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Intentional Strategies that Build Self-Regulation in Preschoolers

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Abstract

As academic standards continue to increase, young children are often challenged to attend to structured and teacher-directed educational activities for developmentally inappropriate periods of time. In response, there is an increasing awareness of how academic achievement and self-regulation are affected by difficulties in sensory processing. Traditional interventions for children with Sensory Processing Disorder (SPD) have primarily been conducted by trained Occupational Therapists (OT) in clinical based settings. This capstone investigated research on possible collaborative interventions and environmental supports and adaptations within the classroom setting that would build self-regulation and attention in all preschool children. The studies reviewed indicated support for a number of strategies that included the use of alternative seating, physical activity breaks, yoga, collaboration with OT's, and teacher training. Some strategies, such as weighted vests, therapy balls, and direct occupational therapy, garnered mixed results, but there was significant support for the use of interventions to increase self-regulation and attention in preschoolers, especially those at-risk for attention difficulties.

Keywords: preschool, self-regulation, sensory processing, increased attention

Intentional Strategies that Build Self-Regulation in Preschoolers

As academic standards continue to increase, young children are often challenged to attend to structured and teacher-directed educational activities for developmentally inappropriate periods of time (Bassok, Latham, & Rorem, 2016; Seifert & Metz, 2016; Stipek, 2019; Zubrzycki, 2011). Additionally, attention deficit or sensory processing disorders in preschool age children have often not yet been diagnosed (Seifert & Metz, 2016). Seifert and Metz (2016) noted the theory that attentional capacity in young children can predict later academic achievement. *Attention* can be defined as the process of selectively focusing on relevant stimuli while ignoring other perceivable information. The ability of young children to focus on relevant stimuli is highly dependent upon their ability to process sensory information.

The process in which the brain organizes sensory stimuli according to relevance is known as sensory processing (Pfeiffer, Henry, Miller, & Witherell, 2008). When this process is disorderly, the child will struggle responding to sensory information in a meaningful and consistent way. Kranowitz (2005) identifies this as Sensory Processing Disorder (SPD) and defined it as “the inability to use information received through the senses in order to function smoothly in daily life” (p. 9). A child with a SPD can often present as having attention and social emotional problems. Even children without SPD concerns may experience difficulties with sensory integration at times. This suggests that strategies and interventions aimed at increasing self-regulation should be introduced at a young age to ensure academic and social success. Considering increased academic expectations and possible difficulties in sensory processing, it is imperative that early childhood professionals be equipped with strategies that help build self-regulation and attention in preschoolers.

Understanding sensory systems and sensory processing is important for early childhood professionals in order to develop sensory sensitive environments that promote learning for all students, particularly those who struggle with sensory integration. The senses are separated into seven systems that work collaboratively to take in and channel sensory information from the environment to the brain: tactile, proprioception, vestibular, auditory, vision, taste, and smell (Biel & Peske, 2009; Dunn, 2009; Kranowitz, 2005; Miller, 2006). The tactile, proprioceptive, and vestibular systems are most directly related to children with sensory processing disorder. The tactile system includes touch, deep pressure, vibration, temperature, and pain sensation. Proprioception refers to how the body senses movement and how body parts relate to one another. Vestibular refers to how the body handles movement, determines where our bodies are in relation to space, and motor planning. Sensory processing is how all of these systems work together to provide a reliable picture of the world and one's place in it (Biel & Peske, 2009).

Dr. A. Jean Ayres, a well-known occupational therapist, educational psychologist, and neuroscientist, pioneered the study of sensory integration dysfunction (now known as sensory processing disorder) in the mid 1900s (Miller, 2006). Dr. Ayres's extensive and probing research continues to be the foundation for the study of SPD and has created the path for other well-known occupational therapists such as Lucy Jane Miller, Lindsey Biel, and Winnie Dunn. SPD is often described as an umbrella that covers a variety of neurological disabilities that include different classifications and subtypes (Biel & Peske, 2009; Kranowitz, 2005; Miller, 2006). The three classifications of SPD are sensory modulation disorder, sensory discrimination disorder, and sensory-based motor disorder. Sensory modulation disorder (SMD) includes three subtypes: sensory overresponsivity, sensory underresponsivity, and sensory craving (Biel &

Peske, 2009; Kranowitz, 2005; Miller, 2006). Sensory-based motor disorder includes two subtypes: postural disorder, and dyspraxia (Biel & Peske, 2009; Kranowitz, 2005; Miller, 2006).

Schaaf and Nightlinger (2007) described sensory modulation disorder as “an inability to regulate and organize the degree, intensity, and nature of response to sensory input in a graded and adaptive manner” (p. 239). Children who have problems with sensory modulation may demonstrate sensory overresponsivity, underresponsivity, or sensory craving behaviors. Children who are overresponsive will adamantly avoid sensory stimulation. These children may avoid touching objects and people, intensely object to getting dirty or coming in contact with certain textures, appear anxious about movement or falling, appear uncoordinated, avoid activities that bring strong sensory input to muscles, may appear sensitive to noise, demonstrate poor eye contact, object to certain odors/tastes, or frequently gag when eating (Kranowitz, 2005; Miller, 2006). Children who are underresponsive are unaware of sensory stimulation. These children may be unaware of messy hands/face or not know when they have been touched, drop items often, be unaware of falling, or demonstrate lack of “inner drive” with toys (Kranowitz, 2005; Miller, 2006). Children who are sensory-craving seek out sensory stimulation (Dunn, 2009; Kranowitz, 2005). These children may frequently chew on objects or rummage through toys without purpose, bump into things, crave fast and spinning movements, enjoy bear hugs or being squeezed. These children may also seem to move constantly, fidget, get into upside-down positions, seek vigorous playground activities, or appear as risk-takers (Kranowitz, 2005).

Sensory discrimination disorder is defined by Kranowitz (2005) as the “difficulty in distinguishing one sensation from another, or in understanding what sensation means” (p. 17). Children with sensory discrimination problems may use too much or not enough force upon objects or use utensils and classroom tools inefficiently. These children may have trouble

processing sensation of pain or temperature, become confused when changing directions, appear “klutzy,” have difficulty in positioning limbs, or be unfamiliar with own body (Kranowitz, 2005; Miller, 2006).

Sensory-based motor problems include two subtypes: postural disorder and dyspraxia (Biel & Peske, 2009; Kranowitz, 2005; Miller, 2006). Kranowitz (2005) defined postural disorder as problems with using both sides of the body together, movement patterns, and balance. Children with postural disorder may have overly tense or loose body tone. These children may have difficulty maintaining stable body positions, lose balance easily, or have difficulty using both sides of the body together (Kranowitz, 2005; Miller, 2006). Children with dyspraxia may have problems with motor planning and coordination, difficulty using both eyes together, difficulty tracking moving objects, or chewing and swallowing (Kranowitz, 2005).

The ability to self-regulate has been linked to increased academics and increased social-emotional skills in young children (Blair & Razza, 2007). Considering the high academic expectations being stressed in preschool (Bassok et al., 2016; Stipek, 2019; Zubrzycki, 2011), early childhood professionals need to be equipped with strategies that help build self-regulation and attention in order to prepare preschoolers for formalized schooling. This capstone explored research in pursuit of identifying intentional strategies for early childhood professionals to use to help build self-regulation. The investigation of research led to studies on three main types of strategies: environmental supports and adaptations (Bagatell, Mirigliani, Patterson, Reyes, & Test, 2010; Fedewa & Erwin, 2011; Lin, Lee, Chang, & Hong, 2014; Lin, Min, Chou, & Lin, 2012; Luke, Vail, & Ayres, 2014; Miramontez & Schwartz, 2016; Pfeiffer et al., 2008; Razza, Bergen-Cico, & Raymond, 2015; Reichow, Barton, Sewell, Good, & Wolery, 2010; Schilling & Schwartz, 2004; Schilling, Washington, Billingsley, & Deitz, 2003; Seifert & Metz, 2016;

Umeda & Deitz, 2011; Webster, Wadsworth, & Robinson, 2015), caregiver-focused interventions through collaboration and training (Dan, 2016; Hui, Snider, & Couture, 2016; Silva, Schalock, & Gabrielson, 2011), and therapist-led intervention and therapy (Roberts, King-Thomas, & Boccia, 2007; Schaaf & Nightlinger, 2007; Silva, Schalock, Ayres, Bunse, & Budden, 2009). The purpose of the review of these studies was to begin exploration into the larger research question: How can early childhood professionals use intentional strategies to build self-regulation skills in preschoolers? With the growing awareness of the sensory processing needs of young children, many strategies found were specifically designed for classroom interventions, particularly ones that involved environmental supports and adaptations.

