2019

Creating a Sensory Inclusive Classroom: A Guide for Teachers

Bobbie Bertsch
University of North Dakota

Kylie Browen
University of North Dakota

Creating a Sensory Inclusive Classroom: A Guide for Teachers

By

Bobbie Bertsch and Kylie Browen

Advisor: Mandy Meyer, Ph. D.

A Scholarly Project

Submitted to the Occupational Therapy Department

of the

University of North Dakota

In partial fulfillment of the requirements

for the degree of

Master of Occupational Therapy

Grand Forks, North Dakota

May 2019

APPROVAL

This Scholarly Project Paper, submitted by Bobbie Bertsch and Kylie Browen in partial fulfillment of the requirement for the Degree of Master of Occupational Therapy from the University of North Dakota, has been read by the Faculty Advisor under whom the work has been done and is hereby approved.

Signature of Faculty Advisor

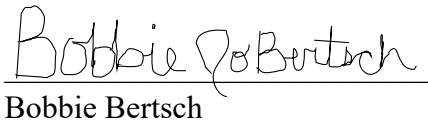
April 15, 2019

Date

PERMISSION

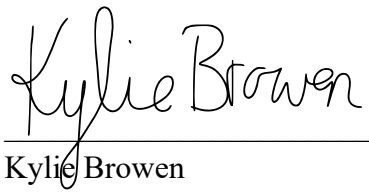
Title	Creating a Sensory Inclusive Classroom: A Guide for Teachers
Department	Occupational Therapy
Degree	Master of Occupational Therapy

In presenting this Scholarly Project in partial fulfillment of the requirements for a graduate degree from the University of North Dakota, we agree that the Department of Occupational Therapy shall make it freely available for inspection. We further agree that permission for extensive copying for scholarly purposes may be granted by the professor who supervised our work or, in her absence, by the Chairperson of the Department. It is understood that any copying or publication or other use of this Scholarly Project or part thereof for financial gain shall not be allowed without our written permission. It is also understood that due recognition shall be given to us and the University of North Dakota in any scholarly use which may be made of any material in our Scholarly Project.



Bobbie Bertsch — April 17, 2019

Bobbie Bertsch — Date



April 17, 2019

Kylie Browen — Date

TABLE OF CONTENTS

ACKNOWLEDGMENTS

We would like to express our greatest gratitude to our advisor, Dr. Mandy Meyer, for all the time and energy she put into helping us complete our Scholarly Project and product guide. Without her guidance, feedback, reassurance, and constant support, this would not have been possible.

We would also like to thank our families, friends, and classmates for their love and encouragement throughout this entire process. We cannot express how much we appreciated having them by our side for advice and motivation as we worked on and completed this project.

ABSTRACT

A school classroom is the place where students are expected to complete the majority of their learning. Many classrooms have a large amount of distracting sensory stimuli such as bright lights, visual stimuli on the walls, noises from individuals within the room, and sensory rich learning experiences. The physical environment can affect children's learning and attention (Miller-Kuhaneck & Kelleher, 2015). Based on an in-depth literature review, it has been found that certain components of the classroom can be altered to create an environment more inclusive for all children, regardless of abilities. In light of the push to keep children in the least restrictive environment, it is anticipated that the following findings and product guide will promote inclusion within classrooms through accommodation of a wide range of sensory preferences. This can be done through the use of intervention strategies from the Ecology of Human Performance (EHP) model, such as create and prevent. The product guide addresses the gap between occupational therapists' knowledge of sensory strategies and teachers' knowledge of student behaviors and classroom design. It is important for teachers and occupational therapists to work together to determine and overcome the contextual barriers in keeping children in their least restrictive environment.

CHAPTER I
INTRODUCTION

The classroom is a critical place where students are expected to complete the majority of their learning. Many classrooms have a large amount of distracting sensory stimuli such as bright lights, visual stimuli on the walls, noises from individuals within the room, and sensory rich learning experiences. The physical environment can affect children's learning and attention (Miller-Kuhaneck & Kelleher, 2015). Occupational therapists have been studying and treating sensory integration difficulties for many years using both remedial and compensatory strategies to treat clients (Bodison & Parham, 2018). Additionally, national practice standards require occupational therapists to consider the environment of their client's and adapt it as they see fit (AOTA, 2016). Because teachers spend the majority of each day with their students, a collaborative process can be used to create an environment that matches students' sensory needs and their unique sensory preferences (Miller-Kuhaneck & Kelleher, 2015).

The purpose of this project is to provide a guide for teachers, developed on the basis of the Ecology of Human Performance (EHP) model, to achieve effective collaboration between occupational therapists and teachers and maximize student learning in the least restrictive environment - the classroom. The intent of this guide is to provide teachers with an evidence-based tool to use when setting up their classrooms and when considering day-to-day activities within their classroom. It will benefit all students, regardless of ability. The guide contains operational definitions of terminology,

classroom modifications specific to each of the seven senses, sensory activities, a checklist to provide more detailed sensory information on a specific student and emphasizes the importance of collaboration so that team members can use common language and understand his or her unique role. This guide falls under the first tier of the Response to Intervention (RtI) approach - Universal Promotion. Tier 1 is considered preventative and considers universal design and supports to help all children. The overarching goal of this project is to collaborate with teachers to engage in universal promotion in order to reduce behavioral problems and increase attention and on-task behavior within the classroom through consideration of the senses.

As outlined above, this guide was created using concepts from the EHP model. EHP is a model derived from occupational therapy (OT) and social science literature, as well as the disability movement. The model is based on the proposition that individuals cannot be understood separately from their environment (Schell, Gillen, & Scaffa, 2014). The model specifies the relationship between person, context, task, and performance. The person brings a unique set of variables, past experiences, personal values and interests, as well as sensorimotor, cognitive, and psychosocial skills (Hinojosa, Kramer, & Royeen, 2017). The context is the set of interrelated conditions that surround the person (Hinojosa et al., 2017). There are numerous intervention strategies that emerge from the EHP ideals including: establish and restore, alter, adapt and modify, prevent, and create (Hinojosa et al., 2017). This model can be used to evaluate and modify the environment to fit the needs of the individuals within the environment. In order to design a classroom that provides a sensory environment that is inclusive to all, the create intervention strategy can be used to maximize performance for all children within the classroom, while the

other intervention strategies can be used to target person and environment match for individual students.

The following chapters will help the reader gain a better understanding of the intent of the project and showcase the guide. Chapter II contains findings from an extensive literature review that was conducted to create this guide. The literature review contains findings from library databases, textbooks, and other educational materials to provide information about laws and regulations regarding school age children, occupational therapist role in the school setting, information regarding interprofessional collaboration, how the classroom environment and the senses impact learning, diagnoses impacted by sensory input, possible classroom modifications, and information regarding the effectiveness and applicability of EHP. Chapter III then describes the methodology used in the development of the product. Chapter IV contains the product of this research, a guide, which is intended for teachers to create a sensory inclusive classroom environment for all students in order to promote optimal learning. Chapter V concludes this project with a brief summary, limitations of the product, implications for future research, and information regarding possible implementation of the guide in the future.

CHAPTER II
REVIEW OF LITERATURE

Laws and Regulations Regarding School Age Children

Section 504 of the Rehabilitation Act, passed by Congress in 1973, sought to protect the rights of disabled individuals (Moses, Gilchrest, & Schwab, 2005). In order to qualify under Section 504, a student must be a handicapped person, which is defined by the authors as "any individual who (i) has a physical or mental impairment which substantially limits one or more of such person's major life activities, (ii) has a record of such impairment, or (iii) is regarded as having such an impairment" (Moses et al., 2005). Within the educational context, the school's 504 team will typically look to the function of 'learning' as the major life activity affected (Moses et al., 2005). This legislation provides services, assistance, and protection to children with a variety of health problems including asthma, diabetes, seizure disorders, spina bifida, cancer, attention deficit disorder, and more (McHenry, 1997). Under Section 504, schools must make reasonable accommodations for students with disabilities, as it is a child's right to attend school, go on field trips, and have a behavior modification plan (McHenry, 1997).

