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Exploratory Application of a Sensory Activity Schedule in Head Start Preschool

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A culminating capstone project submitted to the faculty of Dominican University of California in partial fulfillment of the requirements for the degree of Master of Science in Occupational Therapy

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Abstract

Objective: The objective of this research is to determine whether the implementation of sensory activity schedule in a preschool classroom can increase the on-task behaviors of the students.

Methods: Three students were recruited to participate in a quantitative multiple single subject design with qualitative follow-up study. The participants performed sensorimotor activities before circle time and were monitored for frequency of their off-task behavior using a time sampling frequency data collection. Afterwards, the head teacher was interviewed to discuss the experience.

Results: Off-task behavior decreased from baseline on all three children, which supports the efficacy of sensory activity schedule in reducing off-task behavior. Cultural disconnect, classroom dynamics, and scheduling conflict were identified as barriers to successful implementation of sensory activity schedule.

Conclusion: Occupational therapists are encouraged to conduct a needs assessment before starting a research to identify potential barriers. More research is needed to determine the long-term effectiveness of sensory activity schedule in a classroom.

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Introduction

Sensory diets are widely implemented by therapists for children with sensory integration dysfunction (SID) who need daily doses of sensory input to meet their sensory needs. Sensory diets are a set of carefully planned activities that are integrated into a daily routine (Wilbarger, 1995). The goal of a sensory diet, based on sensory integration (SI) principles is to assist a child to maintain regulated behavioral and arousal states (Wilbarger, 2007). Challenges with generating an adaptive response from sensory stimuli may hinder participation in meaningful occupations. Providing appropriate and enhanced sensory input is thought to help children overcome these challenges. To illustrate, a preschool student may perform an activity that targets proprioception receptors in the body to increase alertness during table activities. A sensory diet can be used to support on-task behaviors which is a form of adaptive response. Sensory diets are prescribed activities that are performed in various settings such as homes, community settings, or classrooms and are designed to become a part of a daily routine.

In occupational therapy practice, there is little consensus of how sensory diets are labeled within the profession of occupational therapy (Hunt, Peterson & White, 2017). Hunt et al. (2017) conducted a survey study asking what terms occupational therapists use to describe sensory diet interventions. The result was a variety of terms used across a range of settings. Terminology spanned from sensory strategies to sensory activity plan; still, sensory diet remains the most frequently used. One contributing reason to the lack of consistency in the profession is the term, “diet” in sensory diet. To the general population, the word “diet” connotes food and does not automatically convey the idea of sensory motor activity (Mills et al., 2016).

Besides the lack of consensus on terminology, there is a shortage of evidence supporting the use of sensory diets, especially in the classroom. Currently, there is limited evidence on teacher driven sensory-based intervention on children with sensory processing disorders such as autism spectrum disorder (ASD) and intellectual disability (ID). Also, what remains in question is how to guide teachers effectively in using sensory based-activities as forms of intervention amongst children and the promotion of school activity participation (Mills et al., 2016). This proposed research could provide evidence to contribute to the therapeutic use of sensory diets in occupational therapy. This research study will examine the effects of an implemented sensory activity schedule (SAS) in a Head Start preschool classroom targeting on-task behavior.

Background and Review of Literature

General Principles of Sensory Integration

Sensory integration (SI) begins developing in utero and continues throughout adulthood. The brain processes sensation from the traditional five senses, such as hearing, vision, touch, smell, and taste, but also two additional senses called the vestibular and proprioceptive systems. These collective sensations are integrated into adaptive responses (Ayres, 2005; Biel & Penske, 2009). Adaptive responses occur when sensory information is processed by the nervous system and a person understands and responds to this information correctly.

Successful SI interventions requires environmental exploration, intrinsic motivation, and exposure to a variety of sensory input. SI disorders can be mapped out by four different factors: praxis, discrimination, postural control/vestibular - bilateral integration, and modulation (Ayres, 2005). For instance, dressing involves various sensory processing aspects such as sensory discrimination, sensory modulation, postural adaptation, and/or praxis (Ayres, 2005). Sensory discrimination is the ability to discriminate between different sensory stimuli, such as visual and tactile input which aid in perception. In the context of dressing, putting on a sweater requires tactile and proprioceptive input to determine the correct orientation of the sleeve in relation to the body part. This action cannot solely rely on visual input. Sensory modulation is the ability to produce a sensory response that matches the intensity, nature and valence of the sensory stimuli and to support optimal arousal (Wilbarger & Stackhouse, 1998). As an example, tags on clothing can cause overwhelming sensory input to some individuals. An unmodulated response to stimulation poses difficulties with completing a dressing activity. Postural control is a result of a well-integrated vestibular, proprioception and visual system and is the foundation of organized movement and coordination of both sides of the body for function. As for dressing,

the synchronization of postural control and distal mobility enable a person to reach for an article of clothing. A person having challenges with postural control and bilateral integration may have difficulties integrating the left and right side of the body and sequencing the correct steps to put on a sweater (Ayres, 2005). Also, this can be observed when a person presents difficulties buttoning a jacket, donning on the sleeves on the correct side or body or maintaining an upright posture throughout the activity. Problems with praxis can be described as the inability to conceptualize, plan and execute a purposeful movement (Ayres, 2005). Ineffective sensory processing leads to execution of uncoordinated movement or absence of motor output. A person having difficulties with praxis may get stuck with initiating an action to put on a sweater.

On the other hand, a person with a well-integrated sensory system can modulate sensory input, coordinate movements, and sustain postural control. During the dressing activity, the environment may provide additional sensory input such as lighting, noise, colors, and smells. To seamlessly process these numerous sensory inputs, an individual requires coordination and cooperation with their motor control, postural adaptation, and sensory modulation. An integrated sensory processing system supports the ability to perform activities of daily living (ADL) such as self-care, dressing, and toileting. As for preschool children, an integrated sensory processing system enable them to engage in play, socialize, and self-regulate, which are essential part of school participation (Ayres, 2005).

Sensory Integration Dysfunction (SID)

SID are categorized by sensory processing abilities such as sensory modulation disorder, vestibular-based postural disorder, sensory discrimination disorder, and dyspraxia (Roley, Mailloux, Parham, Schaaf, Lane, & Cermak, 2015). Sensory modulation or sensory responsiveness has been connected to regulatory factors such as affect, arousal, attention, and

activity level. These may cause significant behavioral distinctions that impede with social participation as (cited by Roley et al., 2015). Dyspraxia consists of specific categories such as visuopraxis, somatopraxis, praxis on verbal command, and vestibular-postural-bilateral integration and sequencing. Dyspraxia affects the ability to perform and plan desired actions as well as to coordinate motor and postural control. Patterns of SI dysfunction may affect social participation and participation in activities (Roley et al., 2015).

Sensory integration is on a spectrum from ideal to poor. Early symptoms of poor SI in children are delayed motor milestones, such as rolling and walking (Ayres, 2005). Some children with early symptoms of SI dysfunction are not coordinated when they engage in motor tasks, such as skipping and jumping. One example of early sensory modulation symptoms is when an infant dislikes being held closely or is difficult to soothe. Ben-Sasson et al. (2009) found that child hyperreactivity may negatively impact social adaptive behaviors of school-age children and family life. The main occupation of children is play, and therefore, sensory dysfunction will likely be evident in this domain. For example, children who show narrow play choices or do not engage in appropriate toys illustrate sensory dysfunction due to certain sensory qualities of toys or activities. An early sign of sensory dysfunction is seen in language development since this requires vestibular, hearing, and muscle development (Ayres, 2005). Some children seem to have no sensory dysfunction until they reach higher level academic skills, such as reading. Intervening early is ideal to help children improve their SI before they struggle academically in elementary school and prevent the risk of developing a more severe SID.

Prevalence and Risk Factors Associated with Sensory Integration Dysfunction

SID is a set of atypical behavior that affects a person's ability to respond to sensory stimuli in his or her environment in an adaptive way (Biel & Peske, 2009). As an example, an infant that cries when it is held because it does not like the firm pressure. Such behavior is not adaptive since it may interfere with caregiver bonding experience. Knowledge of the prevalence of SID in the general population and its risk factors are important to meet the needs of people affected by SID at different life stages. This information may be used to highlight the need to screen, intervene, and educate the public on SID (Ahn, Miller, Milberger, & McIntosh, 2004). Sixteen percent of elementary school aged children were reported to have sensory over responsivity (SOR) which is a subcategory of SID (Ben-Sasson et al., 2009). SOR, also known as sensory defensiveness, occurs a when a child has an extreme response to sensory stimuli that is fairly harmless. Due to the significant percentage of elementary school children affected by SID, it is worth further investigating the cause and intervention methods.