Chapter Two: Review of Literature

Traditionally, occupational therapists have been the primary professionals in the evaluation and treatment of sensory processing disorder (SPD) in children, but increased awareness of sensory processing in the education field has led to the need for more classroom-based strategies and collaborative efforts between educators and therapists. Review of recent research resulted in three main types of interventions: environmental supports and adaptations (Bagatell et al., 2010; Fedewa & Erwin, 2011; Lin et al., 2014; Lin et al., 2012; Luke et al., 2014; Miramontez & Schwartz, 2016; Pfeiffer et al., 2008; Razza et al., 2015; Reichow et al., 2010; Schilling & Schwartz, 2004; Schilling et al., 2003; Seifert & Metz, 2016; Umeda & Deitz, 2011; Webster et al., 2015); caregiver-focused interventions through collaboration and training (Dan, 2016; Hui et al., 2016; Silva et al., 2011); and child-focused, therapist-led interventions related to skill building (Roberts et al., 2007; Schaaf & Nightlinger, 2007; Silva et al., 2009). Considering the significant number of young children now being identified with SPD and sensitivities, it is necessary that early childhood professionals begin exploring strategies to provide sensory sensitive environments that help increase self-regulation, attention, and promote the academic success of preschoolers.

Environmental Supports and Adaptations

Some of the more common strategies for increasing self-regulation are environmental supports and adaptations. The recent increase in awareness of SPD has led to more research on specific types of interventions using environmental supports and adaptations. A review of research explored three main types of environmental supports and adaptations: alternative seating options (therapy cushions and therapy balls), weighted vests or weighted backpacks, and physical activity breaks and yoga. Alternative seating options have become more popular in the

educational setting, and there is preliminary support for the success of these strategies, in addition to positive social validity for these methods (Bagatell et al., 2010; Fedewa & Erwin, 2011; Lin et al., 2012; Pfeiffer et al., 2008; Schilling & Schwartz, 2004; Schilling et al., 2003; Seifert & Metz, 2016).

Alternative Seating Options

Recent studies have supported the use of inflated seating cushions or inflated therapy balls as a positive intervention strategy to increase self-regulation and attention (Bagatell et al., 2010; Fedewa & Erwin, 2011; Lin et al., 2012; Pfeiffer et al., 2008; Schilling & Schwartz, 2004; Schilling et al., 2003; Seifert & Metz, 2016). The use of alternative seating has been utilized more commonly in elementary schools, but review of research revealed some studies that did involve preschool students (Lin et al., 2012; Schilling & Schwartz, 2004; Seifert & Metz, 2016). The studies by Seifert and Metz (2016) and Pfeiffer et al. (2008) investigated the particular use of therapeutic seating cushions at the elementary and preschool level. The study by Lin et al. (2012) also explored the effectiveness of therapy cushions on attention and self-regulation in preschoolers. Additionally, Lin et al. (2012) explored other sensory strategies to determine differences in effectiveness.

Therapy cushions.

Pfeiffer et al. (2008) used a pretest-posttest experimental design with random assignment to investigate the effectiveness of an alternative seating system, the Disc 'O' Sit cushion, on improving attention in 61 second grade students identified as having difficulties with attention. The participants in the study were divided among six different elementary schools. The authors hypothesize that by providing proprioceptive and vestibular input through the use of the cushion, participants would increase attention to task. The Behavioral Rating Inventory of Executive

Function (BRIEF) was used as both pretest and posttest assessment for both the control and treatment groups. The treatment group consisted of 29 students (23 boys and 6 girls) who used the cushion for two hours a day for two weeks. The control group consisted of 32 students (22 boys and 10 girls) who used the typical seating methods within the classroom.

The results of the study found that there was a significant difference in pretest and posttest scores of the treatment group and suggested that the use of the Disc ‘O’ Sit improved self-regulation. Limitations to the study noted by Pfeiffer et al. (2008) included the use of an observational tool for inclusion in the study, the enthusiasm of the participating teachers, and differences in teaching styles. Pfeiffer et al. (2008) noted that while the effect size of the intervention was small to medium, the results were consistent with a number of previous studies involving alternative seating and in turn provided reference for the study by Seifert and Metz (2016). In contrast with the study by Pfeiffer et al. (2008), the study by Seifert and Metz (2016) specifically investigated the impact of inflated seating cushions in preschool classrooms and cited the differences and limitations in previous studies to note the need for more research involving preschoolers with and without identified delays.

The study by Seifert and Metz (2016) was conducted at an independent preschool located on the campus of the University of Toledo. The purpose of this study was to determine if inflated seat cushions had a positive effect on attention in preschool circle time. Random assignment of a convenience sample of 25 students was utilized to separate participants into an intervention group and a control group. The intervention group used usual seating (A) in the first week, followed by a week with inflated seat cushions (B), then repeated the pattern for an additional two weeks (ABAB). The control group used usual seating only for four weeks (AAAA). The authors used a behavior rating scale that included five subscales (affect, attention,

involvement-distractibility, joint attention, and persistence) to assess video-taped circle time. Results of the study indicated that the intervention group demonstrated significant differences in attention and persistence: higher with the use of the inflated cushion. Additionally, Seifert and Metz (2016) found no negative effects of the seating cushion on the subscales of affect, involvement-distractibility, or joint attention. Upon completion of the study, teachers reported that not all students needed the cushions but found it very helpful for some. While the study by Seifert and Metz (2016) presented support for the use of inflated seat cushions on increasing attention, there were noted limitations such as technical complications involving the recording techniques, no demographics on the participants, and a small sample size. Further investigation revealed two previous studies (Lin et al., 2012; Umeda & Deitz, 2011) that specifically explored the effectiveness of sensory processing strategies on preschool and kindergarten age children.

Similar to the study by Pfeiffer et al. (2008), Umeda and Deitz (2011) used the Disc 'O' Sit therapy cushion in a single subject A-B-A-B-C interrupted time series design study with two kindergarten students with ASD to investigate the effectiveness of therapy cushions on in-seat and on-task behaviors. The students were enrolled in an integrated kindergarten classroom at the University of Washington's Experimental Education Unit (EEU) in which 12 of the 18 students received special education services and six of the 18 students were typically developing (Umeda & Deitz, 2011). Each phase of the study (A-baseline, B-intervention, and C-choice) lasted two to three weeks and data was collected via a six-minute digital recording of a math lesson four times a week (Umeda & Deitz, 2011). Two coders were randomly assigned to a participant and rated that participant's recordings using an interval recording method throughout the study (Umeda & Deitz, 2011). Unlike the study by Pfeiffer et al. (2008), results from the study by Umeda and Deitz (2011) did not reveal a positive effect of the therapy cushions on in-seat and

on-task behaviors. Differences in the two studies, that included age of participants and identified disability, may have contributed to the contrasting results. Umeda and Deitz (2011) noted a small sample size as a limitation and possibly exploring other alternative seating options as a direction for future research. Investigation into studies that included multiple alternative seating options revealed one study by Lin et al. (2012).