In 1975, the Individuals with Disabilities Education Act (IDEA) was enacted by congress to ensure that all children have the opportunity to receive free and appropriate education (Lipkin & Okamota, 2015). There are four parts within IDEA: Part A consists of general provisions of the act; Part B covers state grant assistance for children with disabilities ages 3 to 21; Part C covers services for infants and toddlers, ages birth to

three; Part D is focused on general personnel improvement (Lipkin & Okamota, 2015). Within IDEA, states and school districts are required to identify, locate, and evaluate children with disabilities to determine their need for special education (Lipkin & Okamota, 2015). If a child is deemed appropriate for special education, an individualized education program (IEP) is developed, which describes the needs of the child in order to help them reach their educational goals. IDEA mandates that interprofessional collaboration occur when evaluating, implementing, and developing IEPs (Orentlicher, Handley-More, Ehrenberg, Frenkle, & Markowitz, 2014). Parents and the student should be a part of the development of the IEP and implementation of special education services (Lipkin & Okamota, 2015). This collaboration ensures that parents and the student have a say in the plan of care. It should be noted that students who qualify for special education services under IDEA will automatically qualify as a handicapped person under Section 504 and that these students' IEPs will, more often than not, meet the requirements for an accommodation plan (Moses et al., 2005).

IDEA was reauthorized in 2004, becoming "The Individuals With Disabilities Education Improvement Act." This reauthorization mandated a free, appropriate public education in the least restrictive environment for all students (Kinnealey et al., 2012). Smith (2005) states, "to the maximum extent appropriate, children with disabilities should be educated with their nondisabled peers." The 'least restrictive environment' addition to IDEA 2004 resulted in 'main-streaming' and including many students with disabilities into general education settings (Smith, 2005).

Occupational Therapy Role in School Setting

According to the Occupational Therapy Practice Framework, occupational therapy (OT) is defined as "the therapeutic use of everyday life activities (occupations) with individuals or groups for the purpose of enhancing or enabling participation in roles, habits, routines in home, school, workplace, community, and other settings (AOTA, 2014, p. S1)." Within the school setting, occupational therapists are utilized to help clients with occupations related to school performance. Under IDEA, OT is considered a related service. Related services are those that are meant to assist students with disabilities that are physical, behavioral, cognitive, or developmental to benefit from special education (Lipkin & Okamota, 2015). Due to the focus on disability within the educational context, OT goals within school settings must be focused solely on the child's educational performance. According to Dole, Arvidon, Bryne, Robbins, and Schasberger (2003), goals should enhance the child's ability in school and be easily understood by all individuals involved in the child's IEP. OT services can be utilized to help students participate in school-based occupations, including academic and non-academic. This can be done by enhancing performance skills, performance patterns, educational context, student-activity match, and individual student factors (AOTA, 2014).

Within the educational context, the classroom environment is critical to consider due to the amount of time students spend there each day. Occupational Therapy National Practice Standards require careful consideration of the impact environment has on individuals' ability to participate fully in their valued occupations (AOTA, 2014). Approximately 20% of occupational therapists work in public schools and have the

unique skill set to evaluate the environment and suggest modifications to create more positive experiences. OT practitioners also have the unique ability to evaluate concepts related to sensory processing (Sood, LoCure, Schranz, & Morrison, 2018). Therefore, one role of the occupational therapist within the school system may include implementing strategies to incorporate universal design for learning that specifically address the sensory environment (Jimenez, Graf, & Rose, 2007). Through collaboration between teachers, occupational therapists, and other members of the school team, students may have increased opportunities to remain in the least restrictive environment: the classroom.

Interprofessional Collaboration in Schools

IDEA mandates inclusion for all students which led to the growth and implementation of OT and other related services within the school setting. This resulted in increased need for interprofessional collaboration between all disciplines working with students who have special needs (Orentlicher et al., 2014). Inclusion in the classroom specifically facilitated more opportunities for occupational therapists to collaborate with teachers. Occupational therapists can collaborate with teachers and staff to help them develop strategies that can be utilized within the school environment and/or develop routines that can stimulate children's learning within an environment that is better suited for the children's sensory needs (Sood et al., 2018). Because OT practitioners have a solid understanding of concepts related to sensory processing, they ensure that learning environments and routines of children accommodate for sensory needs which, in turn, promotes increased participation (Sood et al., 2018).

According to Hillier, Civetta, and Pridham (2010), interdisciplinary collaboration is commonly used in educational settings when planning a child's IEP, and it has required

both healthcare professionals and non-healthcare professionals to work together to ensure the best outcomes for the child. When positive collaboration is used between teachers and occupational therapists, it is not only beneficial for the students, but also the students' families and individuals within the school environment (Hillier, Civetta, & Pridham, 2010). According to Orentlicher, Ehrenberg, Frenkle, and Markowitzet (2014), there are six characteristics that promote and sustain collaborative relationships between professions. These characteristics include 1) voluntary participation and commitment to collaboration; 2) mutual respect; 3) a common purpose; 4) mutual responsibility for effectiveness; 5) sharing of resources and education of individual knowledge and expertise and; 6) collaborative decision making (Orentlicher et al., 2014).

Wilson and Harris (2018) completed a study in British Columbia, Canada, regarding teacher perspectives on a model used for collaboration between teachers and occupational therapists in a school-based setting. This model, Partnering for Change, was designed for children with special needs. Eleven teachers participated in focus groups and one-on-one interviews in order for researchers to gather qualitative data on how teachers perceive OT delivery of services for their students with special needs with the model implemented (Wilson & Harris, 2018). Four themes emerged from the data: 1)collaborating in the thick of it all; 2) learning and taking risks; 3) managing limited time and resources and; 4) appreciating responsive occupational therapist support (Wilson & Harris, 2018). Teachers were overwhelmingly positive about Partnering for Change as they learned to embed new strategies into their daily routines by interacting with the occupational therapist (Wilson & Harris, 2018). This also led to less removal from classroom time as the model provides therapists with a clear structural framework

and specific strategies to build teachers' capacities to support students on a daily basis so they may remain in the classroom with their peers (Wilson & Harris, 2018). The limitations of the study were the small sample size and data only gathered from one school, however, the results of the study support the idea that increased teacher and occupational therapists' collaboration remains important in keeping children in their least restrictive environment while still feeling supported (Wilson & Harris, 2018).

How the Classroom Environment Impacts Learning

Occupational therapists have been studying and treating sensory integration difficulties for many years using both remedial and compensatory strategies to treat clients (Bodison & Parham, 2018). Additionally, national practice standards require occupational therapists to consider the environment of their client's and adapt it as they see fit (AOTA, 2016). Because teachers spend the majority of each day with their students, a collaborative process can be used to create an environment that matches students' sensory needs and their unique sensory preferences (Miller-Kuhaneck & Kelleher, 2015).

Many classrooms have a large amount of distracting sensory stimuli such as bright lights, visual stimuli on the walls, noises from individuals within the room, and sensory rich learning experiences. The physical environment can affect children's learning and attention (Miller-Kuhaneck & Kelleher, 2015). In a study by Fisher, Godwin, and Seltman (2014), the authors explored the relationship between visual environment and attention allocation. Students were taught six different lessons with varied environments including one with visual distractions typical of a normal classroom, and the other with bare walls and minimal decor (Fisher, Godwin, & Seltman, 2014). The

students took a pretest and posttest on the material they learned. Additionally, four trained coders blind to the hypotheses observed videotapes of the students task behavior. The results showed that children were more distracted, off task, and less learning gains were made within the room that contained a large amounts of visual distractions including decorations (Fisher et al., 2014).

McDowell and Budd (2018) completed a study on the perspectives of teachers and paraeducators on the relationship between classroom clutter and learning, specifically for children with cerebral visual impairments. Two classrooms within the school were de-cluttered by covering glass panels with black paper, hanging sheets over open shelves, removing unnecessary equipment and furniture, taking down things hanging from windows, walls, and ceiling, and creating blank walls in front of students (McDowell & Budd, 2018). The students worked in this environment for two weeks. The perspectives of the teachers and paraeducators were that decluttering the room had a positive effect (McDowell & Budd, 2018). They believed that the environment increased concentration and visual awareness, reduced sensory overload, and decreased distractions (McDowell & Budd, 2018). Many of the teachers also reported that the decluttered room had a calming effect on the students, and tension was decreased within the room (McDowell & Budd, 2018). Despite the positive change in visual attention, noise was still a concern for the participants. Many reported that an increase in noise from within the room, as well as outside of the room, affected the students' ability to concentrate (McDowell & Budd, 2018). When noise was decreased within the room, the staff noticed a positive effect on student behavior and concentration (McDowell & Budd, 2018).