Stress, anxiety, low birth weight, prematurity, and lower socioeconomic status influence the development of SID (Ben-Sasson et al., 2009). Women who were exposed to stress during pregnancy, such as anxiety provoking experiences were noted to have babies with difficulties in self-regulation, maintaining attention, and ability to process sensory information (Foster, 2006). Prematurity and low birth weight are associated with heightened risk for developing SID (Ben-Sasson et al., 2009; Goldsmith, Van Hulle, Arneson, Schreiber, and Gernsbacher, 2006). Infants with SID were more likely born to a single parent from a low socioeconomic status (Ben-Sasson et al., 2009; Goldsmith, Van Hulle, Arneson, Schreiber, and Gernsbacher, 2006). Schaaf and Roley (2006) stated that children who live in poverty lack the foundational sensory experiences due to the insufficient exposure and opportunity that affect children's play repertoire and in

social skills. Furthermore, deprivation of sensory experience may affect the development of the child's ability to modulate his or her responses to the environment which creates a foundation for self-regulatory skills related to social development, learning, and mental health (as cited by Wilbarger, Gunnar, Schneider, & Pollak, 2010).

The Effects of Sensory Processing on a Child's Occupations

Social participation. Social participation enhances the child's development of cognitive and motor skills which strengthens their overall social competence. A number of studies examined children with sensory processing disorder (SPD) and their pattern of social participation. Cosbey, Johnston, and Dunn (2010) reported that children from aged 6 to 9 years old with SPD enjoyed activities that were less structured and did not involve a final product. Children with SPD were involved in a variety of skill-based activities such as drawing, singing, and dancing and were typically led by an adult. In comparison, the typically developing children were motivated to engage in play by their peers (Cosbey et al., 2010). They also discovered that children with SPD had a smaller social network of people. Unlike their typical peers, children with SPD were less likely to be involved in team sports (Cosbey et al., 2010). To observe the effects of SPD on engagement in play activity, Benson, Nicka, and Stern (2006) conducted a case study on a six-year-old child with SPD. The child played mostly with familiar items and was reported to have difficulty with social interaction (Benson et al., 2006). Understanding the play pattern of a child with SPD may help facilitate interventions that will optimize the child's social experience and skill development.

School participation. School participation is a key for children to develop social and academic skills. Children with SPD may find school participation disorganizing due to the variety and intensity of sensory inputs inherent to a school environment. SPD behaviors are

commonly observed in people diagnosed with Fragile X (Miller et al., 1999). Baranek et al. (2002) studied 15 school aged boys diagnosed with Fragile X who presented SPD behaviors. They analyzed the children's participation in school activities, play, and self-care. They found that children with aversion to the sensory qualities of toys were more likely to have reduced participation in school activities and less independent in self-care. Also, they were more inclined to spend less time playing and less interested in new toys. As a result, such behavior might limit their chance of exploring and working through occupational challenges. Overall, children with propensity to having SPD did not automatically reflect difficulties in occupation (Baranek et al., 2002). Results from Baranek's study suggest that children are capable of being adaptive given that they are in a well-supported environment and have adequate intellectual capacity (Baranek et al., 2002). This study urges therapists to capitalize on the strengths of the child and provide them with supportive environments.

Sensory Diet

The development of SI theory gave birth to different forms of sensory interventions as treatments to address SID such as sensory-based interventions (SBIs), sensory strategies, and sensory diets (Case-Smith, Weaver, & Fristad, 2015). Each intervention has its purpose and features but can be administered in conjunction with each other. Sensory diets are individualized to the person's sensory needs throughout their daily routine. This allows for individuals to engage in adaptive response. P. Wilbarger (1984) coined the term "sensory diet" to explain how specific sensory experiences can be used to enhance occupational performance in any individual as well as contribute to the alleviation of developmental and sensory processing disruptions. A sensory diet provides engagement in targeted sensory inputs throughout the entire day coinciding with the child's sensory needs. The goal is for the child to maintain regulated behavioral and

arousal states. Experiencing sensory input at specific times daily and repeating it at planned time intervals may have an impact on functional participation in occupations. Intensity, duration, frequency, and rhythmicity of sensory inputs are vital in designing an effective sensory diet (Wilbarger, 2017). Certain sensory inputs such as vestibular and proprioceptive have longer lasting effects compared to auditory and visual input. Certain activities have a modulating effect on the nervous system for a specific time period. Using the appropriate sensory input can help self- regulation and therefore may prevent challenging behaviors, such as self-injurious (SIB) and self-stimulatory behaviors (Sahoo & Senapati, 2014). Above all, sensory diet allows the child to complete activities successfully and improve the child's quality of life (Sahoo & Senapati, 2014).

Sahoo and Senapati (2014) researched the effects of utilizing sensory diets in outdoor play to improve functional behavior in children with attention deficit hyperactivity disorder (ADHD). In a random controlled trial (RCT), children aged 6-12 years were provided a sensory diet through outdoor play along with SI intervention for two months. The sensory diet implemented through outdoor play activities included tactile, proprioceptive, vestibular, visual, auditory, and olfactory input. The results suggest that the sensory diet, which consisted of outdoor play activities paired with SI intervention is effective in developing functional skills for children with ADHD. While sensory diets are intended for an individual for SID, sensory activity schedule (SAS) are interventions that can be used for a group with mixture of SID and typically developing children.

Sensory Activity Schedule (SAS)

Mills et al. (2016) defined SAS as sensory activities that children engage in at a specific time that fits a classroom schedule. SAS is integrated as part of the child's classroom routine and is adult-led. Sensory diet refers to a set of activities prescribed throughout the day that is specific to target a child's ability to self-regulate and modify his or her arousal state (Mills et al., 2016). SAS is similar to sensory diet except that it is applied to a group and adapted for classroom use. By utilizing a group application, SAS addresses a wide range of sensory needs of the children in the class.

Mills, Chapparo, and Hinitt (2016) implemented SAS in an autism-specific school to observe its impact on on-task behavior in children with ASD and ID. Three out of the four students accomplished significant improvements in classroom task performance measured by task analysis (Mills et al., 2016). Results indicate that SAS intervention can improve classroom task completion for children with ASD and ID. This framework may be utilized to lead school-based occupational therapists to improve sensory difficulties related to on-task performance in the classroom and warrants further investigation.

Approaches and Barriers to Implementing SAS

Investing on team collaboration and ongoing training are key components in implementing SAS effectively in classrooms. The semi-structured interview conducted by Mills and Chapparo (2018) lends insights into the challenges that the teachers encountered during the implementation of SAS in a classroom geared for children with autism. Nineteen teachers from North South Wales, Australia, trained by occupational therapist to implement SAS identified their motivation for participating. Mills and Chapparo (2018) found that the teachers desired to acquire additional tools to help their students improve their focus and self-regulate in class. In

addition, teachers were interested in finding evidence to the effectiveness of SAS (Mills & Chapparo, 2018). This information highlights the needs of the teachers and helps enhance future collaboration between the occupational therapist and teachers.

Another key point that emerged from the teacher's report was the lack of time in the day and staffing during the implementation period. Teachers reported that the need for staff was not adjusted to offset the challenges of attending to one student who may be having difficulties with performing SAS, while still addressing the needs of the rest of the class. Besides the added work demands, teachers had difficulty completing documentation, writing a diary and collecting videos (Mills & Chapparo, 2018). The evaluation component is critical to the providing solid evidence to support the effectiveness of SAS. Thus, identifying an efficient approach to gather data is an area that warrants improvement.

