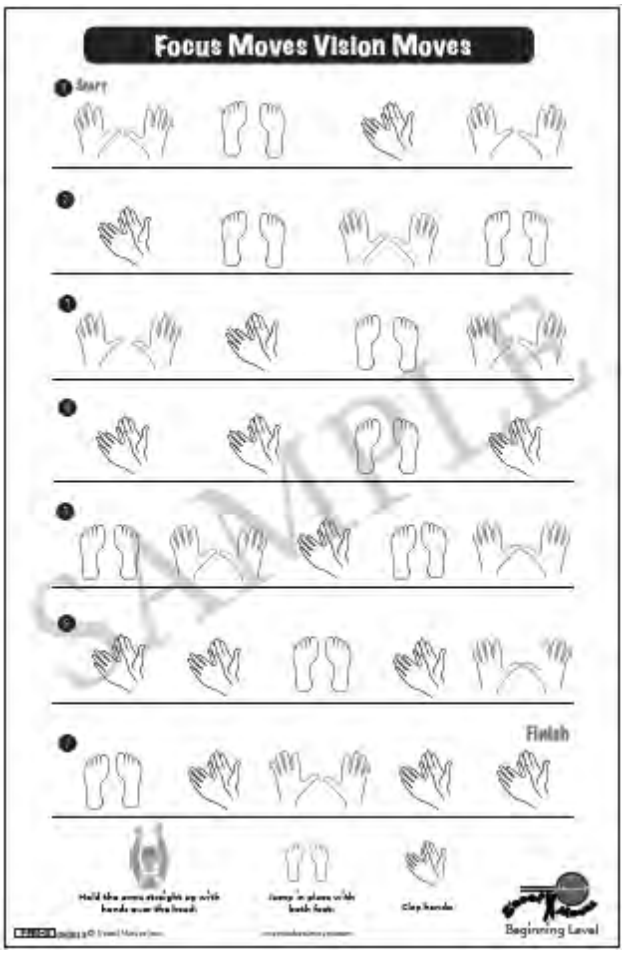
www.schoolmoves.com

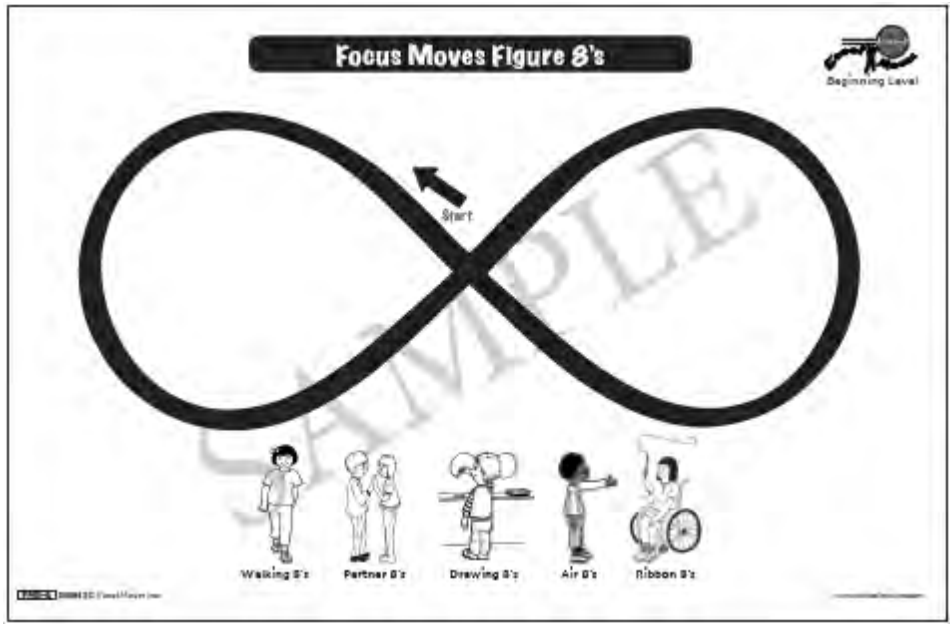

Focus Moves Twister Puzzles I
1 Start
2
3
4
5
L
R
6
L
R
L
R
7
L
R
8
9 Finish
FMB-5 080813 © S'cool Moves Inc.
www.schoolmoves.com
Beginning Level
SAMPLE