The study by Lin et al. (2012) also explored the effectiveness of sensory processing strategies with preschoolers but investigated the effects of multiple other interventions in addition to seating cushions. The purpose of this study was to investigate the impact of implementing sensory processing strategies with children with SPD in inclusive classrooms. Lin et al. (2012) explored two hypotheses: activity level is significantly reduced after intervention and that improvements would be significantly greater in the treatment group. According to Lin et al. (2012), a matching-only pretest-posttest control group design with random assignment was used for the study. A total of 36 children participated in the study in which the intervention group received sensory processing strategies for one to two hours per day, five days a week, for eight weeks. Each participant in the study was assigned a sensory strategy that corresponded to the participant's identified sensory problem. Sensory strategies were categorized into four types: 1) vestibular, which was assigned a ball chair, water cushion, or rocking horse; 2) proprioceptive, which was assigned a weighted vest, heavy school bag, sand ball, or T-stool; 3) tactile, which was assigned a tactile wedge, ball, clay, neck tactile ring, bean bag, or bar; and 4) the mixed type (Lin et al., 2012).

Results of the study by Lin et al. (2012) indicated that strategies that involved vestibular perception, proprioceptive perception, and tactile sensory perception reduced activity levels in students with SPD but only had a medium statistical effect, and noted a small sample size as a

limitation. The study by Lin et al. (2012) reported that teachers observed significant improvements in the activity level of the participants, thus lending to the social validity of the study. Strategies with the most noted effect were the sensory clay, heavy school bag, water cushion, therapy ball, and tactile ball (Lin et al., 2012). The use of therapy balls to increase on-task behavior in children has also been explored in studies by Bagatell et al. (2010), Fedewa and Erwin (2011), Schilling and Schwartz (2004), and Schilling et al. (2003).

Therapy balls.

The studies by Schilling et al. (2003) and Fedewa and Erwin (2011) both investigated the effects of therapy balls on children with attention and hyperactivity concerns but focused on fourth and fifth grade students. Fedewa and Erwin (2011) used a single subject A-B continuous time-series design with a group of eight students with attention and hyperactivity concerns. The students all attended the same elementary school located in rural Kentucky and consisted of six boys (four African-American, two White) and two girls (one African-American, one White). Fedewa and Erwin (2011) reported that while all students were either diagnosed with attention deficit hyperactivity disorder (ADHD) or demonstrated characteristics of ADHD, none of students were on medication. The students were observed three times a week for 12 weeks. Data was collected through momentary time sampling and a social validity scale that was completed by teachers upon completion of the observation period (Fedewa & Erwin, 2011).

Results of the study by Fedewa and Erwin (2011) revealed that the use of the therapy ball decreased levels of hyperactivity and increased levels of attention in all of the students. Fedewa and Erwin (2011) report that prior to the intervention, the students spent an average of 45% of time spent in seat and 10% of time on-task and that post intervention averages were approximately 94% of time spent seated on the therapy balls and 80% of time on-task. Teachers

also responded positively on the social validity scale in all but one area. One noted area of concern reported by a teacher was the replacement cost of the therapy ball. Fedewa and Erwin (2011) also noted the cost of the therapy ball as one of the limitations, in addition to a small sample size, length of intervention time, and lack of student report of social acceptability. While the studies by Fedewa and Erwin (2011) and Schilling et al. (2003) supported the use of therapy balls to increase attention, the age of the participants may have contributed to the positive results. Studies by Bagatell et al. (2010) and Schilling and Schwartz (2004) explored the effectiveness of therapy balls on attention and engagement specifically in three to six-year-old students with ASD.

The study by Schilling and Schwartz (2004) used a single subject withdrawal design to determine the effects of therapy balls on engagement and in-seat behavior of four preschool students with ASD. Schilling and Schwartz (2004) reported the results of the study indicated substantial improvements on in-seat behavior and engagement when students used the therapy ball in place of regular seating options, and was referenced as support of alternative seating in a number of later studies (Bagatell et al., 2010; Umeda & Deitz, 2011).

Similar to the study by Schilling and Schwartz (2004), the study by Bagatell et al. (2010) investigated the effect of therapy balls on engagement and in-seat behavior but with six students enrolled in an instructional program (kindergarten – first grade) with moderate to severe ASD. Bagatell et al. (2010) used a single subject A-B-C (A represented the baseline condition of five days, B represented the intervention condition of nine days, and C represented a choice condition of five days) design for the study. Digital recordings consisting of 16 minutes of circle time, over a period of four weeks (19 days), were analyzed by two the researchers until interrater agreement was obtained. Results of the study were variable and unique to each of the six

students but appeared to have a positive effect on one student's in-seat behavior, although no effect was found in the area of engagement in any of the six students (Bagatell et al., 2010).

Bagatell et al. (2010) noted three main limitations that included small sample size, design of study, and length of study.

Recent research has shown more support for alternative seating options as a way to increase attention and engagement in young children (Bagatell et al., 2010; Fedewa & Erwin, 2011; Lin et al., 2012; Pfeiffer et al., 2008; Schilling & Schwartz, 2004; Schilling et al., 2003; Seifert & Metz, 2016). Additionally, alternative seating has become more visible in the education setting thus providing social validity and support for these types of strategies. The study by Lin et al. (2012) noted support for both therapy cushions and therapy balls but also found support for other sensory strategies such as sensory clay and heavy school bags. Further investigation into weighted vests or weighted backpacks found variable results in the effectiveness of these types of strategies on attention, on-task behavior, and engagement (Lin et al., 2014; Reichow et al., 2010).

Weighted Vests and Backpacks

The use of weighted vests and backpacks has been hypothesized to increase attention by providing deep pressure input for young children, and is a common practice as part of sensory integration therapy. Studies by VandenBerg (2001) and Fertel-Daly, Bedell, and Hinojosa (2001) both explored the effects of weighted vests on attention and on-task behavior. The study by VandenBerg (2001) explored effects of weighted vests on the on-task behavior of four students with ADHD ages five to six. Results of the study concluded that the use of weighted vests did in fact increase the on-task behavior of all participants, and three of the four participants asked to use the vest during non-observation times (VandenBerg, 2001). The study

by Fertel-Daly et al. (2001) investigated the effects of weighted vests on attention to task and decreasing self-stimulating behaviors in five preschool age children with pervasive developmental disorder (PDD). Fertel-Daly et al. (2001) found that the use of weighted vests increased attention to task in all participants and decreased self-stimulating behaviors in all but one participant. While the studies by Fertel-Daly et al. (2001) and VandenBerg (2001) were slightly dated, both have been referenced by more recent studies on the effect of weighted vests by Lin et al. (2014) and Reichow et al. (2010).

The study conducted by Lin et al. (2014) examined the effects of weighted vests on attention, impulse control, and on-task behavior on children with ADHD. Lin et al. (2014) used a randomized, two period crossover design that included 110 participants with a mean age of 8.6 years of age. The authors measured three variables: attention, impulse control, and on-task behaviors. The participants were randomly assigned to two groups (A or B) and were administered the Conners' Continuous Performance Test – II (CPT–II) once upon the start of study under one condition and again four weeks later under the alternative condition (Lin et al., 2014). Group A was assigned the weighted vest condition for two weeks then the unweighted vest conditions for two weeks, while Group B was administered the conditions in the reverse order. Digital video was also used to collect information on four types of on-task behaviors: vocalizations, off task, out of seat, and fidgets (Lin et al., 2014).

Results of the study by Lin et al. (2014) showed significant improvement on attention, speed of processing and responding, and consistency of executive management under the weighted vest condition. The weighted vest condition also resulted in significant improvements on off task, out of seat and fidget behaviors (Lin et al., 2014). Lin et al. (2014) noted the inconsistent effects of weighted vests in previous studies and stressed the high validity of the

current study, as it was designed to address the limitations of the previous research. Lin et al. (2014) reported some limitations to the current study such as the absence of investigating delayed effects of the weighted vest, measuring only one variable for impulsivity, and that a no-vest condition had not been considered. The study by Lin et al. (2014) was also conducted in an experimental setting located in a clinical therapy room in contrast to a classroom-based setting such as the study by Reichow et al. (2010).