Having a professional relationship between the occupational therapist and the teachers prior to the implementation of SAS served as a pillar to the continuation of the program. Each school had a part-time occupational therapist and functioned as a resource to the teachers. Prior to the study, the teachers understood the skills and the function of the occupational therapist, and vice versa. Additionally, an ongoing support from the occupational therapist were available for the teachers throughout the implementation period. For this reason, the teachers viewed their experience as, "it wasn't like someone giving you a piece of paper and saying 'just do it'" (Mills & Chapparo, 2018). A professional relationship founded on recognizing each other's professional value is a backbone of a strong collaborative team approach.

Related Programs

Exercise breaks. The new guidelines for physical activity established by the United States Department of Health and Human services indicate that preschool children 6 years of age and younger should have at least three hours of light, moderate, or vigorous physical activity (Piercy et al., 2018). These guidelines were established in order to enhance the rapid growth and development that takes place at this age. For this reason, it is important to incorporate physical activity within a child's school routine. Exercise break is a program related to sensory diets and SAS which can be incorporated into the classroom schedule and may benefit students who attend schools with limited recess period. Liu, Fedak, and Hamilton (2015) examined the effects of physical activity on stereotypical behaviors of children with ASD. Twenty-three children aged 5 to 11 years participated in 15 minutes of moderate to vigorous activity and were observed for 2 hours before and after. According to the results, there was a significant reduction in stereotypic behaviors of children with ASD. Physical activity is currently accepted as an approach to reduce stereotypical and maladaptive behaviors in children with ASD. Other related programs have been implemented in the classroom using sensory based interventions (SBIs).

Outcomes of Sensory Based Interventions (SBIs) in the Classroom

Sensory based interventions (SBIs). SBIs are implemented to the child to improve behaviors associated with modulation disorders (Case-Smith, Weaver, & Fristad, 2015). SBIs are intended to fit into the child's daily routine may have passive engagement. SBIs that target vestibular and somatosensory systems are thought to promote behavioral regulation. An integral aspect of these techniques is that they are created to influence the child's state of arousal, usually to lower a high arousal state such as self-stimulation behaviors, agitation, and hyperactivity. Examples of SBIs include singing, therapeutic brushing, wearing a weighted vest, massage, and

bouncing on a therapy ball (Case-Smith, Weaver, & Fristad, 2015). These strategies are often applied in the classroom or other settings where staying focused on tasks and calm behavior are required. Adaptive seating can provide a continuous dynamic challenge to posture, engagement of the vestibular and proprioceptive systems and increasing attention and alertness. SBIs have been the subject of very limited research and inconsistent findings (Case-Smith, Weaver & Fristad, 2015). Out of a total of 14 studies that applied SBI, only one study demonstrated a positive effect on children's attention and mixed effects of distractibility (Fertel-Daly et al., 2001). Therefore, SBIs are shown to promote self-regulation and improve behaviors through various sensory inputs.

SBIs in the classroom. Yunus, Liu, Bissett, and Penkala (2015) conducted a systematic review on SBIs for children with behavioral problems. Fourteen studies were reviewed that involved interventions based on tactile, vestibular, or proprioceptive input. Four studies were proprioceptive-based and the targeted behaviors were mostly classroom tasks, such as increasing attention levels, reducing stereotyped and self-stimulatory behaviors, and reducing 'off- task' behaviors (Fertel-Daly et al., 2001; Hodgetts et al., 2001a,b). These studies implemented the use of weight vests for a specific time period. Three single-case studies utilized vestibular-based interventions such as using a therapy ball to improve in-seat behaviors (Bagatell et al,, 2010) and reducing 'off-task' behaviors (Umeda & Deitz, 2011). The third study used horseback riding to reduce behavioral problems (Jenkins & Reed, 2013). Only one study produced positive behavioral results including increased 'in-seat' behaviors (Bagatell et al, 2010). Incorporating proprioceptive stimulation has been reported to improve primarily in-class behaviors, such as difficulties staying seated, off-task behaviors, and inattention issues in the classroom (Fertel-Daly et al., 2011; Hodgetts et al., 2001b). However, only one out of the four studies showed a

decrease in these behaviors (Fertel-Daly et al., 2001) and one study showed improvement in one child (Hodgetts et al., 2011b). Due to lack of positive results and evidence, more research is needed to fill in gaps in the literature targeting behavioral problems in children such as improving on-task behaviors.

Defining On-Task Behavior

A common outcome measure of the effectiveness' of "SBI" or sensory diets in the classroom is on-task behavior. De Haas-Warne (1991) and Vandenberg (2001) defined on-task behavior for preschool age children as completing the activity by observing and touching the necessary materials to complete the activity. Off-task behavior is considered when children are talking to peers about non-related subjects, not looking at the task materials, and getting out of their seat (Grieco, Jowers, Errisuriz, & Bartholomew, 2016). Additionally, Vandenberg (2001) defined off-task behavior as touching or attempting to use items not needed for the task and dropping materials more than once onto the floor. There are several methods to measure on-task behavior, including frequency time sampling and teacher rating scales.

Outcome measurements of on-task behavior. Common methodology for measuring on-task behavior is time-sampling methods and rating scales. De Haas-Warne (1991) defined time-sampling methods as collecting data in a relatively short period without having to be present for the duration of the child's activity or intervention time. This method is relatively easy to train a non-research-oriented professional in the school system. This methodology contains a specific operationalized definition of the target behavior. Built into the operational definition is more specific criteria for on-task and off-task behaviors. There are several time-sampling methods, which are whole interval recording, partial interval recording, and momentary time sampling (Mahar, 2011). Whole interval recording is when the target behavior is exhibited

for the entire duration of the time period. Momentary time sampling is when a target behavior is recorded as happening only at the end of the time period. Partial interval sampling is scored as the target behavior happening at any point in the time period. This last method would be appropriate to our proposed research method as it will be sensitive enough to capture all opportunities of on-task behavior. The problem with the time-sampling method is the potential to underestimate or overestimate the target behavior since there is no opportunity to capture every target behavior (De Haas- Warne, 1991).

Rating scales are less intensive and demand fewer resources from school personnel to implement (Chafouleas, Christ, Riley-Tillman, Briesch & Chanese, 2007). For this reason, they may be more sustainable for long term classroom use. The problem with rating scales is that the data is collected at a much later time than actual observation of the behavior. This means that this method is more of a general impression rather than actual objective data of the target behavior which heavily relies on the rater's memory. Rating scales tend to measure negative behaviors whereas the proposed research is focusing on positive behaviors (Chafouleas, Christ, Riley-Tillman, Briesch & Chanese, 2007). Chafouleas, Riley-Tillman, Sassu, LaFrance, and Patwa (2007) found similar levels of on-task behavior between direct observation (ie. time sampling method) and rating scale from both teacher and outside observer raters. The outside rater had closer results to the direct observation methodology. This could suggest possible teacher bias. Due to the lack of standardized teacher ratings scales for on-task behavior, an original non-standardized teacher rating scale is the preferred method for this research study.

Summary and Conclusion

SAS is a term used to describe planned sensory activities in school to provide a clear description of how the sensory activities will be administered to a group of students. Like sensory diets, SAS are customizable to the student's needs and the classroom's schedule. Many people utilize the concept of sensory diets for multiple reasons. Occupational therapists may refer to this concept as a "sensory diet" while educators may refer to the same idea, but with a different term. Nonetheless, occupational therapists are the appropriate professional to design SAS due to their specialized training and knowledge on SI and its application. Despite the wide use of this concept, there is minimal supporting evidence that SAS are effective. The proposed research may contribute to the existing research about the therapeutic use of SAS in occupational therapy and will examine the effects of an implemented SAS in a Head Start preschool classroom targeting on-task behavior.

Statement of Purpose

Research Rationale and Hypothesis

The purpose of this research is to determine if the implementation of a SAS at a Head Start preschool classroom facilitates increased on-task behavior in the preschoolers. Founded on the principles of SI, SAS aims to enhance overall school performance and participation of preschool children. There is a shortage of evidence on the effectiveness of sensory diets and their application in school programs prompts further study in this area. An added benefit of this research includes the education of teachers on utilizing sensorimotor programs in classroom which can address children's sensory needs. Most importantly, the research will provide more information about SAS to diets, promote awareness, and contribute to evidence-based practice.