How Senses Impact Learning

Sensory processing is considered the interface between the environment and a person's neurological function. In the United States, up to 16% of children are reported to have difficulties processing and integrating sensations, which affects their participation in activities of daily living (Schaaf, Dumont, Arbesman, & May-Benson, 2018). Literature supports the relationship between difficulties with processing and integrating sensations and performance of activities of daily living (ADLs) such as sleeping, engaging in play, and participating in school-related activities (Schaaf et al., 2018). The Ayres Sensory Integration (ASI) intervention, which involves individualized sensory–motor activities contextualized in play to promote adaptive responses and foster functional skills as a foundation for participation in occupations, is used by more than 95% of pediatric OT practitioners (Schaaf et al., 2018). One of the fundamental ideas of the ASI framework is that the early developing, body-centered senses (i.e. tactile, vestibular, and proprioceptive) provide a foundation for the development of later maturing visual and auditory systems (Chia-Ting & Parham, 2014). These systems are utilized largely in learning environments. Ayres theorized that early development and integration of tactile, vestibular, and proprioceptive systems allow for the formation of body scheme (where the body is in space), and object concepts (understanding that objects still exist even when not seen) (Chia-Ting & Parham, 2014).

In Dunn's model of sensory processing, sensory processing is viewed as a normal aspect of everyday life that occurs across the life span and remains relatively stable (Dunn, 2001). However, tension may exist as individuals process internal information with external information. Internal information is sensation that comes from the body,

while external information comes from the environment (Dunn, 2001). People respond differently to sensory information based on the amount of sensory input needed to detect (threshold) and manage (self-regulate) sensory stimuli (Little, Dean, Tomchek, & Dunn, 2018). This leads to four sensory processing patterns including 1) low registration; 2) sensory seeking; 3) sensory sensitivity; and 4) sensory avoiding (Dunn, 2001). *Low registration* occurs when individuals have a high threshold and passive self-regulation, meaning that their high threshold makes them require large amounts of sensory input to respond and their response is passive in nature (Dunn, 2001). *Sensory seeking* occurs when individuals have a high threshold and actively self-regulate by finding sensory input. These individuals usually enjoy sensory input and find ways to satisfy those needs by performing activities such as climbing, twirling, bouncing, etc. (Dunn, 2001). *Sensory sensitivity* is when individuals have a low threshold for sensory input and passive self-regulation, meaning they notice sensory input readily but don't actively avoid it (Dunn, 2001). Lastly, *sensory avoiding* is when individuals have a low threshold and actively self-regulate by avoiding the sensory input (Little et al., 2018; Dunn, 2001). Students who have difficulty modulating the sensory information in their environment have difficulty attending to the stimuli relevant for learning (Kinnealey et al., 2012).

Chia-Ting and Parham (2014) completed a study hypothesizing that problems with sensory integration may affect not only a child's physical engagement with activities, but his/her feelings of competency in the context of social participation. Results of the authors' study suggest when a particular sensory system is not working well, the child is likely to experience a variety of difficulties involving that sensory system such as under-responsiveness, over-responsiveness, and problems with sensory-

motor control (Chia-Ting & Parham, 2014). Individuals who are under-responsive to sensory stimuli are often quiet and unresponsive to typical stimuli within their environment (About SPD, 2018). In the classroom, students may appear withdrawn and difficult to engage because they do not detect the sensory input within their environment (About SPD, 2018). Under-responsivity to tactile input may lead to poor body awareness and clumsiness (About SPD, 2018). Additionally, individuals may not perceive objects that are too hot or cold or they may not notice pain in response to obvious injury (About SPD, 2018). Conversely, individuals with sensory over-responsivity are more sensitive to sensory stimulation than most people (About SPD, 2018). Their bodies feel sensation too easily and/or intensely, and they may feel as if they are being attacked with information all the time (About SPD, 2018). As a result, these individuals often have a 'fight or flight' response to specific sensations, such as unexpected touch or sudden loud noise (About SPD, 2018). Within a classroom environment, students with over-responsiveness may try to avoid or minimize sensations (typically more visually or auditorily) which might be displayed by avoidance to touch or covering their ears to avoid loud noises (About SPD, 2018).

Diagnoses Impacted Most by Sensory Input & The Typical Child

Sensory processing is a normal part of everyday life. Difficulties with sensory processing are common across a variety of developmental and behavioral conditions (Bodison & Parham, 2018). Additionally, evidence suggests that up to 16% of typically developing children demonstrate difficulties with sensory processing (Sood et al., 2018). Dean, Little, Tomchek, and Dunn (2017) completed a study to explore sensory processing in the general population. Parents of 51 participants ages 6-11 completed the

Child Sensory Profile 2 to determine information on the children's sensory system, behaviors, and sensory processing patterns. They also completed the Behavior Assessment System for Children 2, which gives information on children's adaptive and maladaptive behavior (Dean, Little, Tomchek, & Dunn, 2017). Results on sensory processing patterns were compared with adaptive and maladaptive behavior. The results of the comparison suggest that when avoiding behaviors occur more frequently, challenging behaviors and decreased scores on the adaptive subscale occured (Dean et al., 2017). On the other hand, sensory seeking behavior was related to less frequent malaptive and depressive behaviors, which could be due to the idea that sensory seeking can be seen as a form of self-regulation (Dean et al., 2017). Ultimately, each person has a unique sensory processing pattern. These patterns have the potential to either inhibit or benefit occupational performance depending on how each child responds in different situations.

In 2015, children with disabilities made up about 15% of the United States. Under IDEA 2004, these children are entitled to education with their peers with and without disabilities in the least restrictive environment (Lipkin & Okamota, 2015). In the following subsections, the most common disabilities that include sensory dysfunction are described in regard to a general overview of commonalities for each disability:

Learning disability. According to the National Institute of Neurological Disorders and Stroke (NINDS), learning disabilities are "disorders that affect the ability to understand or use spoken or written language, do mathematical calculations, coordinate movements, or direct attention" (Learning Disabilities Information Page, 2018). Research shows that up to 10% of American children have some type of learning disability (Learning Disabilities Information Page, 2018). Although learning disabilities

occur at a very young age, the disorders are typically not identified until the child reaches school age (Learning Disabilities Information Page, 2018). Stonefelt and Stein (1998) state that learning disabilities are the most frequently reported causes of functional limitation among school-age children.

Many children with learning disabilities also have underlying difficulties integrating their senses (Stonefelt & Stein, 1998). Children with learning disabilities who have difficulty making sense of their environment, may give up trying to make sense of it all together. As a result, the child may appear to have very little interaction with the environment (Hong & Hong, 2004). Hong and Hong (2004) completed a study on multisensory environments and the impact this may have on children with a learning disability. The authors describe multisensory environments as specially designed spaces that enable individuals to engage with a wide range of sensory experiences including visual effects, special sounds, scents, and tactile sensations (Hong & Hong, 2004). Sensory experiences utilized in this particular study included: bean bags, bubble tubes, fiber optics, dimmed lights, sound and light floor, tactile panels, etc. (Hong & Hong, 2004). The study concluded that children who have difficulty coping with cognitive demands appear to benefit from basic sensory experiences, and that gentle stimulation appeared to have a soothing effect on children with learning disabilities (Hong & Hong, 2004). Overall, the authors state that multisensory environments appear to benefit children with learning disabilities if there is an opportunity to use them (Hong & Hong, 2004).

Attention Deficit-Hyperactivity Disorder. NINDS defines attention deficit-hyperactivity disorder (ADHD) as a neurobehavioral disorder. One in eleven children

ages 4–17 years are diagnosed with ADHD (Little et al., 2018). This disorder interferes with the individual's ability to stay on task and to maintain age-appropriate inhibitions (Attention Deficit-Hyperactivity Disorder Information Page, 2018). Common signs of ADHD include failure/difficulty listening to instructions, inability to organize self and/or school work, fidgeting with hands/feet, excessive talking, leaving work unfinished, and having trouble paying attention and responding to details (Attention Deficit-Hyperactivity Disorder Information Page, 2018).