The study by Reichow et al. (2010) investigated the effects of weighted vests on three preschool age children that attended classes within the university affiliated early childhood center. All of the participants had a medical diagnosis of autism or developmental delay and used a weighted vest during a portion of the school day. Reichow et al. (2010) used an alternating treatment design of three different conditions: weighted vest, vest with no weight, and no vest. Each participant was assigned the conditions randomly for five consecutive school days and contained two days with the weighted vest condition, two days with the unweighted vest condition, and one day with no vest (Reichow et al., 2010).

The vest condition was unknown to the observers in the double-blind placebo trial, and was not revealed until after all data had been collected and coded (Reichow et al., 2010). Each session was digitally recorded during a table-top activity and then analyzed using momentary time sampling and coded by five categories: engagement, nonengagement, stereotypic behavior, problem behavior, and unable to see the child (Reichow et al., 2010). After analyzing the data, Reichow et al. (2010) concluded that the weighted vest condition had no effect on engagement and an increased effect on problem behavior. Some correlation was found between the weighted vest condition and the decrease in stereotypic behavior but did not represent a statistical difference (Reichow et al., 2010). To assess social validity, 23 graduate students completed a

questionnaire after viewing 14 video clips and responded on engagement, stereotypic behavior, and overall impression of weighted vests (Reichow et al., 2010). The questionnaire produced mixed results for each of the participants and found that the graduate students did not rate the weighted vests as an effective strategy for increasing engagement (Reichow et al., 2010). As in the study by Lin et al., (2014), Reichow et al. (2010) also reported a notably large limitation of the study in that it only measured the immediate effect of weighted vests thus leaving out any findings on delayed effects of weighted vests, which had been found in the previous study by Fertel-Daly et al. (2001).

The use of weighted vests has largely been associated with sensory integration therapy and often not seen as a feasible classroom solution for students without identified disabilities. Research into this strategy appeared to have mixed results, but Reichow et al. (2010) noted that the parameters of how and when weighted vests are used should be closely monitored. Investigation into more feasible classroom strategies produced a number of studies on using physical activity breaks to increase attention and self-regulation in young children.

Physical Activity Breaks

The growing awareness of SPD has increased the need for research on specific types of interventions that can be used within the classroom to help students with self-regulation and attention. One feasible and low-cost strategy that has become more popular is the use of physical activity breaks such as dance, calisthenics, outdoor-play, and mindful yoga (Luke et al., 2014; Miramontez & Schwartz, 2016; Razza et al., 2013; Webster et al., 2015). The studies by Luke et al. (2014) and Webster et al. (2015) both investigated how physical activity breaks affected attention and on-task behaviors in preschoolers.

Luke et al. (2014) suggested that using proactive interventions positively impact children's on-task behavior and is a promising alternative to reacting to unwanted behavior. The study by Luke et al. (2014) explored the effects of physical activity breaks on attention and on-task behaviors in five preschool age boys with significant developmental delays. The participants were enrolled in a self-contained special education preschool classroom in an urban public elementary school in the southeastern United States (Luke et al., 2014). The participants included one four-year-old Asian American boy, two three-year-old Caucasian boys, one five-year-old African Russian boy, and one four-year-old African American boy who all exhibited off-task and stereotypic behaviors (Luke et al., 2014).

Luke et al. (2014) used a withdrawal design (A-B-A-B) to investigate the effects of 20 minutes of antecedent physical activity on attention and on-task behavior during a 15-minute teacher-led activity on the carpet. On-task behavior included looking at the teacher, keeping hands to self, singing or imitating movements to songs or poems, and sitting with bottoms on cube chairs (Luke et al., 2014). All observations were digitally recorded and reviewed later using momentary time sampling of 15-s intervals to collect data (Luke et al., 2014). During the control observation period, each participant was allowed to engage in a self-selected activity that did not include physical activity for 15 minutes, followed by the teacher-led activity (Luke et al., 2014). During the intervention observation period, each participant was engaged in a physical activity outdoors for 20 minutes followed by the teacher-led activity (Luke et al., 2014). No participant was allowed to sit down or stand still for more than five seconds during the 20-minute activity, and data was collected for 20 sessions over a 12-week period (Luke et al., 2014).

Results of the study by Luke et al. (2014) found that engaging in physical activity immediately before a teacher-led activity led to an increase in on-task behavior and attention in

all participants during the activity. Three other professionals working in the same school, who were blind to the purpose of the study, conducted observations prior to the implementation of the physical activity and after (Luke et al., 2014). All three observers acknowledged that the group of participants appeared to be more on-task after the physical activity break, thus providing social validity for the study (Luke et al., 2014). Luke et al. (2014) reported that three main limitations to the study: no quantifiable measure was used to determine the intensity of the physical activity, observation method may have been subject to bias or interpretation, and that the observation did not provide information on the duration of the intervention effects.

Further support of physical activity breaks as a strategy to increase attention and self-regulation in preschoolers was found in the study by Webster et al. (2015). The study by Webster et al. (2015) used a much larger sample size and consisted of 118 preschool students from one Head Start center in the southeastern United States, and not only investigated the effects of activity breaks on attention and on-task behavior, but also physical activity participation. Webster et al. (2015) used Actical accelerometers, worn by all preschoolers throughout the day, for four consecutive days, to measure physical activity. Webster et al. (2015) used a modified version of momentary time sampling of 10-s intervals to measure time on-task. Each participant was observed for four minutes prior to the activity break and for four minutes after the activity break (Webster et al., 2015). Each teacher was provided training and two routines to ensure all breaks were similar during the four days of the study: implementation of two days with physical activity breaks and two days of no intervention (Webster et al., 2015). Each activity break consisted of moderate-to-vigorous physical activities (MVPA) such as marching, bunny hops, scissor kicks, and lunges (Webster et al., 2015).

Webster et al. (2015) found that students spent significantly more time engaged in MVPA on days in which the intervention was administered. Additionally, the ten-minute activity break accounted for more than one third of the students MVPA throughout the whole day (Webster et al., 2015). Results of the study by Webster et al. (2015) found significant effects of physical activity breaks on the on-task behavior of students most at-risk for attention and self-regulatory concerns. Webster et al. (2015) acknowledged the interventions were not evaluated long term, and the limited observations were the main limitation to the study. Further investigation into the effects of physical activity breaks as a strategy to increase self-regulation and attention revealed additional studies with young children (Miramontez & Schwartz, 2016; Razza et al., 2015).

Miramontez and Schwartz (2016) also investigated the effects of physical activity on attention and on-task behavior, but the physical activity used in the study was conducted for only five minutes and investigated the effect of the activity on journal writing. The study by Miramontez and Schwartz (2016) was conducted in an inclusive full day kindergarten program located at a comprehensive intervention center. Miramontez and Schwartz (2016) used an alternating treatment design that examined the effects of three different adult-directed activities (dance party, yoga, or listening to a story) on the on-task behavior of three kindergarten age children with ASD. The intervention occurred during the last five minutes of the morning circle time and was immediately followed by a journal writing activity (Miramontez & Schwartz, 2016). Conditions were randomly assigned each day with no one condition being selected more than two days in a row for 14 sessions. Data was collected through momentary time sampling in 10-s intervals (Miramontez & Schwartz, 2016).

Results of the study found that on-task behaviors during a journal writing activity increased when preceded by a physical activity but contained some variability in the findings

(Miramontez & Schwartz, 2016). While all three participants demonstrated overall increased on-task behaviors after physical activity, one participant demonstrated more significant results than the other participants (Miramontez & Schwartz, 2016). Miramontez and Schwartz (2016) reported that of the 29 students and four participating staff members, all but one chose dance party or yoga as their favorite and most helpful intervention. Additionally, staff found it easy to implement, and reported interest in continuing the use of the interventions after the study (Miramontez & Schwartz, 2016). While the results of the study were in support of physical activity breaks, Miramontez and Schwartz (2016) stated limitations of the study that included a small sample size and length of the intervention period.