A previous study conducted by Mills, Chapparo and Hinitt (2016) provided evidence that the use of SAS among students with autism led to an improvement in on-task behavior. Children from low-income families are more likely to develop sensory issues (Ben-Sasson, Carter, & Briggs-Gowan, 2009). Head Start, a preschool community serving low income families, is an ideal setting to implement SAS because of the high-risk factors of developing SID in this population (Ben-Sasson, Carter, & Briggs-Gowan, 2009). Therefore, the research question is: Does a SAS implemented in a Head Start preschool classroom improve on-task behaviors in preschool children as measured by observation and teacher rating scale?

Theoretical Framework

Sensory integration theory was pioneered by A. Jean Ayres in the 1960's during which she created a theory and framework for understanding SID and its intervention (Ayres, 2005). Her emphasis on vestibular and proprioceptive senses, in addition to the traditional five senses was a breakthrough in fully understanding SI (Ayres, 2005). Sensory integration is a concept that the nervous system integrates the senses from the child's internal and external environment and produces an adaptive response, from utero and throughout a child's development. An adaptive response is when a child effectively takes in sensory information from the environment. The response is relayed to the brain and produces a functional response to the incoming sensory input. Sensory integration is dependent on typical developmental experiences (Ayres, 2005). Sensory integration is foundational to learning and academic success in preschool and beyond.

Sensory integration theory discusses seven senses that come from the environment and are transmitted to the brain for interpretation to produce an adaptive response. Touch is a powerful sensory input that begins from a child's birth throughout their life. This is a primary way for infants and toddlers to learn about the world in the first two years of their life (Ayres, 2005). The tactile system contains both protective and discriminative components. Protective components are systems set in place to protect the body from harm, such as the light touch response from a spider crawling across the skin. Discriminative systems allow the body to determine through touch what an object is via stereognosis. This system is particularly important to sensory systems in the hand and fingers. Proprioceptive input informs the body of position in space. Proprioception is triggered when the joints and muscles in the body are stretched or pulled (Ayres, 2005). Proprioception allows children to move without having to rely on using visual information to make their bodies move. Proprioception based activities can be powerful

for arousal modulation when combined with deep touch such as heavy work activities like pushing a chair. Oral-motor activities provide proprioceptive input to the joints in the jaw. The vestibular sense helps with a child's balance, sense of gravity, and head movements (Ayres, 2005). This allows a child to walk upright and not fall down. In the context of the SAS, the researchers will use the vestibular sense to alert or calm down arousal level. The traditional five senses are not a primary focus of SAS.

The above sensory inputs can be utilized in different intervention methodologies, including Ayres Sensory Integration® (ASI) and sensory based interventions (SBIs). Within the research, there is not a clear definition or language that defines various types of SI intervention. The fidelity measure by Parham et al. (2011) was developed to differentiate ASI from another SI intervention. Parham et al. (2011) developed an ASI fidelity measure to see if individualized SI intervention was adhering to Ayres' original principles. Some key principles of ASI on this fidelity measure are the creation of a therapeutic alliance between child and therapist, helping child maintain proper alertness, maintaining a "just-right" challenge for the child, having the child choose the activity to maintain the child's intrinsic motivation of play, and most importantly providing enhanced sensory opportunities. ASI is provided directly by a trained clinician in the context of a therapeutic relationship. Additionally, setting up the environment for therapeutic use is an important principle to adhere to ASI. The therapist uses varying sensory inputs to improve a child's SI, such as integrating asymmetrical tonic neck reflex (ATNR). The therapist uses different sensory inputs to modulate arousal level of the child during a therapy session (Parham, 2011). Ayres Sensory Integration® (ASI) intervention uses specific sensory inputs to help children improve SI, resulting in more regulated arousal level.

Sensory diets, coined by Patricia Wilbarger (1996), use the principles of ASI to expand the use of sensory inputs to optimize function and development. They can also be used to address sensory modulation issues. A core tenet of sensory diets is the use of sensory inputs that are individualized based on the child's specific needs and his or her daily occupations. The therapist also considers the quality of sensation for the child to be at a calm and alert state (Schaaf & Roley, 2006). Qualities of sensation for the therapist to consider are type, intensity, rate, duration, and frequency of sensory exposure. A therapist designs the sensory diet but is not the one who implements the activities (Wilbarger, 1996).

Sensory activity schedule (SAS) takes the concept of the sensory diet and is applied to a group setting (Mills et al., 2016). In this case, the participating group is a Head Start preschool class. SAS utilizes key SI principles. A key principle of SI is the use of sensory input to modulate arousal level to prepare a child for the ability to learn. Similar to sensory diets, the quality of sensation is considered when choosing an appropriate sensory activity within the preschool classroom that is receiving SAS (Schaaf & Roley, 2006). The chosen sensory activity is based on the analysis of what kind of sensory input is needed, either alerting or calming, in order to prepare the child for sustained attention, sitting appropriately, and focusing on a task. A common preschool example is circle time. There will be a sensory activity that is modulating so that the child may be alert, attentive to the teacher's directions, and sitting calmly during circle time. For example, some children may have a low arousal level prior to circle time and need an alerting activity. Some children may have a high arousal level before circle time and need a calming activity. Although not ASI, SAS carries over the core principles of the use of sensation to affect change on a group level.

Ethical and Legal Considerations

This research study adhered to guidelines for protections of human subjects as mandated by Dominican University of California Institutional Review Board and adhered to the Occupational Therapy Code of Ethics of the American Occupational Therapy Association (AOTA).

The research study was reviewed and approved by Dominican University of California Institutional Review Board for the use of human subjects and is IRB#10669. Written informed consents were given to the agency, teachers, and parents. Once agency granted consent, written informed consents were given to the teachers. Teachers were given the parental consents to the parents. For those parents who granted consent, a verbal assent was given to their children. All participants were given a copy of "Research Participant Bill of Rights".

The Principles and Standards of Conduct outlined by the AOTA code of ethics that apply to this project include beneficence, nonmaleficence, autonomy, justice, veracity, and fidelity will be enforced for professional behavior (AOTA, 2015). All activities in the SAS were age appropriate and child friendly. Care was taken to make sure that children are safe and had a positive experience participating in the activities. Student researchers did their best to accommodate and habituate with preschoolers in their classroom by coming multiple days to the classroom to decrease possible distraction. Student researchers were in the classroom to support the teachers during the activities twice a week, during week one, three, four, and five of the study collecting data. Student researchers were available for the teachers if needed throughout the entire research study. Autonomy is the principle that the client or in this case, the research participants had a choice at any time in the study to not participate and had a right to self-determination. The children and their parent assented or consented to participate.

This research study tackled occupational justice as one of the key ethical considerations by conducting a research study in an underserved community of low-income families (AOTA, 2015). As student members of AOTA, the profession was represented in a dignified manner. The student researchers demonstrated concern for the well-being and safety of all participants, refrained from harmful actions, respected the right to self-determination, consent, and confidentiality, promoted fair treatment, and provided accurate information (AOTA, 2015).

Methods

Research Design

In this small pilot study, a mixed method design was utilized to explore the efficacy of sensory activities in improving on-task behavior (Portney & Watkins, 2009). The quantitative method was a multiple single case subject AB design using a time sampling method to measure on-task behavior frequency. The qualitative method was the follow-up interview with the head teacher. An AB design increases internal validity by utilizing multiple case subjects as their own control condition. Each child experiences both the control and intervention condition which minimizes the intervention being due to subject's individual characteristics or differences. The independent variable was the implementation of the SAS. The dependent variable was the frequency of off-task behavior, which was defined as not handling task materials, focusing, and attending to the task. Each activity had specific criteria for off-task behavior that was tailored to that activity. The researcher created a teacher rating scale that utilized a Likert rating scale for each subject's on-task behavior. The three subjects were observed during the pre-implementation phase where the teachers taught as usual and implementation phase where researchers implemented the SAS.

Participants

Participants were recruited from a Marin Head Start preschool class. To qualify for Head Start, a child's family must meet the federal poverty guidelines and public assistance criteria, the child has an IEP, or the child is in a foster care program (Community Action Marin, n.d.). A significant percent of the families served by Head Start in Marin County were Hispanic whose primary language is Spanish. All children in the targeted preschool classroom, except for one

student, were primarily Spanish speaking. All preschoolers participated in the sensory activities, but three students were targeted as having additional sensory and/or behavioral needs by the head teacher. These three students were the targets for data collection. They were two boys and one girl. The boys were both 5 years old and the girl was 4 years old. The participants were between the ages of 3-5 years old and primarily spoke Spanish. Parents signed the consent forms and children gave verbal assent prior to the child's participation in the SAS.