Sensory sensitivities and avoidance have been highly reported in children with ADHD (Little et al., 2018). Researchers estimate the extent of sensory over-responsivity in children with ADHD varies from 46% to 69% (Ben-Sasson, Soto, Heberle, Carter, & Briggs-Gowan, 2017). For example, a child with ADHD may appear inattentive during tasks in which he/she finds aversive (Little et al., 2018). Additionally, sensory sensitivity in ADHD is related to anxiety, socialization difficulties, and aggressive behavior (Little et al., 2018).

A study completed by Shimizu, Bueno, and Miranda (2014), found that children with ADHD experience major difficulties showing significance in all four response patterns: 1) sensory avoiding; 2) sensory seeking; 3) sensory sensitivity; and 4) low registration. The authors also discovered that this population demonstrate significant sensory processing impairments such as emotional/social responses, including items relating to self-esteem, frustration tolerance, irritability, etc. (Shimizu, Bueno, & Miranda, 2014). More specifically, results showed impairments in auditory-processing items (Shimizu et al., 2014). Research supports the use of sensory interventions for

children with ADHD consisting of techniques that address specific modalities such as the auditory system (Ben-Sasson et al., 2017).

Sensory Processing / Sensory Modulation Disorder. According to the STAR Institute, sensory processing refers to "the way the nervous system receives messages from the senses and turns them into appropriate motor and behavioral responses." When sensory signals are either not detected or do not get organized into appropriate responses, it is called sensory processing disorder (SPD) (About SPD, 2018). Research has documented an association between having sensory processing challenges and functional limitations in adaptive behavior, executive function, and occupational performance across various contexts (Miller-Kuhaneck & Watling, 2018). Specifically, having difficulties with processing sensory information can interfere with a child's ability to perform school tasks, develop social relationships, and participate in age-appropriate activities (Sood et al., 2018).

The term 'sensory modulation,' as defined by Bar-Shalita, Vatine and Parush (2008), refers to a complex process of perceiving sensory information and generating responses that are appropriate based on the situation. Sensory modulation is the ability to regulate and organize reactions to sensory input, filter out unwanted stimuli while attending to relevant stimuli, and maintain an optimal arousal level - simultaneously (Bar-Shalita et al., 2008). The ability to register and manage sensory input impacts the efficiency of an individual's interactions with different environments, ability to adapt to challenges, and overall quality of life (Bar-Shalita et al., 2008). Individuals diagnosed with sensory modulation disorder (SMD) may display a wide range of behaviors ranging from over-responsiveness to under-responsiveness to sensory seeking (Bar-Shalita et al.,

2008). This is due to typical sensory stimuli being experienced as unpleasant, painful, or irritating, which can lead to defensive behaviors and/or withdrawal from daily tasks (Bar-Shalita et al., 2008). Research estimates that the prevalence of SMD within the pediatric population is about 5% (Bar-Shalita et al., 2008). Bar-Shalita et al. (2008) completed a study investigating the participation in daily life functions of children diagnosed with SMD between the ages of 6 and 11 compared to same age children without SMD. The results indicate that, compared to typically developing peers, the degree of enjoyment and frequency of participation in functional activities of children with SMD is significantly lower (Bar-Shalita et al., 2008).

Autism Spectrum Disorder. Autism Spectrum Disorder (ASD) is a disorder characterized by social and communication impairments, restricted interests, and repetitive behavior. Additionally, many individuals with ASD appear to be hyper- or hypo-reactive to sensory input or unusual interest in the sensory environment (American Psychiatric Association, 2014). Rates of unusual response to sensory information for children with ASD may be as high as 90% (Suarez, 2012). Individuals diagnosed with ASD have common symptoms and characteristics that affect school participation, including sensory processing difficulties, stereotyped behaviors, communication and language difficulties, low muscle tone, and sleep disturbances (Kinnealey et al., 2012). According to literature, 1 in 68 children will be diagnosed with an ASD by the age of 8 years (Little et al., 2018).

Although patterns of sensory processing differ from child to child, the sensory processing difficulties associated with academic underachievement in children with ASD have been found to be tactile processing, auditory filtering, and under-responsiveness or

sensory seeking (Bagatell, Mirigliani, Patterson, Reyes, & Test, 2010). For students with ASD, the sensory stimuli within the environment may not be appropriate for their needs. Reactions to uncomfortable sensory stimuli could include a variety of behaviors including avoiding, violence, and aggression (Menzinger & Jackson, 2009). The educational progress of children with ASD can be affected by their limited capacity to self-regulate emotional and behavioral responses and remain on task (Ashburner, Ziviani, & Roger, 2008). Ashburner, Bennett, Rodger, and Ziviani (2013) completed a study investigating the responses of children with ASD to sensory stimuli within the classroom environment. The results of the study suggest that sensations that were expected, predictable, controllable, as well as self-selected were more likely to be perceived as pleasant (Ashburner, Bennett, Rodger, & Ziviani, 2013). Conversely, sensations that were unexpected and outside of the individual's control were perceived as unpleasant (Ashburner et al., 2013). Another study, completed by Ashburner, Ziviani, and Roger (2008), compared sensory processing of typically developing children to children with a diagnosis of ASD within the classroom setting. All the children in the study with ASD were included in regular education classes, ages 6 to 10 years, and diagnosed with ASD by a pediatrician (Ashburner et al., 2008). The results suggested that within the ASD group, under-responsive/sensation seeking, and auditory filtering had a significantly negative association with academic performance and attention to cognitive tasks (Ashburner et al., 2008). Much of the literature found discussed the significance of auditory sensitivity with this population. Stewart et al. (2016) states that auditory difficulties in individuals with ASD can include lack of response to one's name, distress over sound, or distractibility by background noise. Environment modifications and

support may allow for greater participation in meaningful activities for children with ASD (Suarez, 2012). Additionally, sensory-focused intervention and implementation targets aversions and challenges, meeting the needs for sensory input, with a specific goal of improving people's abilities to interact within their environments (Weitlauf, Sathe, McPheeters, & Warren, 2017).

Classroom Environment Modifications

Due to the large amount of time children spend within the classroom, the environment should be carefully considered as a contributing factor to new learning, social participation, and behavior. In order to succeed within the classroom environment, children must meet demands of both learning and social tasks (Mills, Chapparo, & Hinitt, 2016). Different interactive learning styles are starting to be used within classrooms which has enhanced active involvement in student learning. However, a negative consequence is increased sensory challenges within the classroom (Ashburner et al., 2008). In order to make the classroom environment suitable for every student, including those with and without disabilities, universal design can be used to ensure the environments, products, and communication systems are appropriate for everyone (Kinnealey et al., 2012). Universal Design for Learning (UDL) is grounded in research from different learning, new media, and effective teaching practices (Jimenez et al., 2007). The idea behind it is that teachers should design instruction to meet the needs of diverse groups of students while also considering the built environment and how to make it more usable for everyone with minimal costs (Jimenez et al., 2007). By providing students with multiple means of learning within the classroom, it gives numerous ways to learn information based on individual learning styles, experiences, and background

knowledge (Jimenez et al., 2007). Consideration of universal sensory design can help improve attention, engagement, mood, and performance of students.

Barrett, Zhang, Moffat, and Kobbacy (2013) completed a study involving 751 elementary students to determine the impact of classroom design on learning. The students were assessed on start and end level of reading, writing, and math. The environment was assessed on naturalness (light, sound, temperature, and air quality), individualization (choice, flexibility, and connection), and stimulation (complexity, color, and texture) (Barrett, Zhang, Moffat, & Kobbacy, 2013). The five environmental factors that had a positive impact on learning included color, choice, complexity, flexibility, and lighting (Barrett et al., 2013). The classroom features that appeared to help children learn included natural light from numerous sources; high quality of artificial lighting; space around windows left clear; high quality and purposefully designed ergonomic tables and chairs; zones for varied learning; easily changeable space; clear pathways; quiet environment; and general color scheme (Barrett et al., 2013). The results of the study show that although young people may appear to enjoy excitement within the classroom, there needs to be a reasonable level of structure and order, while also keeping the classroom interesting (Barrett et al., 2013).