In contrast to previous studies (Luke et al., 2014; Miramontez & Schwartz, 2016; Webster et al., 2015), the study by Razza et al. (2015) conducted a yearlong study that evaluated the effectiveness of mindful yoga on self-regulation in preschoolers. Razza et al. (2015) used a quasi-experimental pretest/posttest treatment and control design to investigate three specific facets of self-regulation: attention, effortful control, and executive function. The participants included 29 children from two different preschool classrooms in an urban public elementary school in Syracuse, NY (Razza et al., 2015). Children were not assigned randomly, as one classroom served as the treatment group and the other as the control group. The teacher of the treatment group had completed 200 hours of the YogaKids certificate training program (Razza et al., 2015). The participants in the treatment group received 40 hours of mindful yoga that was incorporated into the curriculum throughout the day, over a period of 25 weeks (Razza et al., 2015). Evaluation of the intervention was assessed through parent questionnaire and child assessments prior to the start of the intervention and again upon completion (Razza et al., 2015).

Results of the study by Razza et al. (2015) found mindful yoga to have significant positive effects on all three facets of self-regulation. Preliminary evidence was also found that indicated the intervention provided even more benefits to children most at-risk for self-regulation dysfunction (Razza et al., 2015). A relative strength of the study was the length of intervention, but Razza et al. (2015) noted limitations that included small sample size, non-random assignment of participants to treatment and control groups, and child assessment measures that included ceiling effects.

Environmental supports and adaptations were found to provide preliminary support as plausible and easy-to-implement strategies to help build self-regulation and attention in preschoolers, but the study by Razza et al. (2015) provided insight into other possible types of interventions. The use of intensive teacher training in the study by Razza et al. (2015) provided new support of caregiver-focused interventions. Environmental supports such as therapy balls, cushions, weighted vests, and replacements have been known to be costly. Considering the support for continued professional development, the one-time cost of teacher/caregiver training presented an effective and less costly strategy to help early childhood professionals build self-regulation and attention in preschoolers.

Caregiver-Focused Interventions

Caregiver-focused interventions have primarily involved occupational therapists working with parents or teachers to facilitate learning opportunities for children in the home or classroom environments (Reynolds et al., 2017). These types of coaching and training approaches have become increasingly more common and available as part of the intervention process. As the awareness of sensory processing has increased, continuing education and professional development on sensory-based strategies have become more accessible for early childhood

professionals. Investigation into research on caregiver-focused interventions found two specific studies that addressed training for early childhood professionals: occupational performance coaching (Hui et al., 2016) and a collaborative intervention program (Dan, 2016).

The study by Hui et al. (2016) explored the effects of occupational performance coaching (OPC) on teacher self-efficacy and satisfaction in classroom management of students with disruptive behaviors. The study used a multiple-case replication design involved 11 regular education elementary school teachers in the Easter Townships School Board in Quebec, Canada (Hui et al., 2016). All participants attended a one-day training on improving attention and self-regulation and eight subsequent follow-up sessions with the researchers (Hui et al., 2016). The objectives of the initial workshop were 1) to understand how sensory processing impacts self-regulation; 2) to understand terminology; 3) to interpret personal self-regulation; 4) to understand how self-regulation effects attention, learning, and behavior; 5) to learn about the Alert Program; and 6) to apply sensorimotor strategies within the classroom (Hui et al., 2016). With the guidance of the researchers, each participant set three to four goals for their classroom, which were addressed at each OPC session (Hui et al., 2016). According to Hui et al. (2016), “each OPC session was structured using specific domains: emotional support, information exchange, and structured problem solving” (p. 118). Hui et al. (2016) stated that the nature of OPC is a two-way street in which participants shared information that is equally important as what the therapists shared in order to meet goals.

Results of the study by Hui et al. (2016) indicated that 32 of the 40 goals set by the participants were attained, and that participants reported improvements in classroom management, perception of performance, and satisfaction. In addition to the initial reported improvements, most participants reported maintained improvements at the 7-week follow-up

(Hui et al., 2016). Participation in study was voluntary, which may have caused a positive bias toward the results, thus noted as a possible limitation by Hui et al. (2016). Additionally, Hui et al. (2016) reported that most participants indicated only moderate behavior issues, thus making it difficult to generalize the results for more severe behaviors. In contrast, the study by Dan (2016) investigated developing self-regulation in students with high levels of impulsive behaviors.

The study by Dan (2016) utilized a mixed method design to investigate the effectiveness of an intervention program that was implemented with three kindergarten age children who demonstrated high levels of impulsive behaviors. Quantitative data revealed the number of students who demonstrated difficulties with self-regulation through teacher completion of the Achenbach Child Behavior Checklist (Dan, 2016). The kindergarten teacher of each of the three students met with the researcher once every three weeks, for three months, to implement the intervention program (Dan, 2016). The intervention program was individualized for each student and consisted of five stages: 1) identifying a concern, 2) establishing mutual goals, 3) co-constructing a plan based on scaffolding and mediated learning that was to be implemented in the classroom, 4) implementation of the intervention, and 5) collecting data to determine achievement of goals (Dan, 2016). Qualitative data collected from teachers throughout the study provided a deeper interpretation of children's difficulties with self-regulation and impulsive behaviors (Dan, 2016). This data also revealed that teachers felt a lack of knowledge or skills needed to work with children with high levels of impulsive behaviors, which in turn led to frustration and feelings of failure (Dan, 2016).

Upon completion of the study, the teachers reported an increase in the children's self-regulation and also acknowledged feeling less frustrated, more confident and knowledgeable, and an overall change in the quality of the life in the classroom (Dan, 2016). The study by Dan

(2016) was seen as unique in that the intervention program empowered and educated the teachers, and was easily applicable within the daily routine and classroom. There were no limitations reported in the study by Dan (2016), but similar to the study by Hue et al. (2016), the voluntary nature of the participants could have caused a positive bias in the results.

Further research into caregiver-focused interventions revealed an additional study by Silva et al. (2011) that focused on parent-delivered qigong massage. Silva et al. (2011) used a randomized control trial design to determine the effectiveness of a dual parent and trainer-delivered qigong sensory training (QST) intervention on measures of autism and self-regulation. The study by Silva et al. (2011) participants were selected from three to six-year old children who had been receiving early intervention services for autism in the Salem and Portland areas in Oregon. Silva et al. (2011) randomly assigned 47 children to treatment and wait-list control groups. Parents of the children in the study attended a three-hour group training on QST and continued to receive individual coaching support from trainers once a week for 30 minutes, for seven weeks (Silva et al., 2011). Silva et al. (2011) described the 15-minute QST protocol as a sequence of 12 patting, shaking, or pressing movements that are modified based on the physical response of the child. Checklists were completed by the teachers (blind to the assignment of groups) of all the participants in the program prior to the study and again upon completion (Silva et al., 2011). Parents were also required to complete checklists pre and post study (Silva et al., 2011). Overall results of study found the program to have a medium effect size on improving measure of autism and a large effect size on self-regulation, but did not indicate any limitations to the study (Silva et al., 2011).

Caregiver-focused interventions have often overlapped with environmental supports and adaptations such as in the study by Razza et al. (2015). It is not uncommon to have received

some type of training or instruction when implementing alternative seating methods (Lin et al., 2012), weighted vests (Lin et al., 2012; Lin et al., 2014), or physical activity breaks (Webster et al., 2015). Additionally, caregiver-focused interventions have often begun with or have been combined with therapist-led interventions, as was the case in Silva et al. (2011). Investigation into therapist-led interventions revealed additional research by Silva et al. (2009) and two other studies involving sensory integration therapy (Roberts et al., 2007; Schaaf & Nightlinger, 2007).

Therapist-Led Interventions and Therapy

Therapist-led intervention has traditionally been practiced by trained occupational therapists in clinical-based settings. Approaches vary but therapy is primarily child focused and aimed at “enhancing sensory processing abilities or eliciting neurological change” (Reynolds et al., 2017, p. 2). Effectiveness of therapist-led interventions have sometimes involved feedback from school professionals, (Roberts et al., 2007; Schaff & Nightlinger, 2007) but have been predominately measured by parent report (Roberts et al., 2007; Schaaf & Nightlinger, 2007; Silva et al., 2009).