Procedures to Obtain Consent

The student researchers hosted an information session on Head Start Family Night on the school campus where families were invited to attend. Children's consent forms were given to the parents on Family Night and the researchers responded to inquiries from families and staff. The researchers obtained written consent form the teacher and the teacher aides. A verbal child assent was obtained from all of the children in the preschool classroom on initiation of the intervention, at the start of phase one (baseline) and during phase two of the study (intervention). This was the script read to the children:

"We need your help in doing some activities that help you get ready for school. You will be doing them in class with your teacher and classmates. We want to know if the activities help you in school. Here are some of the activities that you will be doing (pictures will be shown to describe the activities to the children). Sometimes my friends and I will watch you from the back of the class. You do not have to join the activity if you do not want to. What questions do you have for me? Raise your hands if you want to do the activities."

The research study was reviewed and approved by Dominican University of California Institutional Review Board for the use of human subjects IRB# 10669.

Measures and Instruments

Off-task behavior frequency time sampling. This frequency time sampling form was utilized by the student researchers during observations of off-task behavior of the participating children. Frequency time sampling was used to track the frequency of off-task behavior after circle time and before nap time. The form listed the start and ending time for after circle time and before nap time, as well as duration of each off-task behavior. The children were observed for a total of five times across

The definition of on-task and off-task behavior for this research study was created through a review of the literature. Construct validity was controlled by using the most prevalent terms for on-task behaviors that is within the body of literature on preschool children's classroom behavior (Portney & Watkins, 2009). De Haas-Warne (1991) and Vandenberg (2001) defined on-task behavior as by completing the task by touching the necessary materials to complete the activity. The operational definition for off-task behavior was defined as the child is looking away from task materials for a period of 10 seconds or more, not touching any task materials, and child getting up and leaving the instruction area. Each activity had slight variations to the off-task behavior definition depending on what the children were expected to do. For instance, preparing for nap time has different off-task behaviors than circle time. See Appendix A for the off-task behavior data sheet. The use of a time frequency data form that was created by the researchers allowed for the needed customization to increase inter-rater reliability and construct validity of off-task behavior. This allowed all the researchers to consistently record the same amount of frequency data for the same observed off-task behaviors to result in high inter-rater reliability. The researchers achieved reliability by having at least two researchers present to collect data for each data point.

Teacher rating scale. The scale consisted of a series of questions regarding behavior in the classroom. Due to the individualized nature of Head Start preschool classrooms, the researchers determined that a self-created teacher rating scale would fit the needs of the classroom and students supporting construct validity. Teaching staff were asked to rate the children's behavior every time the researchers were present in the classroom. See Appendix B for a copy of the researcher created teacher rating form. Questions were answered on a Likert scale from 0 (never) -10 (always). The teacher rating scale allowed the researchers to get the teacher's insights about the on-task behavior of the child that day.

Intervention: Sensory Activity Schedule

The researchers observed the classroom twice before developing the sensory schedule. The Head Start schedule was analyzed to see when key points for a sensory activity to either provide alerting activity or calming activity to increase on-task behavior. For example, an alerting activity, such as the hokey pokey, is a beneficial activity to get children moving and be more alert prior to circle time. A calming activity, such as a crab walk, would be more beneficial prior to nap time where the child will be engaging in on-task behavior that requires a low arousal level. A sensory activity visual board was created to represent distribution of the sensory activities throughout the day. The board included key times in the preschool schedule that could use a sensory activity to alert or calm the children to prepare for instructional time. There were interchangeable sensory activity icons. The sensory activity icons had a picture symbolizing the activity on the front while the backside had directions on how to do the sensory activity. The icons were in both English and Spanish to accommodate the needs of the teaching staff. See Appendix C for examples of the sensory activity icon descriptions. The icons were divided into calming activities, alerting activities, and proprioception activities. Since proprioception can be

both calming and alerting, it was chosen to have its own category. The sensory activities were designed to be easy to administer and last no longer than five minutes. This allowed sensory activities to be easily incorporated into the daily schedule.

The researchers provided training to the head teacher on how to utilize the sensory activity schedule board in order for them to implement the full SAS during the school week in the absence of the researchers. There were multiple copies of each icons for the teaching staff to cover the entire board without having to remove them daily to create for the next day. The teacher was given a form to record what activities they had done. The teachers were instructed to setup the activity board prior to the beginning of class and then follow the schedule. The sensory activities were intended to be administered before and after circle time and before and after nap, Monday through Friday, for a total of four sensory activities each day. Prior to the targeted instruction, like circle time, the teaching staff were asked to lead the sensory activity as a group. The implementation emphasized that sensory activities should begin once all children had reached the instructional area, typically the circle time carpet.

Procedures and data collection methods. The research study took place at a Head Start preschool classroom with 3 to 5 year old children. Table 1 presents the timeline of procedures and data collection. This study was divided into two phases, pre-implementation and implementation for a total of 5 weeks from April to May 2018. The follow-up interview took place during the fifth week.

Follow-up Interview

A follow-up interview with the head teacher took place following the conclusion of data collection to discuss the experience and to gather feedback. The interview was conducted by two student researchers and was later transcribed and coded to identify recurring themes. Interview

questions can be found in Appendix D. The head teacher will be given a copy of the final research study once completed.

Table 1

Sensory Activity Schedule Research Study Timeline

Pre-Implementation Observe and record data on frequency and duration of the children during activities to gather baseline data. The graduate students may come into the classroom before week 1 to allow kids to become accustomed to their in the classroom.	
Week 1	On-Task Behavior Data Collection (twice during the week for 1-2 hours) Teacher rating Form
Week 2	
Week 3	On- Task Behavior Data Collection (twice during the week for 1-2 hours) Teacher Rating Form Teacher Training
Implementation The intervention phase begins with the teacher leading the sensory activity schedule (SAS). The research students will observe and record data. The teachers will fill out the teacher rating scale for the three subjects at the end of the school day.	
Week 4	First day of implementation - Student researchers present for assistance On- Task Behavior Data Collection (twice during the week for 1-2 hours) Teacher Rating Form
Week 5	Semi-structured interview with the head teacher. Interview transcription and coding

Data management and analysis. Participants' names remained confidential by assigning participant numbers and a master key was stored in a separate locked file. Electronic data was stored in a password protected laptop. Hard copy data was stored in the faculty advisor's locked cabinet. All data was kept confidential. Only the faculty advisors, student researchers, and graduate student assistants had access to the data analysis and abided by

confidentiality protocol. The time sampling data was handwritten on paper hard copy and then stored in faculty's locked cabinet. The time sampling data sheet contained no identifying information that could be tied to the participants. The time sampling data points were frequency data that were tallied per episode of off-task behavior. The researchers defined what is considered off-task behavior and came to a consensus for each activity. For example, for day 1 data (before circle time), the numbers of tallies were totaled, and then were averaged by the number of researchers present. Frequency data was organized into graphs for visual analysis.

The follow-up interview was recorded and immediately transferred to a password protected computer and was deleted off the recording device. The interview was transcribed verbatim and analyzed for themes.

Results

Modification to Procedures

During pre-implementation, off-task behavior was recorded for all three target children four times by three raters during morning circle time. During the implementation phase, the SAS was implemented only one time by the researchers prior to circle time. The researchers facilitated the SAS intervention in lieu of the teachers because the research team concluded that the teacher training was inadequate and therefore there was a strong likelihood that SAS would not be performed as planned. Off-task behavior observations were recorded by two raters for all three children during circle time and after SAS. The originally planned phase 2 of the pre-implementation phase was discontinued. The teacher rating scale forms were completed inconsistently and therefore, were eliminated.