Visual. Modern classrooms tend to have a high level of visual stimulation. The physical environment is oftentimes brightly lit, has items hanging from the walls and ceilings, and people moving around the room (Miller-Kuhaneck & Kelleher, 2015). Because each child has different responses to visual input, teachers should make the visual environment as relevant as possible, which can be done by limiting the number of visual distractions within classroom decor (Fisher et al., 2014). However, visual learning

is still important, as some student learn best with a visual style. Therefore, combining verbal instructions with visual instructions can be helpful to ensure that each child's needs are met (Ashburner et al., 2008).

Lighting is another important consideration in the visual environment. Lighting within classrooms has a significant influence on learning and is a critical aspect of the environment that can affect student achievement (Kinnealey et al., 2012). The use of high quality lighting in school has a positive correlation to improved mood, behavior, and concentration in students. Classroom lighting also has the potential to improve student comfort and attention (Kinnealey et al., 2012). However, fluorescent lights are commonly used within schools due to energy efficiency. Fluorescent lights do not have the best quality of light for learning due to unnatural color, discontinuous spectrum, and brightness. These types of lights have a correlation with increased student stress and negatively affect students learning, behavior, and comfort (Kinnealey et al., 2012). Therefore, incorporating high quality lighting, such as full-spectrum or halogen lighting, can be helpful in improving attentional and engagement of students, especially those with visual hypersensitivity (Kinnealey et al., 2012).

Auditory. In addition to the high level of visual stimuli within classrooms, auditory stimuli is also an important factor in students' performance. Classrooms are often loud with poor acoustics which can further impact attention, concentration, and learning (Miller-Kuhaneck & Kelleher, 2015). Along with visual, auditory sensory input comes from the environment, making it harder for children to control and escape (Dunn, 2001). Individuals with ASD are especially impacted by unpredictable auditory stimulation in that they become either easily distracted or tune out auditory input all

together (Ashburner et al., 2008). Limiting additional noise within the classroom is one of the most effective ways to control adverse reactions to auditory stimuli. For example, installation of sound absorbing walls or panels can improve attention and engagement of students with auditory sensitivities (Kinnealey et al., 2012). It may also be helpful to provide spaces to escape from auditory stimuli in situations when the stimulus may be loud and unpredictable. When possible, it is important to provide auditory stimuli that is predictable and repetitive (Ashburner et al., 2013).

Tactile. Research is limited on tactile responses to sensory stimulation within the classroom environment, however, some literature has been completed regarding tactile processing for children with ASD within the classroom setting. Ashburner et al. (2008) completed a study exploring the relation between sensory processing and classroom outcomes. The findings suggest that children with tactile sensitivity are more likely to be inattentive and distractible in the classroom (Ashburner et al., 2008) The authors state that interventions that reduce unpredictable tactile input, such as positioning children at a distance from classmates, warrants further exploration (Ashburner et al., 2008). Due to the idea that the combined impact of complex sensory input in different forms may be cumulative, the authors suggest that it may be advantageous to simplify classroom sensory environments by enhancing the prominence of instruction while minimizing other sensory stimuli, increasing the predictability of activities, and presenting information at a reduced speed (Ashburner et al., 2008).

Similarly, Miguel and colleagues (2017) completed a study to explore the relationship between touch processing and classroom behaviors, specifically relating to social problems, using a sample of children and adolescents with ASD. The authors state

that sensory processing abnormalities have been described as the most challenging concerns of parents of children with ASD, with impaired responses to tactile stimulation as one of the most reported (Miguel et al., 2017). The authors also report that children with ASD show significantly more defensive reactions and lower pleasantness ratings to tactile stimuli than typically developing children (Miguel et al., 2017). Results of the study support the authors' hypothesis that atypical touch processing is related with increased social problems in children diagnosed with ASD (Miguel et al., 2017). Additionally, the association between atypical touch processing and social problems were more obvious among children with hypo- and hyper-responsiveness (Miguel et al., 2017). These findings can have clear implications when translated to situations of daily life, as it has been proposed that a pattern of hypo-responsiveness to sensory stimuli in ASD, including tactile, may lead to failure in responding to environmental cues and missing learning opportunities which are the foundation of more complex processes (Miguel et al., 2017).

Seating. Efficient sensory processing is considered to be essential for optimal occupational functioning, including the ability to learn and modulate behavior (Bagatell et al., 2010). Sensory processing strategies are designed to provide children with the sensory input needed to maintain arousal so that they can respond more effectively to environmental challenges and, in turn, participate in their everyday occupations (Bagatell et al., 2010). Based on literature, there are various types of sensory processing strategies used within the classroom setting to help support individuals with and without disability. Some of these strategies include changes/additions to the physical environment, such as different types of furniture within the room for children to use based on their needs. Some

literature suggests that sensory processing may result in a decrease in social isolation and inattention to class tasks (Sadr et al., 2017). Described below are three dynamic seating arrangements and equipment that has been used and tested within the classroom environment for children with and without disability.

Therapy ball chairs / Exercise balls. Therapy ball chairs consist of an exercise ball stabilized within a ring or with "feet" at the bottom to keep it stable (Bagatell et al., 2010). Therapy ball chairs are dynamic, low-cost seating alternatives that provide children with the opportunity to actively move while maintaining an optimal arousal level (Bagatell et al., 2010). Therapy ball chairs may be used in a classroom setting with children who have a variety of sensory-based concerns (Bagatell et al., 2010).

A study completed by Schilling, Washington, Billingsley, and Deitz (2003), examined the use of therapy balls for classroom seating as an intervention for children with ADHD. For all participants, with or without ADHD, both in-seat behavior and legible word productivity improved when seated on a therapy ball (Schilling, Washington, Billingsley, & Deitz, 2003). Findings of the study support the use of therapy balls for students with ADHD as an alternative seating option within the classroom (Schilling et al., 2003). Another study, completed by Taipalus, Hixson, Kanouse, Wyse, and Fursa (2017), evaluated the effects of use of therapy balls with on task behavior and academic performance of elementary students diagnosed with ADHD. Overall, the authors found no effect on use of the therapy balls within the classroom, including no effect on reading comprehension or math fluency (Taipalus, Hixson, Kanouse, Wyse, & Fursa, 2017). The authors report that students preferred sitting on the therapy balls,

however, teachers reported that the therapy balls were difficult to use and did not find them particularly effective (Taipalus et al., 2017).

Sadr et al. (2017) completed a study comparing the effectiveness of dynamic seating devices on improving a students' in-seat and on-task behaviors and decreasing ASD related behaviors within the classroom. The authors hypothesized that as a result of normalizing arousal levels and regulating sensory stimuli by rocking and bouncing on a therapy ball, students with ASD could be satisfied physiologically and would not need to engage in self-stimulatory behaviors (Sadr et al., 2017). The results of the study suggest sitting on the therapy ball stimulated proprioceptive and vestibular systems, which can adjust arousal situations (Sadr et al., 2017). Additionally, results proposed that most ASD students showed a positive increase in on-task behavior while seated on the therapy ball (Sadr et al., 2017). The authors also state that sitting on a therapy ball allows children to release energy and receive sensory stimulation at the same time, reducing the need for disrupting sensory seeking behaviors (Sadr et al., 2017).

Bagatell et al. (2010) also completed a study to determine the effect of therapy ball chairs on classroom participation, specifically, in-seat behavior and engagement for children with a diagnosis of ASD. The results indicate that therapy ball chairs may be more appropriate for children who seek out vestibular-proprioceptive input, rather than for children with other sensory processing patterns and needs (Bagatell et al., 2010). The results of this study highlight the importance of choosing strategies to improve classroom participation on the basis of patterns of sensory processing for each child and not based on a diagnosis (Bagatell et al., 2010).