In contrast to the study by Silva et al. (2011), Silva et al. (2009) investigated the effects of therapist-administered qigong massage on improving self-regulation and sensory difficulties in children with autism. Silva et al. (2009) used the same study design and process of participant selection as in the study by Silva et al. (2011) previously discussed in caregiver-focused interventions. The 46 children, all under the age of six, included in the study were randomly assigned to QST intervention group or the waitlist control group (Silva et al., 2009). The study by Silva et al. (2009) lasted 5 months and included 20 meetings with families in which one of fifteen QST trainers provided qigong massage to each participant and provided additional training to parents. Data was collected from both parents and teachers of the participants,

through the use of checklists and inventories, on three different occasions: 1) prior to the intervention, 2) upon completion of the last therapy session, and 3) five months after completion of the study (Silva et al., 2009).

Results of the study found that teachers reported significant improvements in social and language abilities and reduction in autistic behaviors in the children who received the intervention (Silva et al., 2009). Silva et al. (2009) stated that parent data confirmed the findings and reported that parents also found the intervention to improve social and communication skills and reduce maladaptive behaviors. While Silva et al. (2009) reported positive effects of qigong massage on self-regulation and autistic behaviors, caution was expressed in generalizing the results. Limitations noted in the study included small sample size and shortened length of intervention period (Silva et al., 2009).

The study by Silva et al. (2009) was unique in that it focused on qigong massage as an intervention, as opposed to direct sensory integration (SI) therapy. SI therapy has been primarily used by occupational therapist with children with difficulties in sensory modulation to increase self-regulation and reduce maladaptive behaviors (Schaaf & Nightlinger, 2007). Further investigation revealed two studies that specifically focused on the use of SI therapy (Roberts et al., 2007; Schaaf & Nightlinger, 2007). Each of the two studies involved a single preschool age child with poor sensory processing, but length of intervention periods varied greatly (Roberts et al., 2007; Schaaf & Nightlinger, 2007). In the study by Schaaf and Nightlinger (2007), the intervention was administered for 11 months, as opposed to the 11-week intervention period utilized in the study by Roberts et al. (2007).

The study by Schaaf and Nightlinger (2007) used a descriptive case study design to evaluate the effectiveness of occupational therapy using the sensory integrative approach (OT-

SI) with a four-year old child with poor sensory processing. Parent interviews, review of previous evaluation reports, and systematic observation of behaviors were used to develop specific goals (Schaaf & Nightlinger, 2007). OT-SI was provided once a week by a trained occupational therapist, and documentation of progress was collected and charted weekly (Schaaf & Nightlinger, 2007). The child involved in the case study demonstrated hyperresponsivity to tactile, oral-sensory, vestibular, and auditory stimuli, so therapy was aimed at remediating sensory hypersensitivities (Schaaf & Nightlinger, 2007).

Data collected revealed that target levels were attained on all five occupational therapy goals upon completion of 10 months of therapy (Schaaf & Nightlinger, 2007). Substantial improvements in the child's sensory processing were noted across settings (school and home), and parents reported an increase in participation in age appropriate activities (Schaaf & Nightlinger, 2007). Due to the case study design, the study could not be generalized, but the researchers indicated that this limitation was offset as it provided a guide for clinical practice and support for the use of OT-SI specifically (Schaaf & Nightlinger, 2007). Schaaf and Nightlinger (2007) also reported additional limitations related to data collection methods and the lack of the use of intervention in multiple settings. Although the results of the study by Schaaf and Nightlinger (2007) were unable to be generalized, further support for the use of OT-SI was found in an additional study by Roberts et al. (2007).

The study by Roberts et al. (2007) was designed to investigate the effects of OT-SI therapy on the self-regulation of a three-year-old boy with difficulties in sensory processing and delayed communication skills. Another goal for the study was to determine if self-regulatory behaviors increased with OT-SI therapy, would the improvements have been seen in multiple settings (Roberts et al., 2007). Roberts et al. (2007) used a prospective longitudinal, single-

subject A-B-A-B design for a period of 11 weeks. The intervention program was administered as follows: A) no treatment for two weeks, B) treatment for five weeks, A) no treatment for two weeks, and B) treatment for two weeks (Roberts, et al., 2007). During the treatment condition, the participant received one-on-one OT-SI for one hour, three times per week, in a clinical setting (Roberts et al., 2007). To evaluate the effectiveness, teachers at the participant's school, who were blind to the nature of the treatment, were asked to complete rating scales of behavioral regulation for a total of 35 days (Roberts et al., 2007). Additionally, to provide validity, the assistant teacher completed the same rating scales for 16 of the 35 same days (Roberts et al., 2007).

Analysis of the data revealed four main behavioral variables: aggression, engagement, mouthing objects, and teacher intensity (Roberts et al., 2007). Results of the data analysis found a significant reduction in mouthing objects, aggressive acts, and intensity of teacher input, in addition to an increase in engagement during the treatment condition (Roberts et al., 2007). Roberts et al. (2007) also reported that the challenging behaviors did not increase during the second non-treatment phase. Roberts et al. (2007) provided a number of reasons that could have contributed to this result: 1) the nature of the therapy was intensive enough to effect the change or 2) that the positive behaviors were further reinforced by care-givers in a sustainable manner. Roberts et al. (2007) also stated that this effect could have been caused by the length of the second no-treatment phase and reported this as a limitation of the study. Similar to the study by Schaaf and Nightlinger (2007), the study by Roberts et al. (2007) noted that due to the single subject design the results of the study were limited by poor generalizability. The studies by Schaaf and Nightlinger (2007) and Roberts et al. (2007) provided preliminary evidence to support the use of OT-SI therapy as a guide for clinical practice and as an effective strategy to

increase self-regulation. Additionally, Roberts et al. (2007) demonstrated how OT-SI therapy, that was administered in a clinical setting, affected the behaviors of the participants in a school setting.

Conclusion

Some studies have reported mixed results (Reichow et al., 2010; Umeda & Deitz, 2011), but review of research has revealed initial support for a variety of environmental supports and adaptations that can be used in the classroom setting to help build self-regulation (Bagatell et al., 2010; Fedewa & Erwin, 2011; Lin et al., 2012; Pfeiffer et al., 2008; Schilling & Schwartz, 2004; Schilling et al., 2003; Seifert & Metz, 2016). Additionally, caregiver-focused intervention has become increasingly more common and has provided support for strategies that include collaboration with occupational therapists and intervention training (Dan, 2016; Hui et al., 2016). Investigation into the research has provided evidence that sensory-sensitive environments can help increase self-regulation, attention, and social and academic success in preschool age children. Early childhood professionals need to be equipped with strategies that help build self-regulation and attention in order to prepare preschoolers for formalized schooling. Further analysis of the research has provided more specific answers on the most effective strategies to build self-regulation.

Chapter Three: Research Summary and Conclusion

Research has suggested that difficulties with self-regulation can affect young children's academic and social success (Blair & Razza, 2007). Additionally, academic demands have continued to increase for preschool age children, and expectations have not always been developmentally appropriate (Bassok et al., 2016; Stipek, 2019; Zubrzycki, 2011). A growing awareness of how sensory processing affects self-regulation has prompted early childhood professionals to be prepared to provide sensory sensitive environments for young children. Review of current research provided preliminary answers to the larger research question: How can early childhood professionals use intentional strategies to build self-regulation skills in preschoolers? The investigation into current research revealed support for strategies that included the use of alternative seating, physical activity breaks, yoga, collaboration with occupational therapists (OT) and teacher training.