Off-Task Behavior Frequency Time Sampling

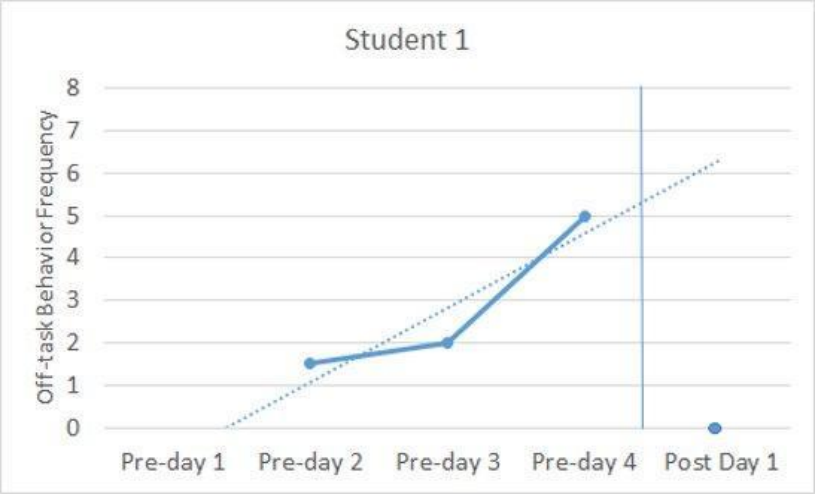
The frequency of off-task behavior was reported for three observation days in the pre-implementation phase and one for the implementation phase. The data from the first day of observation during the pre-implementation phase was eliminated due to an abnormally high frequency of off-task behavior of the students. The children were likely distracted due to the novelty of having the researchers in the classroom. Data for each child is presented in Figures 1, 2 & 3. The averaged frequency of off-task behavior was recorded for each observation day. The data point was the average of two to three raters. Any discrepancies were resolved by discussing and clarifying off-task behaviors after the observation data were collection. A trend line was calculated on the pre-implementation data which allowed the researchers to compare the predicted off-task behavior trend to the implementation SAS data point. The trend line creates a

line passing through as many points as possible with equal amount of points below and above the trend line. The researchers calculated it through use of Microsoft Excel program.

Student 1. The off-task behaviors on pre-implementation days 2, 3, and 4 show increasing frequency of off-task behavior. As shown in Figure 1, the trend line predicts that the off-task behavior would continue to increase in frequency. On day 1 of the implementation phase, student 1 exhibited no off-task behavior which is the opposite of the trend line prediction. Off-task behavior decreased following SAS implementation.

Figure 1

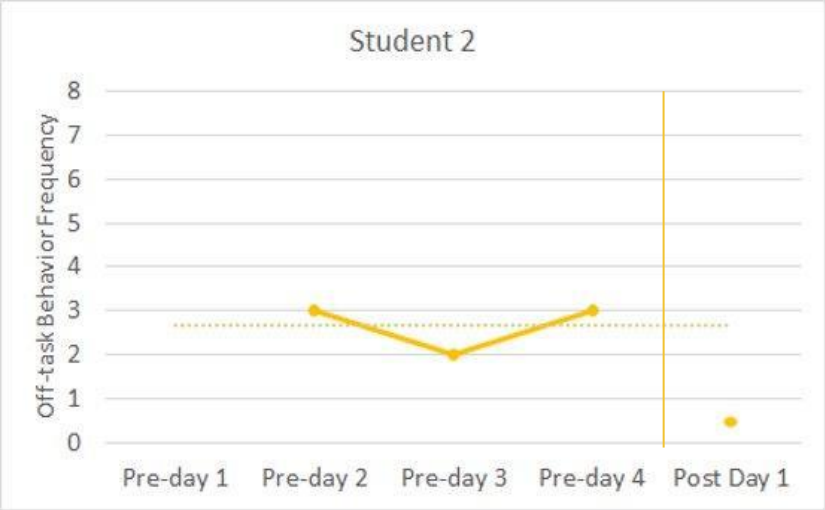
Student 1 Off-Task Behavior Frequency Graph



Student 2. Off-task behavior decreased on pre-implementation days 2 and 3 with exception of pre-implementation day 4. On post-implementation day 1, student 2 exhibited the least off-task behavior, which was lower than the prediction of the trend line, that is off-task behavior frequency would be the same during the pre-implementation phase. Off-task behavior decreased following SAS implementation.

Figure 2

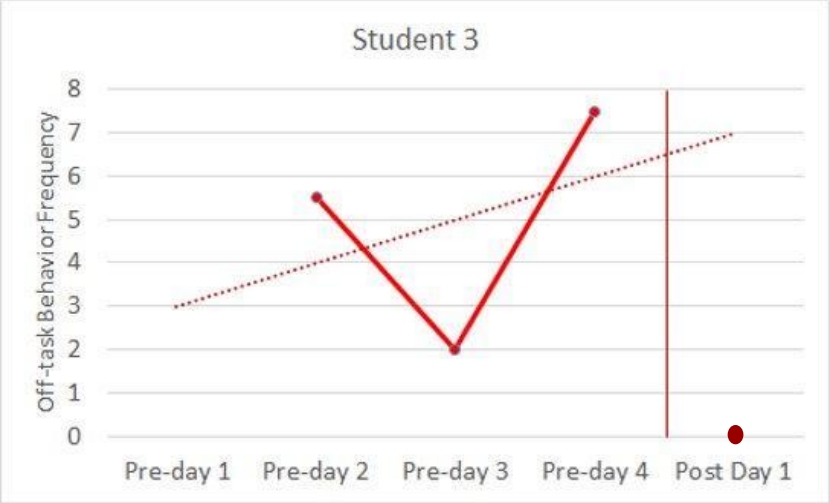
Student 2 Off-Task Behavior Frequency Graph



Student 3. The off-task behavior decreased on pre-implementation days 2 and 3 with exception of pre-implementation day 4. The trend line predicts that without any intervention the expected off-task behavior frequency would continue to increase. On SAS implementation day, student 3 exhibited zero off-task behavior, which is the opposite of the trend line prediction. Off-task behavior decreased following SAS implementation.

Figure 3

Student 3 Off-Task Behavior Frequency Graph



On pre-implementation phase - days 2 and 3, all three students showed a decrease in off-task behaviors. There was a slight increase in off-task behavior from all three students on pre-implementation day 4. According to the observation field notes, all teaching staff were present. The students were near one another while receiving many directions from all three teachers at the same time. All three students exhibited the lowest frequency of off-task behavior, when SAS was implemented.

Follow-up Interview with Head Teacher

Two weeks after the completion of the project, the head teacher participated in a semi-structured interview to obtain feedback and gather information about the strengths and barriers of implementation. Three key themes emerged: program timing, culture, and classroom dynamics. Data for each theme is presented in tables 2, 3, and 4.

Table 2 program duration and timing. Program timing presented as a critical issue for both the Head Start preschool and the researchers. Since the research study began during the

middle of the school year, there was a lack of time to fully implement SAS and to obtain consistent data. Data collection was highly affected due to the limited availability and scheduling conflicts between the preschool and research students. Difficulties in finding mutually available times caused minimal data collection and implementation. The head teacher suggested that beginning the research study during the start of the school year and spending time with teaching staff to build rapport would have been more effective.

Table 2

Results of Qualitative Interview - Program Duration and Timing

Program Duration and Timing	
Sub-themes	Quotes
Head Start Daily and Research Students Schedule	"I mean even like hours of the day and then you could have come in and actually work with my teachers to like give them some ideas and like, you know walk with them just see how implementation was handled and, like if you had tips like that kind of thing. I think timing would have helped with a lot of that."
Head Start School Year Schedule	"I would definitely say that it would have to be at the beginning of the year, just cause to bring in something like that change, you know like the routine something to make it like a well-oiled machine is something hard that we make it work on for halfway through the year everything *chu chu chu*."
	"...and so we got him at the time we started, like Kinder transitions, IEP's, everything was kinda just coming in with, like… the meetings, we had all of this parent stuff going on, and like and then we were also being observed by the federal reviewers and so that didn't go so well."

Table 3 culture and rapport. Differences in culture between the research students and the preschool students and their families affected the research study. Since none of the research students shared the same cultural background, there were difficulties in forming a positive relationship. Additionally, majority of the students and their families only speak Spanish. Due to the language barrier, a slight concern was raised from the families questioning the purpose for the research study. National policies towards immigrants became more stringent during the start

of the study. The shift in the political climate may have accentuated the barriers for the families. The head teacher suggested that addressing the cultural aspect with the researchers would have been beneficial in building rapport and gaining support from the families.