Therapy cushions. Therapy cushions are inflatable discs originally designed and used for core strengthening and balance training (Umeda & Deitz, 2011). This seating option is believed to function similarly to therapy balls, providing students with a seating surface that allows more sensory feedback than a standard classroom chair (Umeda & Deitz, 2011). Additionally, it is hypothesized that cushions may be a more practical seating choice than therapy balls because they are small and portable, allowing students to easily transport them to various settings and use them more discreetly in the classroom without being singled out (Umeda & Deitz, 2011). Umeda and Deitz (2011) completed a study on sitting tolerance and task-related behaviors with participants utilizing therapy cushions in the classroom. The study results did not reveal substantial changes in sitting or task-related behavior for either study participant when seated on the cushions (Umeda & Deitz, 2011). The authors suggest therapy cushions lack a quality unique to therapy balls, as cushions are placed on the seat of standard chairs which might maintain a fairly stable seating surface.

Another study, completed by Sadr et al. (2017), investigated multiple types of dynamic seating options within the classroom in their study and found that sitting on a cushioned chair had no significant effect on in-seat behavior, however, it improved sitting times for most of the students. The authors state something similar to the aforementioned study, “unlike the ball, a cushion provides a more stable surface for sitting, and the children do not need more muscle activity to keep balance on seats” (Sadr et al., 2017). The authors go on to say that the children are less conscious about their balance, which may diminish their arousal level to sit calm and relaxed while on the cushioned chair (Sadr et al., 2017).

Height-adjustable desks. Children spend between 50-70% of their time sitting while at school, and research suggests that prolonged sitting is associated with poor health outcomes in adulthood (Hinckson et al., 2016). Hinckson and colleagues (2016) completed a systematic review to provide an overview of a relatively new area of research designed to reduce youth sitting time while at school by changing the classroom environment. Environmental changes included placement of height-adjustable or standing desks/workstations with stools, chairs, exercise balls, bean bags, and/or mats in the classroom (Hinckson et al., 2016). Study results propose that, with use of other equipment, sitting time was reduced by between 44-60 min/day and standing time was increased by between 18-55 min/day during classroom time at school (Hinckson et al., 2016). Additional benefits included increased energy expenditure and potential for improved management of students' behavior in the classroom (Hinckson et al., 2016).

The authors state that the implementation of standing desks or workstations in schools can be very effective; however, the costs associated and effort involved with incorporation and installation of furniture, and altering teaching practices, may prevent schools from choosing them over traditional desks and chairs (Hinckson et al., 2016). The costs of standing desks can be relatively low, some research stating this option is approximately 40% cheaper than traditional seated desks and chairs (Hinckson et al., 2016). Other literature states that the sit-stand desks and stools were approximately 20% more expensive than standard seated desks and chairs (Hinckson et al., 2016). Overall, Hinckson et al. (2016) states that youth should frequently interrupt sitting time with standing, adding that regular stretching and balance shifts are also recommended when standing for longer periods of time.

Oral motor. Chewing is an action that used as a self-regulatory method for individuals at birth. Babies do this in the form of chewing/sucking on a pacifier or thumb, while older individuals may find gum chewing as a way to reduce anxiety levels (Scheerer, 1992). Chewing can provide focus, organization, and a general calming effect on students who are feeling hyperactive, distracted, or frustrated. It can be used as a way to organize nervous systems and decrease stress. Scheerer (1992) completed a study in which 58 children were observed for two years within a therapy session using a chewy. The chewy toy was a long cylindrical piece of rubber tubing for the intent of children to suck or chew on. Twenty-six of the children in the study used the chewy throughout therapy sessions. The chewy was used for different circumstances such as stress relief, sensory substitute for non-food items, and calming. The children made significant behavioral changes over time (Scheerer, 1992). Therefore, providing children with oral motor input could be an effective tool during situations where they are likely to become stressed or overwhelmed.

Mechanisms for sensory regulation. Certain sensory stimuli can have a calming effect on students' behavior (Kumari Sahoo & Senapeti, 2014). Incorporating specific sensory input into a child's daily routine is considered part of their sensory diet. A sensory diet is the prescribed combination of sensory related activities that contribute to meeting an individual's sensory needs (Kumari Sahoo & Senapeti, 2014). If sensory diets are properly designed and implemented, it can help prevent challenging behaviors. The goal of the sensory diet is to help maintain a calm yet alert state for the child, as well as helping to make the student feel more comfortable and in control (Kumari Sahoo & Senapeti, 2014). Outdoor play is an important part of every child's sensory diet, because

every type of sensory input is available to them. Additionally, outdoor play can be either structured or unstructured, giving the child some choice as to what sensory input will make them feel best.

As previously stated, children who have difficulty coping with cognitive demands of the environment may benefit from basic sensory experiences within the classroom (Hong & Hong, 2004). Therefore, including gentle stimulation experiences such as bean bags, bubble tubes, fiber optics, dimmed lights, sound and light floor, tactile panels, and the like within the classroom could be especially beneficial to include in the sensory diet of children with learning disabilities.

Mills, Chapparo, and Hinitt (2016) explored the idea of creating an in-class sensory activity schedule, specifically for children with ASD and intellectual disabilities. The idea stemmed from sensory diets as their goal was also to provide specific sensory input and set times to improve occupational performance. Four children participated in the study, in which they engaged in a number of sensory activities for about 10 minutes with a teacher or teacher's aid. Activities included jumping on a mini trampoline, being squished under a therapy ball, going in a Body Sock, bouncing on a therapy ball, and the like. The activities were chosen by the school's occupational therapist based on the child's needs. Three out of the four children made significant improvements in task completion following the sensory activities (Mills et al., 2016). Mills and Chapparo (2018) explored teachers' perspectives of the schedule, and in general, the schedule helped teachers learn new ideas, collaborate with the OT, and see a positive increase in concentration and reduction in behaviors.

Exercise breaks within the classroom are another option to be added to all students' sensory diets, as structured physical exercise has shown to be effective in improving engagement in classroom tasks (Lang, O'Reilly, & Healy, 2012). Children spend most of their day in a prolonged sedentary position, which causes reduction in attention, and also prevents them from meeting daily exercise recommendations. Harris, Cortina, Templin, Colabianchi, and Chen (2018) explored the use of six-minute coordinated bilateral physical activity (CBPA) breaks within the classroom to increase attention and concentration. Three groups were in participation, one group who participated in CBPA, one who wore FitBits to track their daily exercise, and a control group. Each group took the D2 Test of Attention as a pretest and posttest. In the CBPA intervention group, students followed a video for six minutes after they had been sitting for a 20 minute duration prior. The results of the study showed the participating in the CBPA increased processing speed, focused attention, concentration performance, and attention span (Harris, Cortina, Templin, Colabianchi, & Chen, 2017).

Overall, sensory input can either benefit or inhibit school performance, depending on the type of stimuli and the students' individual sensory preferences. This can be done by modifying the sensory environment to fit the needs of all students, and incorporating varying types of sensory input within the classroom. In doing so, one must assess the students within the classroom and utilize interdisciplinary collaboration to determine ways to make the classroom inclusive for all.

Model: Ecology of Human Performance

The Ecology of Human Performance (EHP) is a model derived from OT and social science literature, as well as the disability movement. The model is based on the

proposition that individuals can not be understood separately from their environment (Schell, Gillen, & Scaffa, 2014). The model specifies the relationship between person, context, task, and performance. The person brings a unique set of variables, past experiences, personal values and interests, as well as sensorimotor, cognitive, and psychosocial skills (Hinojosa, Kramer, & Royeen, 2017). The context is the set of interrelated conditions that surround the person (Hinojosa et al., 2017). The contexts considered within this model are temporal, physical, social, and cultural. The term 'task' is used in place of occupation in order to expand the interdisciplinary use of the model. Tasks are considered sets of observable behaviors that allow an individual to accomplish an end goal (Hinojosa et al., 2017). Performance is what occurs when a person engages in tasks within a context. Performance range is the amount of tasks available based on interaction between the person and the context (Hinojosa et al., 2017).

EHP was developed due to a general lack of consideration of the context of clients through the therapy process, especially during evaluation (Dunn, Brown, & McGuigan, 1994). If individuals are evaluated without considering context, the interpretation of their skills can be misconceived. Therefore, this model provides a structure to consider context as an important variable within assessment and intervention (Hinojosa et al., 2017). During the evaluation and intervention planning process, there are basic steps to be used when applying this framework. To start, determine the person's wants, need, and priorities. Next, the prioritized tasks should be analyzed to determine the skills needed and demand of the tasks, followed by evaluation of the individual's performance within the tasks. The context should then be assessed and it should be understood as to how it might affect performance of the individual. Those factors should be compared with the

person factors to determine which factors inhibit or support occupational performance. Finally, based on this information, prioritized goals and intervention strategies can be chosen to support participation within the context (Hinojosa et al., 2017). A collaborative process should be used by the occupational therapist throughout the entire evaluation and intervention process. Evaluation and intervention should not be driven by the therapist, but should be based on what is most important to the client. Each aspect of the person, environment, and occupation should be considered continually as a dynamic process (Schell et al., 2014).