Environmental Supports and Adaptations

Recent awareness of how difficulties in sensory processing has affected young children has led early childhood professionals to seek out intentional strategies that help build self-regulation. Research revealed a significant amount of studies involving environmental supports and adaptations such as alternative seating, weighted vests or backpacks, and physical activity breaks. Upon further exploration of the research, while one study found no effect of alternative seating on self-regulation (Umeda & Deitz, 2011), a number of studies found preliminary support for the use of alternative seating options and physical activity breaks (Bagatell et al, 2010; Fedewa & Erwin, 2011; Lin et al., 2012; Luke et al., 2014; Miramontez & Schwartz, 2016; Pfeiffer et al., 2008; Razza et al., 2013; Schilling & Schwartz, 2004; Schilling et al., 2003; Seifert & Metz, 2016; Webster et al., 2015). Research on weighted vests and backpacks revealed

inconclusive results on increasing self-regulation (Fertel-Daly et al., 2001; Lin et al., 2014; Reichow et al., 2010; VandenBerg, 2001).

The studies by Lin et al. (2012), Pfeiffer et al. (2008), and Seifert and Metz (2016) all provided support for the effectiveness of therapy cushions on increasing self-regulation. While the results of the study by Pfeiffer et al. (2008) were overall positive, the participants of the study were second grade students, which thus made the results less generalizable to preschoolers. The study by Lin et al. (2012) also provided some support for the use of therapy cushions but noted that the strategies found most effective were the sensory clay and heavy school bag. In contrast, the studies by Seifert and Metz (2016) indicated strong support for the effectiveness of the use of therapy cushions with preschoolers, both with and without identified disabilities, on attention and persistence. The study by Umeda and Deitz (2011) found the therapy cushion to have no affect on in-seat and off-task behaviors but used only two participants with autism spectrum disorder (ASD).

Research into the use of therapy balls as an effective strategy to build self-regulation revealed mixed results. The studies by Schilling et al. (2003) and Fedewa and Erwin (2011) both found a positive affect of the use of therapy balls on attention, but both studies involved much older students. The study by Schilling and Schwartz (2004) provided some initial support for the effectiveness of therapy balls on attention and on-task behaviors in four preschoolers with ASD, and while not recent it provided reference for the study by Bagatell et al. (2010). Lastly, the study by Bagatell et al. (2010) found only moderate support for the use of a therapy ball on in-seat behavior of only one of the six participants, and found no affect on engagement in any of the six participants. Review of research on alternative seating provided more support for the use of therapy cushions as an intentional strategy to help build self-regulation in preschoolers.

Research into weighted vests or backpacks revealed mixed results. While the studies by VandenBerg (2001) and Fertel-Daly et al. (2001) found a positive affect of weighted vests on attention and on-task behavior, the results were dated and only explored the use of vests on children who had been diagnosed with attention deficit hyperactivity disorder (ADHD) or pervasive developmental disorder (PDD). The study by Reichow et al. (2010) also investigated the effectiveness of weighted vests on self-regulation, but found that the vests had no affect on increasing engagement. The study by Lin et al. (2014) was the only current study that indicated support for the use of weighted vests on increasing self-regulation. As weighted vests or backpacks have primarily been utilized in sensory integrative approach (OT-SI), Reichow et al. (2010) cautioned against the use of weighted vests without consultation with trained occupational therapists.

Research into the use of physical activity breaks on increasing self-regulation revealed all positive results. The studies by Luke et al. (2014) and Webster et al. (2015) investigated the effectiveness of physical activity breaks on attention and on-task behaviors of preschoolers. While the study by Luke et al. (2014) focused on outdoor physical activity, the study by Webster et al. (2015) focused on teacher-led physical activity involving calisthenics, but both found a significant increase on attention and on-task behavior under treatment conditions. The study by Miramontez and Schwartz (2016) explored the effectiveness of physical activity breaks on three kindergarten age students with ASD. Results of the study found an increase in on-task behavior for all students with a particular significant increase in one of the three participants (Miramontez & Schwartz, 2016). Unlike the studies by Luke et al. (2014), Webster et al. (2015), and Miramontez and Schwartz (2016), the study by Razza et al. (2015) specifically investigated the effects of yoga on self-regulation in preschoolers. The yearlong study revealed that the

implementation of mindful yoga had positive effects on self-regulation in preschoolers, particularly for students most at-risk for self-regulation concerns (Razza et al., 2015). Results of the research indicated positive support for the use of physical activity breaks as an easily implemented strategy to increase self-regulation in preschoolers.

Caregiver-Focused Interventions

Caregiver-focused interventions have become more common and accessible for early childhood educators through continued professional development and collaborations with therapists. Review of research revealed the effectiveness of teacher training interventions on increasing self-regulation in young children and in teacher self-efficacy and confidence (Dan, 2016; Hui et al., 2016). Further investigation found additional support for parent-delivered qigong massage on increasing self-regulation (Silva et al., 2011).

The study by Hui et al. (2016) focused on the effectiveness of OPC on teacher self-efficacy and classroom management of students with disruptive behaviors. Results of the study by Hui et al. (2016) supported the use of occupational performance coaching (OPC) to help build self-regulation in elementary school children through teacher training, in addition to improving teachers' perception of performance and satisfaction. Demographics were not provided on the students of the participants in the study by Hui et al. (2016), thus the results of the study were difficult to generalize. In contrast, the study by Dan (2016) explored an intervention program implemented by the teachers of three kindergarten age children who demonstrated high levels of impulsive behaviors. Upon completion of the study, teachers reported an increase in children's self-regulation, in addition to feeling more confident personally and an overall improved quality of life within the classroom (Dan, 2016).

Caregiver-focused interventions have also included studies on parent-implemented strategies. The study by Silva et al. (2011) investigated the effectiveness of parent-delivered qigong massage on characteristics of autism and self-regulation. Parents of children receiving early interventions services for ASD received training on the treatment method and implemented the massage protocol for even weeks (Silva et al., 2011). Silva et al. (2011) indicated that parents and teachers completed checklists and reported positive effects of the intervention program on self-regulation, both at home and at school. While the study resulted in support of caregiver-focused interventions, this particular study is not applicable as a strategy that would be easily implemented by early childhood professionals within the classroom setting. Evidence supports the use of teacher training and collaboration with therapists as an effective and plausible strategy for early childhood professionals to help build self-regulation in preschoolers (Dan, 2016; Hui et al., 2016; Lin et al., 2012; Lin et al., 2014; Razza et al., 2015; Webster et al., 2015).

Therapist-Led Interventions and Therapy

Therapist-led intervention has traditionally been conducted by trained occupational therapist in a clinical-based setting. Review of the research found two studies on the positive effect of OT-SI therapy on self-regulation and sensory processing (Roberts et al., 2007; Schaaf & Nightlinger, 2007). Both of the studies by Roberts et al. (2007) and Schaaf and Nightlinger (2007) involved a single subject design on preschool age children with sensory processing difficulties. Results of both studies were measured in multiple settings (home and school) and OT-SI therapy was found to have positive effects on sensory processing and self-regulation in both settings (Roberts et al., 2007; Schaaf & Nightlinger, 2007). The nature of single subject designs made the results of both studies difficult to generalize but did support the use of OT-SI therapy as a guide for clinical practice.

OT-SI therapy has been seen as an effective treatment for sensory processing dysfunction but further investigation revealed another type of therapist-implemented intervention. The study by Silva et al. (2009) explored the use of therapist-administered qigong massage in children under the age of six who had been receiving early intervention services for ASD. Upon completion of the study, results indicated significant improvements in social and language abilities and reduction in autistic behaviors (Silva et al., 2009). While the evidence supports the use of therapist-led interventions, the nature of clinical-based therapies prevents this from being implemented by early childhood professionals, therefore not a potential strategy for classroom based settings.