Table 3

Result of Qualitative Interview - Culture and Rapport

Culture and Rapport	
Sub-themes	Quotes
Students and parents dynamic (Hispanic and ESL)	"..obviously a cultural thing and they gravitate more towards… and this community is really tight knit especially with what is going on with the world right now they are kind of closed off to outsiders so if you come in here and don't speak Spanish then they are like who are these people? You know not all of them are residents so it's immigrant families trying to hide, when there is stuff going on around here none of the kids come to class kinda deal. So it's definitely a cultural aspect that would definitely be beneficial to address it in some sense."
	"The small group that met you. They felt like their kids were being studied or something. They were a little like you know asking a bunch of questions and just curious to what was going on.."

Table 4 Classroom Dynamics. The team dynamic of the teaching staff contributed to the inconsistency of the research study. Since it was the head teacher's first year with the preschool class, he was still building rapport and developing teamwork among the teacher aides who have been working in the classroom for many years. The head teacher expressed that he is still on process of establishing work performance expectations with his teacher aides. As a result, it was a challenge for the head teacher to delegate tasks pertaining to SAS implementation

to the teacher aides. Such work dynamic was a barrier to effective collaboration and the standardization of SAS implementation.

Table 4

Results of Qualitative Interview - Classroom Dynamics

Classroom Dynamics	
Sub-themes	Quotes
Head teacher vs. teacher aides dynamics	"This is my first year with this team so I am not really strict yet with them and I'm doing my first review with them this week, so I didn't want to be like the person that is so like because I just started and they have been like here for multiple years."
	"this was extreme they were kind of just like standoffish, like what is this guy going to do and uhh so I tried not to change anything cause I could tell by their vibe that like you know… but little by little I kinda just started doing things"
Teacher Aides Dynamics	"I've got so much going on it is hard for me to be on top of them and they kind of get lax and kind of just go with the flow."
	"then they had drama. They have had since last year. Um so we had multiple sit downs with higher ups and counseling sessions because it got ugly"

Discussion

The purpose of this research was to determine if the implementation of SAS can reduce off-task behavior of preschool children. Result of this study supports the efficacy of SAS in reducing off-task behavior. All three children demonstrated reduced off-task behavior following the SAS activities; however, this was based on a short implementation period with one day of data collection. Thus, results of this research should be considered with caution. Despite of its short duration, the outcome of this research supports previous study by Mills et al. (2016). The follow-up interview was conducted to understand how SAS implementation could be improved for the benefit of future studies. Three core barriers were identified. The result of both quantitative and qualitative findings will be discussed below.

Observations of Off-Task Behavior

The three children included in the study were identified by the teachers as struggling in the classroom and could use more support to their learning. All three showed decrease in off task behavior after SAS. Similar outcomes were observed in the study by Mills, Chapparo, and Hinitt (2016) where the implementation of SAS in the classroom improved the task completion of the children with ASD and ID. However, unlike the study by Mills, Chapparo, and Hinitt (2016), results of this research were based on one day of data collection. Therefore, future studies may benefit from a longer implementation period to increase the validity of the experiment.

All three students had variability in off-task behavior and could have been affected by the inconsistencies amongst the teaching staff. The teaching staff redirected the targeted students when they were beginning to exhibit off-task behavior which has the potential to decrease the

amount of recordable off-task behavior. Student to teacher ratio varied during instructional time which can influence the amount of off-task behavior. For example, on pre-implementation day 4 all three children had increased off-task behavior frequency and all three teachers were present and giving directions. This has the potential to be confusing for 3-5-year-old children to understand what expected on-task behaviors are during this time.

Follow-up Interview

The follow-up interview revealed three key themes that shed light on the barriers to the SAS implementation. These key themes were program timing, culture and classroom dynamics. Despite the enthusiasm of the head teacher to learn new tools to help children self-regulate in class, he faced many challenges during implementation.

Program timing. The lack of time in the day was a major factor in program implementation as described by Mills and Chapparo (2018). The teachers who participated in the study by Mills and Chapparo (2018) found that the added work demand associated with implementing an SAS program was a key challenge. Similarly, the teacher who participated in this study faced similar difficulties. The teachers did not have the time to complete the teacher rating scale form; hence, the teacher rating scale had to be eliminated as a secondary tool for data collection. For this reason, the results of this study had a reduction in validity since the teacher's perception data was missing to support the off-frequency time sampling data. This information would have been key to knowing if SAS caused a noticeable change in the child's behavior that was recognized by the teaching staff. The teacher rating scale form could have complemented the data from the off-task behavior frequency time sampling. Despite the missing data from the teacher rating scale, an observable decrease in off-task behavior was evident after implementing SAS.

Additionally, all the teaching staff did not have the time to participate in the SAS training, which would help assure standard implementation of SAS. The head teacher received a 30-minute training instead of the full 2 hours intended. The research team inferred that the teachers were not prepared to facilitate SAS at the time of the implementation. As a result, the researchers unanimously agreed to facilitate the activities with the children in the morning in order to capture one day of correct implementation.

Furthermore, the lack of time in the day limited the teacher's ability to collaborate with the researchers to design a SAS program that is sustainable. The lack of "buy in" from the teaching staff was a major limitation and may be another reason the implementation of SAS did not go as planned. A future recommendation to occupational therapists is to develop a needs assessment at the inception phase, which by doing so will help determine the readiness of a classroom to receive SAS program.

Culture and rapport. Given the limited timeframe to conduct a research study, there was inadequate time to establish rapport with the school teachers and understand their culture. Mills and Chapparo (2018) emphasized the importance of building relationship with the teaching staff in their study. The teaching staff had a solid understanding and respect of the role of occupational therapy and vice versa. In addition, the ongoing support for the teachers by the occupational therapist for the duration of the SAS implementation added to the success of the research (Mills & Chapparo, 2018). Unlike the study by Mills, Chapparo, and Hinitt (2016), this research study was restricted by the researcher's academic schedule which limited the number of face-to-face interactions that could be planned with the teachers. For this reason, there was difficulty in establishing strong rapport with the teaching staff. Future studies should consider planning to allot ample time to establish rapport with the community especially that school

teachers operate under predetermined schedules. Occupational therapists should advocate for teacher-therapist collaboration to promote understanding of the roles and values of each discipline.

The inability to build relationship with the teaching staff led to overlooking the cultural climate of the school community which had a strong influence in the success of the SAS implementation. One key challenge was the language barrier. Since the preschool population was a tight knit Hispanic community, the researchers were viewed as "outsiders". To some degree parents were wary of new personnel at school because of the stringent immigration policy developing in the country during the research. Future studies should consider identifying the cultural barriers prior to designing a school program. Occupational therapists should develop a community profile that will inform the process of implementation and building key relationships with notable figures within the community in order to make a program successful.

Classroom dynamics. Classroom dynamics played a key role into how implementation of the SAS was affected. This is an important aspect that must to be examined when conducting a needs assessment. Unlike the study by Mills, Chapparo, and Hinitt (2016), where all the participating teachers were registered and qualified to teach primary school, the teaching staff at the Head Start classroom consisted of a head teacher and teacher aides who all assumed the responsibilities of carrying out the implementation of SAS. Since Mills & Chapparo (2018) referred to SAS as "teacher directed", it was challenging to have the teacher aides lead the SAS implementation without the adequate teamwork among the teaching staff. Additionally, the teacher aides, who felt like the classroom should be under their guidance due to the many years of experience working at Head Start were still adjusting to the leadership of the new head teacher. In addition, having worked closely with the head teacher, the researchers may have

been viewed as trying to dictate how the classroom should be run. This may have caused the teacher aides to be less open and motivated to implement the SAS as instructed. Understanding the working relationship among the teaching staff and adapting to it would have been key to getting a “buy-in” from the staff and thus taking ownership of SAS implementation. Such issue may have been avoided had the researchers established rapport and collaborated with the teacher aides on the sensory activities and training in use of the SAS.