There are numerous intervention strategies that emerge from the EHP ideals including establish and restore, alter, adapt and modify, prevent, and create (Hinojosa et al., 2017). Establishing and restoring is focused on improving a person's skill, establishing a new skill, or restoring a skill that has been lost. Altering aims at finding options for current abilities and context options available. Adapting and modifying requires consideration of changes to make in aspects of the context or task. Prevent intervention is used to avert potential negative outcomes. Finally, 'create' is an intervention that does not assume that a problem exists or is likely to occur, rather, it is focused on maximizing performance for all people and populations (Hinojosa et al., 2017). In conclusion, this model can be used to evaluate and modify the environment to fit the needs of the individuals within the environment. In order to make a classroom that provides a sensory environment that is inclusive to all, the create intervention strategy can be used to maximize performance for all children within the classroom, while the other intervention strategies can be used to target person and environment match for individual students.

CHAPTER III
METHODOLOGY

The primary methodology used to create this product included an extensive literature review of current research. The purpose of the literature review was to gain a better understanding of how the sensory system impacts learning, current sensory-based strategies that would be helpful in the classroom, common diagnoses impacted by sensory processing, and current laws and legislation in the school system.

The literature review was completed on multiple databases on Harley E. French and Chester Fritz Library including CINAHL, ERIC, Google Scholar, OT Search, and AJOT. Key terms used to conduct the research included; sensory processing, classroom environment, occupational therapy, teachers, students, flexible seating, universal design, sensory integration, sensory modulation, and collaboration. Textbooks and research articles were also utilized in the methodology of this product. The guide was created through utilization of the EHP model, and content was based on the findings of the research to promote universal design in relation to sensory processing.

Prior to beginning the research, an outline was created to determine what should be included within the review. The review of literature indicated that although young students may appear to enjoy the excitement within the classroom, there needs to be a degree of structure and order when designing the classroom (Barrett et al., 2013). Many classrooms have a large amount of distracting sensory stimuli such as bright lights, visual stimuli on the walls, noises from individuals within the room, and sensory rich learning

experiences; each of which can have an impact on learning (Miller-Kuhaneck & Kelleher, 2015). Therefore, consideration of the sensory environment is important to ensure that all children are able to learn to the best of their ability. In designing the classroom it is ideal to have high lighting quality, adequate acoustics within the room to control noise, and limited decor on the walls in order to control the visual and auditory of sensory stimulation (Barrett et al., 2013; McDowell & Budd, 2018; Fisher, Godwin, & Seltman, 2014). Additionally, there are a variety of strategies to use directly with the students, such as flexible seating options and movement breaks to facilitate proprioceptive and vestibular input (Bagatell et al., 2010; Lang, O'Reilly, & Healy, 2012).

This guide is designed based on information from the literature review to provide teachers with information on the sensory system, sensory processing, learning styles, and common diagnoses with sensory sensitivities. Next, recommendations are given on strategies for universal design in relation to the sensory system. These recommendations are given in sections according to each individual sense (visual, proprioceptive/vestibular, tactile, auditory, oral-motor, and olfactory). Each section includes environmental modifications as well as sensory related activities to be used within the classroom. Each recommendation given within this section has potential to benefit all children within the classroom, not just those who have a diagnosis related to sensory processing. Finally, the last section includes a sensory checklist that is meant to facilitate collaboration between the teacher and school occupational therapist to develop a plan for specific students.

The main purpose of the guide is to assist teachers in developing a classroom that accommodates children with a wide variety of sensory needs and preferences. Another

purpose of the guide is to promote collaboration between teachers and occupational therapists, as both professionals' have a unique skill set that is helpful in classroom design and student intervention.

CHAPTER IV
PRODUCT INTRODUCTION

This guide, which may be found in the Appendix, was created to be used by teachers to create and modify their classroom to facilitate an inclusive sensory environment. Background information related to occupational therapists' knowledge of sensory processing, universal design, and collaboration between occupational therapists and teachers is included. Essential components of the sensory system are described to provide teachers with a basic understanding of factors related to sensory processing. Following this educational information is a resource containing sensory activities for teachers to incorporate in the classroom to promote inclusion and optimal learning, prevent negative behaviors, and provide suggestions for a sensory sensitive environment.

Benefit to Teachers

The intent of this guide is to provide teachers with a tool to use when setting up their classrooms. Included within the guide are evidence-based, universal design suggestions for the classrooms in order to promote a more sensory inclusive environment for all students. It is our hope that these suggestions will reduce behaviors, provide sensory experiences that children require to be calm and comfortable within the classroom, and empower teachers to reach out to the school's occupational therapist to discuss children that may have higher sensory needs. After reading through the guide, it is intended that the teacher will feel more knowledgeable about the sensory system and how it impacts children's learning.

Benefit to Occupational Therapy

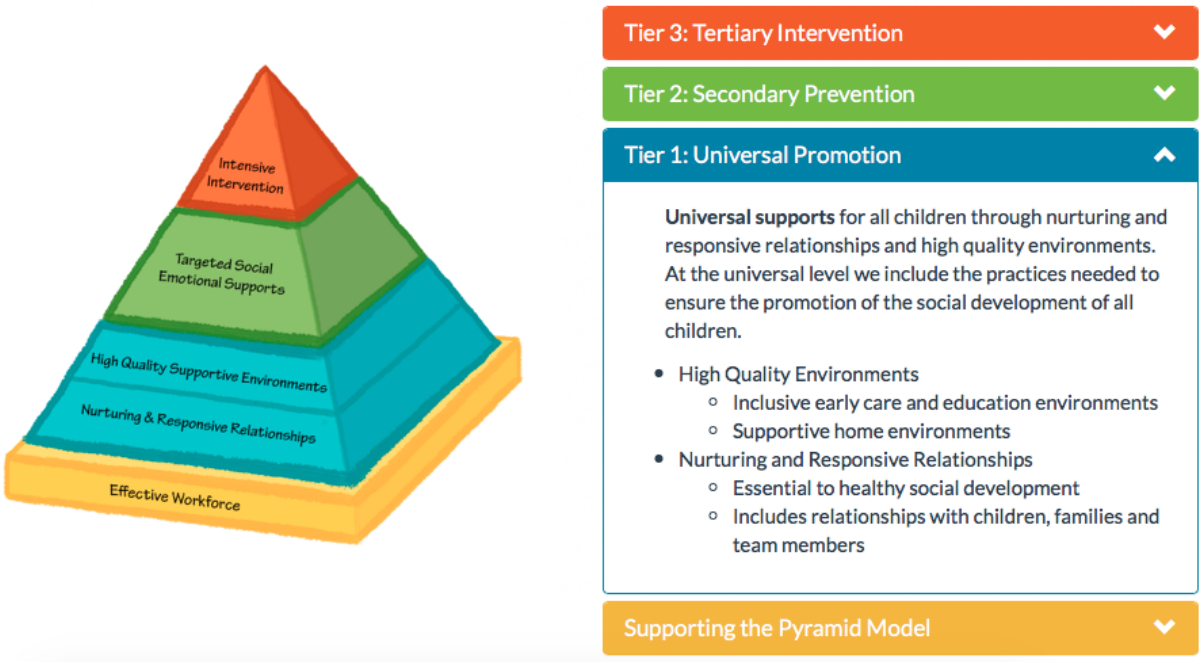
The discipline of occupational therapy (OT) has had a collective interest in sensory processing across the entire evolution of the profession. OT has generated and continues to generate a wealth of knowledge about how individuals process sensory information and how those methods influence choices. These choices ultimately affect a person's ability to live a satisfying life (Dunn, 2001). This guide provides an opportunity for occupational therapists within the school setting to share their knowledge about the sensory system with teachers and open the door to collaboration. Interdisciplinary collaboration is commonly used in educational settings to develop a child's IEP to ensure the best outcomes for the child (Hillier, Civetta, & Pridham, 2010). In addition to collaborating to ensure optimal outcomes for an individual child's needs, collaboration can and should be used to promote optimal outcomes for all children. Because occupational therapists have knowledge of the sensory system, they should have a role in implementing strategies for universal design that address the sensory environment. Additionally, this helps give identity to the OT profession, specifically for those working in schools.