Conclusion

While not all studies revealed positive results, review of research supported the use of a number of intentional strategies to help build self-regulation in preschoolers. The use of alternative seating, specifically therapy cushions, found positive affects on preschoolers both with and without disabilities (Lin et al., 2012; Seifert & Metz, 2016). Additionally, significant support was found for the use of physical activity breaks and yoga within the preschool classroom (Luke et al, 2014; Razza et al., 2015; Webster et al., 2015). Further investigation of the research revealed support for caregiver-focused interventions, more specifically, interventions that involved teacher training and collaboration with occupational therapist (Dan, 2016; Hui et al., 2016). This type of collaborative intervention was further supported by intervention training aspects that had been included in studies involving environmental supports and adaptations (Lin et al., 2012; Lin et al., 2014; Razza et al., 2014; Webster et al., 2016). The summary of evidence has provided preliminary support for the use of sensory strategies, and has implied that early childhood professionals become more knowledgeable of intentional strategies

in order to provide more sensory sensitive environments that can help increase self-regulation in preschoolers.

Chapter Four: Discussions and Applications

The research on sensory processing and self-regulation provides some preliminary support for the effectiveness of sensory-based strategies. Although some of the research presents mixed statistical results, social validity, in the form of teacher and therapist approval, supports further research of environmental supports and adaptations that address limitation of previous studies: larger sample size, longer intervention period, longer length of study, and more systematic observation techniques (Fedewa & Erwin, 2011; Lin et al., 2012; Reynolds et al., 2017; Seifert & Metz, 2016). Additionally, there are a number of strategies that garnered overwhelming positive support as effective intentional strategies that early childhood professionals can utilize to help build self-regulation in preschoolers (Luke et al., 2014; Razza et al., 2015; Seifert & Metz, 2016; Webster et al., 2015). One other commonality found in some effective intervention strategies was the aspect of teacher training or collaboration with therapists (Hui et al., 2016; Lin et al., 2012; Lin et al., 2014; Razza et al., 2015; Webster et al., 2015). Environmental supports and adaptations, in addition to caregiver-focused interventions, are becoming increasingly more common thus supporting the necessity for early childhood educators to become more knowledgeable of sensory integration and interventions.

Large group activities, such as circle time, require young children to sit and attend for longer periods of time, and are a main component in many preschool curriculums. The study by Seifert and Metz (2016) provides support for inflated therapy cushions to help preschoolers increase attention and persistence, specifically during large group activities. Additionally, Seifert and Metz (2016) found no negative effect of the therapy cushions on joint attention or distractibility. The study by Lin et al. (2012) further supports the effectiveness of therapy cushions on increasing self-regulation in preschool students with sensory processing disorder

(SPD). The results of both studies imply that the use of therapy cushions can be a viable strategy in increasing attention and self-regulation in preschoolers with and without identified disabilities.

Physical activity breaks are commonly found as a part of preschool curriculums and recent research now supports the use of structured physical activity breaks such as dance, calisthenics, and yoga to help increase self-regulation and attention on young children (Razza et al., 2015; Webster et al., 2015). The studies by Webster et al. (2015) and Razza et al. (2015) provide overwhelming support for the effectiveness of physical activity breaks on increasing attention and on-task behaviors in preschoolers, particularly students at-risk for attention and self-regulatory concerns. The implementation of yoga by Razza et al. (2015) found significant results on increasing self-regulation but the teacher responsible for the implementation of the activity had completed 200 hours of YogaKids training. This specific intervention could present challenges in finding an implementer or training a current staff member, but the results provide support for further investigation into other yoga intervention strategies. In contrast, Webster et al. (2015) provided two structured routines that incorporated marching, bunny hops, scissor kicks, and lunges that were easily implemented by the current teaching staff. The results of the study by Webster et al. (2015) imply that structured physical activity breaks through the use of calisthenics or movement to music is an effective and easy-to-implement strategy to help increase self-regulation in preschoolers.

The successful strategies involving environmental supports and adaptations often include a component of caregiver-focused interventions: collaboration with therapists or researchers (Lin et al., 2012; Razza et al., 2015; Seifert & Metz, 2016; Webster et al., 2015). Interventions may consist of therapy cushions or physical activities breaks but direct training from therapists and researchers is key in the effectiveness of the implementation. The positive results of the study by

Hui et al. (2016) provide additional support for occupational therapy coaching/training but require a specific training program and a significant commitment from participants. Further investigation into other training programs could yield more accessible results. The overall research implies that the collaboration of occupational therapists and early childhood professionals, as a means to provide successful caregiver-focused interventions, can help build self-regulation in preschoolers.

There is preliminary support for alternative seating, physical activity breaks, and caregiver-focused interventions but there are noted limitations to the research. Small sample size and length of intervention period are frequently noted among much of the research (Fedewa & Erwin, 2011; Lin et al., 2012; Reynolds et al., 2017; Seifert & Metz, 2016) and warrant further investigation into studies for longer periods of time and that involve larger preschool populations. The absence of training for particular interventions is also common, thus creating the need for more research involving active collaboration between early childhood professionals and therapists to more effectively implement interventions strategies. With the exception of the study by Seifert and Metz (2016), review of research reveals many studies involving older children or only children with identified disabilities. Research involving the effectiveness of sensory strategies on increasing self-regulation in all preschool children is limited, and reveals a gap in the research. More research that includes preschoolers, with and without identified disabilities, is necessary to provide adequate support for the most effective intentional strategies to help build self-regulation.

Possible Future Research

Noted limitations in the research indicates that further studies are needed that include larger sample sizes and longer length of studies. The study by Webster et al. (2015) was

conducted using 118 children enrolled in one Head Start center. One suggestion for possible future research is accessing children enrolled in multiple Head Start programs to provide for a larger sample size and longer length of study (full academic year). Head Start is a federally funded program and has preschool classrooms nationwide, therefore the participant selection could be conducted on a state or nationwide level. Financial costs should be considered when developing a study with this number of participants. A study involving alternative seating may not be financially possible but the implementation of structured physical activity breaks may be more realistic and less costly. The use of Head Start classrooms also addresses the gap in the research by including preschool students with and without identified disabilities.

Research involving alternative seating can be limited by lack of training on how to use the intervention tool properly and by the lack of knowledge on sensory processing. Children have to be instructed on how to use alternative seating strategies in order to truly determine the effectiveness. A study on the use of alternative seating options, involving active collaboration between occupational therapists and early childhood professionals, would provide opportunities to address both noted limitations. Initial training would be necessary to provide early childhood professionals basic knowledge of sensory processing and exactly how to teach children to use the alternative seating option. Additionally, continued collaboration between early childhood professionals and occupational therapist would be necessary to provide support and instruction throughout the study.

Lastly, future research on intentional strategies to build self-regulation in preschoolers should include investigation into different types of caregiver-focused interventions. The study by Hui et al. (2016) provided initial support for occupational performance coaching but additional research is needed to find other successful collaborative strategies. Accessing state

funded at-risk preschool classrooms, located within school districts, would provide built-in opportunities for professional development and collaboration with occupational therapists. School district early childhood special education programs are also possible avenues in finding study participants or staff collaboration. One commonality found in all options for future research was the importance of participant training on interventions.

Conclusion

The development of self-regulation in young children has proven to be an important component of early childhood curriculum. The ability to self-regulate has been linked to increased academics and increased social-emotional skills (Blair & Razza, 2007). Early childhood professionals are tasked with the challenge of helping build self-regulation and attention in order to prepare preschoolers for formalized schooling. The purpose of this capstone was to begin exploration into the larger research question: How can early childhood professionals use intentional strategies to build self-regulation skills in preschoolers? Often times, early childhood professionals are unaware of how sensory strategies can help increase self-regulation or how to intentionally implement them successfully. Review of the research revealed strong support for sensory strategies using alternative seating, physical activity breaks, and caregiver-focused interventions. Many strategies found were noted to be easily implemented within the classroom curriculum, involved collaboration with occupational therapists, and found that teacher training and enthusiasm often made a significant difference on the effect of the implemented strategies. More importantly, the research revealed that successful sensory strategies made the most impact with children that were considered at-risk for attention difficulties. It is necessary for early childhood professionals to become more knowledgeable of the sensory needs of young children in order to create sensory sensitive environments. The

research further supports the use of sensory strategies, in addition to collaboration between occupational therapist and early childhood professionals, as the key in implementing successful intentional strategies that help build self-regulation in preschoolers.

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