Conclusion

The outcome of this study should be interpreted with caution due to the short duration of the SAS implementation. The characteristics of the classroom such as the schedule, staffing, style, and strategies of the teacher contributed the lack of implementation. The strength of this study includes strong inter-rater reliability of off-task behavior frequency, gold standard implementation of SAS as a proof of concept, and AB design utilizing each subject as their own control condition. The internal validity is limited due to the redirection given by the teaching staff which may appear to have influenced the decrease in the off-task behavior of the subjects. Furthermore, fluctuating staff presence influenced the amount of attention given to these off-task behaviors. A consistent teacher to student ratio would help reduce this variable. Future studies on SAS must account for these variables to increase the validity of the results. The external validity of the results is limited because of the small sample size, which is from a homogeneous Hispanic community in one geographical location. The participants were recruited by the teachers; hence, the outcome of the study was not representative of the general population. A positive feature of this study is that the results were based on healthy-abled bodied population, which adds to the limited amount of research on SAS with typical developing children.

SAS may be a useful tool for children at risk for sensory integration dysfunction for improving school participation. Also, SAS can be effective in use with typical developing children. More research is needed on effectiveness of SAS in a classroom including: a larger sample size, longer implementation period, and a creation of an implementation training protocol. Conducting a needs assessment before finalizing the site selection is essential to identify the assets and barriers to successful SAS implementation in the classroom. Building rapport with teaching staff is critical to the sustainability and success of SAS. Additionally,

making the teaching staff as collaborative partners in creating sensory activities in their own classrooms is key.

The aim of the study is to explore the effects of an implemented SAS in a Head Start preschool classroom on off-task behavior. The implementation of the SAS has been observed to decrease off-task behaviors. Therefore, SAS may have potential to improve on-task behavior in a preschool classroom. Future experiments with multiple intervention time points will rule out random occurrence or decrease off-task behavior due to extraneous variables. Furthermore, the SAS should be implemented by either blinded researchers or the teaching staff instead of the primary researchers. Such change in methods may help reduce the likelihood that the researchers judged off-task behavior differently in the implementation phase. Taking such steps may increase the validity of the results. Lastly, including a critical step of conducting a needs assessment would determine the readiness of a target classroom in adoption of a new program, such as an SAS.

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Appendix A. Off-task Behavior Time Sampling and Observation Sheet

Off-Task Behavior Time Sampling and Observations

On-Task Behavior Definition: Child is handling task materials, focused and attending to task at hand during specific activity (i.e. staying seated at circle time, eating and staying seat during meal time, staying on mat during nap time).

Activities observed	**Operationalized definition of off-task** -behavior must last for more than 10 sec
Circle time	Loses manual contact with the task materials Stands and walks away from the group (except when approaching a teacher) Manipulates toys, puzzles, materials in the environment when not instructed Does not visually orient to the teacher/speaker Speaks to another student unrelated to the topic of conversation
Table activities	Loses manual contact with the task materials and simultaneously stands and walks away from the group (except when approaching a teacher or checking the task at another station) Distracting student doing something not related to play Displays aggressive behavior: shouts, screams, destroys nearby properties, hits and grabs classmates or teacher.
Free play	Loses manual contact with the task materials and simultaneously stands and walks away from the group (except when approaching a teacher or checking the task at another station) Displays aggressive behavior: shouts, screams, destroys nearby properties, hits and grabs classmates or teacher.
Lunch	Stands and walks away from the table (except when approaching a teacher) Exception walks to teacher and talks about something not related to lunch time behaviors
Oral hygiene	Discontinues physical contact with cup or toothbrush Leaves the sink area without the cup or toothbrush
Nap time	Walks away from the bed (except when approaching a teacher or using restroom and wash hands afterwards) Plays with another toy or at another section of the room

	Distracts other student from preparing for nap time
Transitioning to next activity	Performs a different task from what he or she was instructed (i.e. playing with a toy after coming back from outdoors instead of walking to the designated table for lunch)

Total Observation Session:_____minutes
Date:

Time of Observation Type of Activity	Off-task Behavior Duration (I.e. I - 3 min)	Comments (i.e. Teacher? Types of behaviors?)
__ :_____=__: _ Activity:	1S _____ 2C _____ 3A	_____ _____
__ :____ -__: __ Activity:	1S _____ 2C _____ 3A	_____ _____

__ :____ - __: __ Activity:	1S _____ 2C _____ 3A	_____
__ :____ - __: __ Activity:	1S _____ 2C _____ 3A	_____ _____
__ :____ - __: __ Activity:	1S _____ 2C _____ 3A	_____ _____

Completed by: _____

Appendix B. Teacher Rating Scale

Student On-Task Behavior Report

Student # _____ Ages: _____

Teacher Reporting: _____

Directions: Please rate the student on the behaviors below. Indicate the ratings for each question. You may write comments about the student behaviors on the comment sections.

Student Behaviors	Comments
Student pays attention to teacher instructions and lessons. 1 2 3 I 4 5 6 I 7 8 9 Never/Seldom Sometimes Most/Always	
Student completes and turn in classwork assignments. 1 2 3 I 4 5 6 I 7 8 9 Never/Seldom Sometimes Most/Always	
Student listens to the teacher and complete requests in a timely manner. 1 2 3 I 4 5 6 I 7 8 9 Never/Seldom Sometimes Most/Always	
Student is able to remain on task during classroom lessons. 1 2 3 I 4 5 6 I 7 8 9 Never/Seldom Sometimes Most/Always	
Student is able to transition into activities in a timely manner. 1 2 3 I 4 5 6 I 7 8 9 Never/Seldom Sometimes Most/Always	
(Optional Behavior)	

_____ _____ 1 2 3 I 4 5 6 I 7 8 9 Never/Seldom Sometimes Most/Always	

Teacher Signature: _____ Date: _____

Appendix C. Sensory Activity Descriptions and Icons Examples

Crab Walk/Caminata De Cangrejo  1	Child lays on back then pushes up with arms and legs and walks in a circle once around the play area. El niño se acuesta en ese momento empuja hacia arriba con los brazos y las piernas y camina en círculo una vez alrededor del área de juego.
Animal Sounds/Sonidos De Animal -Tigre  10	Tell the kids, “What sound does the tiger make? Take a deep breathe, 1..2..3.. “RAARR!” Repeat 3 times. Dígales a los niños, "¿Qué sonido hace el tigre? Respira profundo, 1..2..3 .. "RAARR!" Repite 3 veces.
Yoga Pose - Downward Facing Dog/Postura Del Perro Boca Abajo  16	Start out like a table. Spread your fingers and press your palms flat onto the floor. Lift your buttocks, straighten your legs. Heels gently to the ground. Look down between your legs. Comience como una mesa. Extiende tus dedos y presiona tus palmas sobre el piso. Levante sus nalgas, enderece sus piernas. Tacones suavemente al suelo. Mira hacia abajo entre tus piernas. Respire 5 veces.

Yoga Pose - Child's Pose/Pose Del Nino  17	Kneel on the ground. Sit down on bent legs. Put your head on the ground. Arms stretched forward. Arrodillarse en el suelo Siéntate con las piernas dobladas. Pon tu cabeza en el suelo. Brazos estirados hacia adelante.

Rhythmic Dancing- Baile rítmico  20	Encourage students to follow along to songs with rhythm such as "Head, Shoulders, Knees, and Toes" "Hokey Pokey" and the "Macarena". Perform two songs. Indique a los alumnos que sigan las canciones con ritmo, como "Cabeza, hombros, rodillas y dedos de los pies", "Hokey Pokey" y "Macarena". Realiza dos canciones.
ABC Circle- Circulo ABC  21	Students hold hands in a circle and skip together while singing "ABCs" Make sure students keep hands held together until the end of the song. Do this three times in different paces: normal, fast, and slow. Los estudiantes se dan la mano en un círculo y saltan juntos mientras cantan "ABC". Las manos se mantienen juntas hasta el final de la canción.Repita 3 veces rápido, normal y lento.

Appendix D Interview Questions

Interview Questions for the Teacher

1. What are somethings that you think went well with our study?
2. How do you see that the calendar as being beneficial?
3. What about the calendar is beneficial?
4. What are somethings that you think didn't go well?
5. What are some things that we could have done better?
6. What do you think you as the head teacher and the teacher aides could have done better?
7. What are some resources you think that could be given to make the program more successful?
8. What could we do to make us feel like we were a part of your classroom?
9. Is there anything that you would do differently on how you approach the sensory activity schedule?
10. Would it been beneficial if we knew how to speak Spanish?