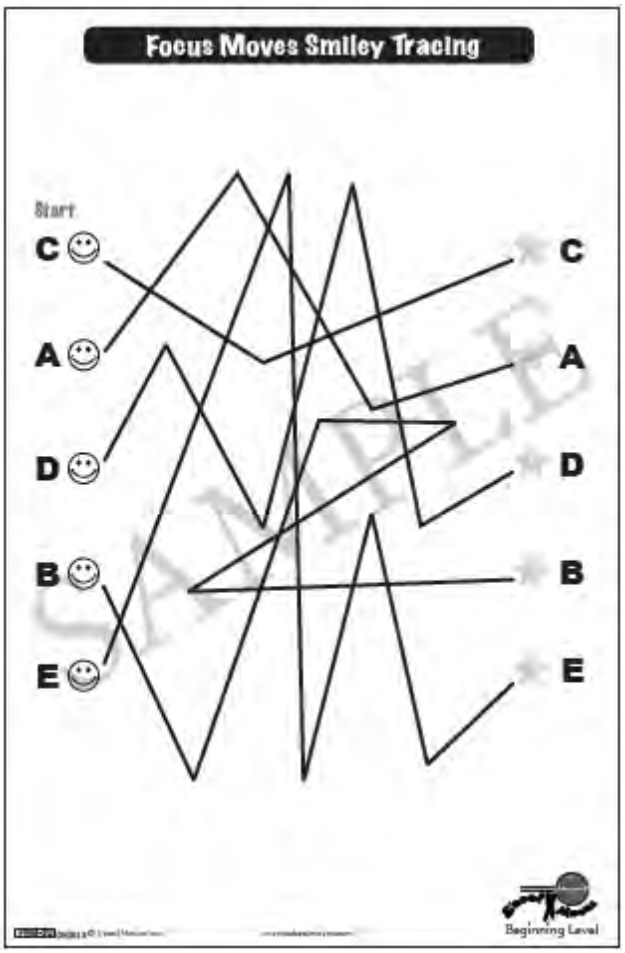

Focus Moves Hands & Feet I
Hold the arm(s) straight up with hand(s) over the head.
Beginning Level
Start
Finish
FMB-3 080813 © S'cool Moves Inc.
www.schoolmoves.com
SAMPLE

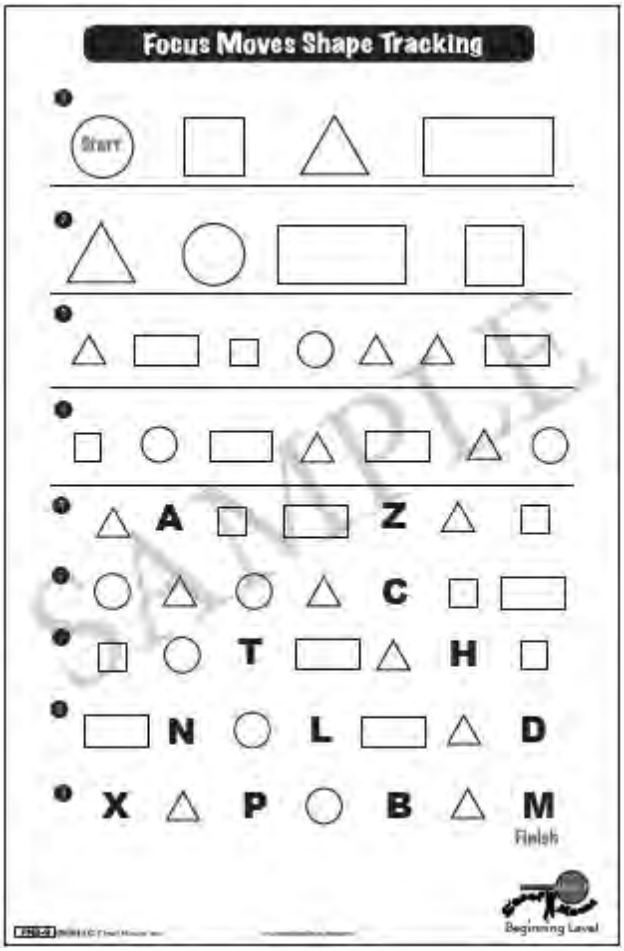

Focus Moves Jumping Feet I
Beginning Level
❶
Finish
#1 Start
❷
Finish
#2 Start
❸
Finish
#3 Start
FMB-4 080813 © S'cool Moves Inc.
www.schoolmoves.com
SAMPLE


Focus Moves Smiley Jumps I
1
Start
2
3
Finish
Beginning Level
SAMPLE

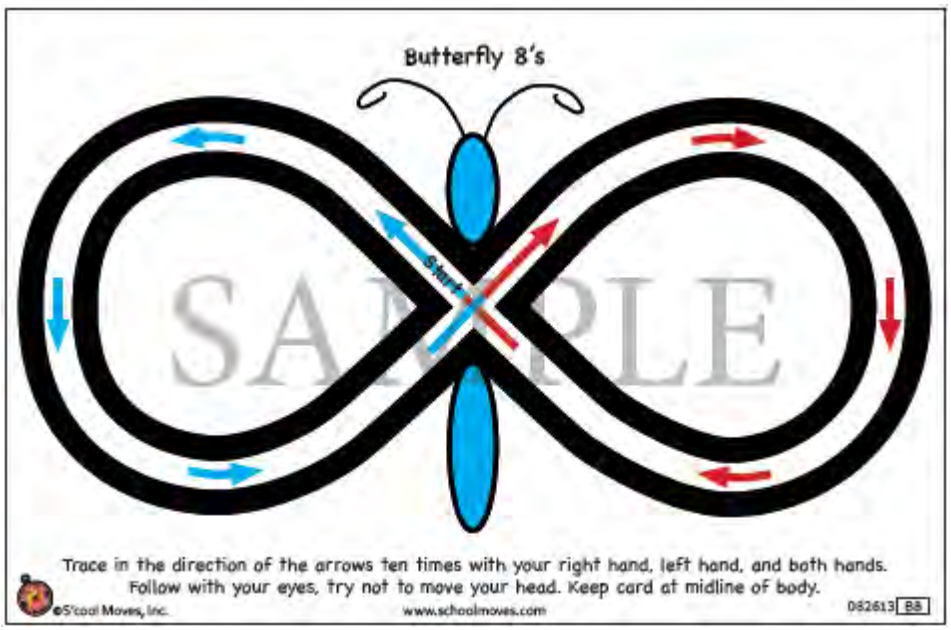

Focus Moves Vision Moves
Start
Finish
Beginning Level
SAMPLE


Focus Moves Figure 8's
Beginning Level
Start
Walking 8's
Partner 8's
Drawing 8's
Air 8's
Ribbon 8's
SAMPLE


Focus Moves Smiley Tracing
Start
C
A
D
B
E
C
A
D
B
E
SAMPLE
Beginning Level


Focus Moves Shape Tracking
Start
A Z
C
T H
N L D
X P B M
Finish
Beginning Level
SAMPLE

Appendix R: Butterfly 8's Card



Appendix S: Focus Desk-Top Strip

Appendix T: Review Questions: A S'cool Moves Game

Student #:	Question 1	+/-	Question 2	+/-	Question 3	+/-	Question 4	+/-
S-1 _____								
S-2 _____								
S-3 _____								
S-4 _____								
S-5 _____								
S-6 _____								
S-7 _____								
S-8 _____								
S-9 _____								
S-10 _____								
S-11 _____								
S-12								

1. What poster(s) help you to use both sides of your body and brain?
2. What posters help you with posture/sitting up at your desk?
3. What posters provide movement to assist with focusing?
4. Show me a movement that assists with calming?
5. Show me a movement that is proprioception/heavy work? To help with focusing in class?
6. Which posters assist with your vision for reading and writing?
7. Which posters assist with using both sides of your brain for reading and writing?
8. Which posters help your eyes to move across a page and go down to the bottom of the page?

Appendix U: Table 5.2 Teacher Survey Responses

Table 5.2 *Teacher survey responses*

Survey Question and Statement	T-11 Response	T-12 Response
Describe the types of behaviors you observed from students prior to the intervention strategies that kept them from completing classroom assignments.	'Lack of focus and attention to task.' 'Incomplete work on work plan and for homework.'	• 'Short attention span, staring off for long periods of time.' • 'Excessive socializing with peers.' • 'Decreased ability to follow class routine.' • 'Very low daily work production compared to peers.'
What strategies have you used with students to target on-task behavior concerns prior to the intervention strategies?	• Timer • Peer tutoring • Eye cues • Modification of work	• Modified work • Change in seating • Peer mentors • Parent conferences • Different class placements • Timers • Re-teaching and 1:1 • Modified work plan
Describe the behaviors you observed in students after the intervention strategies were implemented.	'Increased focus and amount of work for a few students.'	• 'Seen an increase in the number of work tasks finished and an increased awareness of students doing assignments.' • 'Students are eager to do the S'cool Moves strategies.' • 'Students took the strategies seriously.'
Discuss your thoughts on the following phrases: The intervention strategies used by students in the classroom were ….	'Used minimally in class.'	'Helpful to a few and starting to assist other students towards the end in doing more work in class.'
If I have a student who shows difficulty with on-task behavior, I will …	'Started to do more whole class sensory-movement breaks.' 'Will use the S'cool Moves strategies.'	'Will encourage the student to use the S'cool Moves interventions.'
The collaboration process with the occupational therapist was …	'Helpful in terms of information shared on the strategies.' 'Very engaging with students and kept me involved during the entire processes.'	• 'Interesting and informative.' • 'Did not feel pressured or stressed during the project.' • 'Felt OT and I had same goal-to help students become more successful.'

Appendix V: Table 5.3 Student Focus Group Responses

Table 5.3 *Student Focus Group Responses*

Question and Statement	Student Responses
Talk about how you participated in class work after you did the strategies.	• "It was easier" • "Fantastico" • "School was more fun" • "I can use my brain better" • "I felt good after" • "I had no color changes. I am still working on making better choices" • "My hyper-ness has gone down some"
The strategies I used in class were …	• "Good" • "Great at helping to use my brain" • "Helped my vision" • "It made me work a lot more" • "Helped me to calm down to finish more work"
The strategies make me feel …	• "Happy" • "Wonderful" • "Proud" • "I am not sure" • "At first it was fun, then it became easy; I would like to have harder ones" • "Like I was using my brain"
Anything else you want to share? Students listed the sensory strategies they enjoyed performing, which consisted of:	• The sensory materials (beanbags, blending bands, balance boards) • Focus Moves and Developmental Symphony Moves • Ribbon wands with the Figure 8 pattern • Jumping Feet and Smiley Jumps