Response to Intervention Tiers

Response to intervention (RTI) integrates assessment and intervention within a multi-level prevention system to maximize student achievement and reduce behavioral problems (Essential Components of RTI, 2018). With RTI, schools use data to identify students at risk for poor learning outcomes, monitor student progress, provide evidence-based interventions, adjust the intensity of those interventions depending on a student's

responsiveness, and identify students with disabilities (Essential Components of RTI, 2018).

This product falls under the first tier, Universal Promotion. As outlined in the image below, Tier 1 is considered preventative and considers universal design and supports to help all children. The overarching goal is to collaborate with teachers to engage in universal promotion in order to reduce behavioral problems and increase attention and on-task behavior within the classroom.



(Pyramid Model Overview, 2018)

Model

This guide was created using concepts from the Ecology of Human Performance (EHP) model. This model was made with the idea that individuals can not be understood separately from their environment (Schell et al., 2014). Intervention strategies that

emerge from the EHP ideals include: establish and restore, alter, adapt and modify, prevent, and create (Hinojosa et al., 2017). This model can be used to adapt and modify the environment to fit the needs of the individuals within the environment. It can also be used to to prevent negative behaviors related to sensory processing. Finally, in order to make a classroom that provides a sensory environment that is inclusive to all, the create intervention strategy can be used to maximize performance for all children within the classroom.

CHAPTER V
CONCLUSION

The purpose of this project was to gain knowledge about the sensory system and how it impacts student learning within the classroom in order to develop a guide for teachers. This information was gathered through an extensive literature review of research obtained through library databases and other educational materials. The goal of the guide is to educate teachers and provide a resource to assist them in creating a sensory inclusive classroom for all of their students, regardless of ability. Included in the guide is operational definitions of terminology, classroom modifications specific to each of the seven senses, sensory activities that can be incorporated in the day-to-day classroom schedule, and a checklist to provide more detailed sensory information on a specific student. Additionally, it is intended that the guide will facilitate collaboration between teachers and occupational therapists in the school setting.

A limitation of the guide is the lack of research on the flexible seating options that are available to purchase for classrooms. This creates confusion regarding whether certain seating options are beneficial or counter-productive for students while learning. Additionally, some of the recommendations given within the guide may not be feasible given the resources available within specific schools. However, the product leaves room for teachers to be creative with the resources they do have, and promotes collaboration between teachers and occupational therapists.

This product can be implemented through distribution to teachers or occupational therapists in elementary schools who show interest. Additionally, the product can be sent to parents if they show interest or curiosity in the set-up or activities used within their child's classroom. The product can be sent digitally by email for no charge or a hard copy can be sent through the U.S. Postal Service if the recipient is willing to pay for the cost to print, bind, and ship the product. In the future, the product usefulness could be measured through a teacher satisfaction survey sent out via Survey Monkey. Utilizing a likert scale, the survey questions would address the strengths and weaknesses of the guide after teachers have implemented the recommendations for the duration of at least six months. This would allow the creators of the guide to make changes to the guide in order to ensure usefulness. Additionally, the information gathered from the surveys would provide research relating to the usefulness of the product within various classrooms and in turn, promote a more widespread use of the guide. It is not anticipated that there be roadblocks in the distribution of the product, as there is the option of the resource at no cost for teachers, occupational therapists, and parents. However, problems may arise with the implementation of the recommendations. Some recommendations may not be feasible in certain classrooms due to lack of equipment, funds, and time. The intent is that the user focus on the basic information provided within the guide and use creativity, as well as collaboration, to create a classroom environment that is relevant and inclusive for all students.

Recommendations for future action related to this product could include creating an inservice or workshop held by occupational therapists for teachers relating to sensory inclusion in the classroom. A guide could also be produced for occupational therapists to

offer direct consultation for teachers in creating their classrooms. On a larger scale, future action could be taken to develop a plan for occupational therapists to be involved when creating schools utilizing the concepts of universal design. As for the guide, it is important that the information stay relevant and up to date in the future based on the most recent research relating to the sensory systems, classroom equipment, beneficial environmental modifications and sensory activities.

In light of the push to keep all children in the least restrictive environment, it is anticipated that the guide will promote inclusion within classrooms through accomodation of a wide range of sensory preferences. This can be done through the use of intervention strategies from the EHP model, such as create and prevent. The guide addresses the gap between occupational therapists' knowledge of sensory strategies and teachers' knowledge of student behaviors and classroom design. It is important for teachers and occupational therapists to work together to determine and overcome the contextual barriers in keeping children in their least restrictive environment.

REFERENCES

About SPD. (2018). Retrieved from https://www.spdstar.org/basic/about-spd

American Psychiatric Association (2014). Diagnostic and Statistical Manual for Mental Disorders, 5th ed (DSM-V). Washington, DC: APA.

American Occupational Therapy Association. (2014). Occupational therapy practice framework: Domain and process (3rd ed.). *American Journal of Occupational Therapy, 68*(Supplement 1), S1–S48. http://doi.org/10.5014/ajot.2014.682006

American Occupational Therapy Association. (2016). *Occupational Therapy in School Settings* [Fact Sheet].

Ashburner, J., Bennett, L., Rodger, S., & Ziviani, J. (2013). Understanding the sensory experiences of young people with autism spectrum disorder: A preliminary investigation. *Australian Occupational Therapy Journal*, *60*(3), 171-180. doi:10.1111/1440-1630.12025

Ashburner, J., Ziviani, J., & Rodger, S. (2008). Sensory processing and classroom emotional, behavioral, and educational outcomes in children with autism spectrum disorder. *American Journal of Occupational Therapy*, *62*(5), 564–573. doi:10.5014/ajot.62.5.564

Attention deficit-hyperactivity disorder information page. (2018, June). Retrieved from https://www.ninds.nih.gov/Disorders/All-Disorders/Attention-Deficit-Hyperactivity-Disorder-Information-Page

Bagatell, N., Mirigliani, G., Patterson, C., Reyes, Y., & Test, L. (2010). Effectiveness of therapy ball chairs on classroom participation in children with autism spectrum disorders. *American Journal Of Occupational Therapy*, *64*(6), 895-903. doi:10.5014/ajot.2010.09149

Barrett, P., Zhang, Y., Moffat, J., & Kobbacy, K. (2013). A holistic, multi-level analysis identifying the impact of classroom design on pupils' learning. *Building and Environment*, *59*, 678-679. http://dx.doi.org/10.1016/j.buildenv.2012.09.016

Bar-Shalita, T., Vatine, J. J., & Parush, S. (2008). Sensory modulation disorder: A risk factor for participation in daily life activities. *Developmental Medicine and Child Neurology, 50*, 932–937. https://doi.org/10.1111/j.1469- 8749.2008.03095.x

Ben-Sasson, A., Soto, T. W., Heberle, A. E., Carter, A. S., & Briggs-Gowan, M. J. (2017). Early and concurrent features of ADHD and sensory over-responsivity symptom clusters. *Journal of Attention Disorders*, *21*(10), 835–845.

Bodison, S. C. & Parham, L. D. (2018). Specific sensory techniques and sensory environmental modifications for children and youth with sensory integration difficulties: A systematic review. *American Journal Of Occupational Therapy*, *72*(1), 1-11. doi:10.5014/ajot.2018.029413

Chia-Ting, S. & Parham, L. D. (2014). Validity of sensory systems as distinct constructs. *American Journal Of Occupational Therapy*, *68*(5), 546-554. doi:10.5014/ajot.2014.012518

Dean, E. E., Little, L., Tomchek, S., & Dunn, W. (2017). Sensory processing in the general population: Adaptability, resiliency, and challenging behavior. *American Journal of Occupational Therapy, 72*(1), 7201195060. doi:https://doi.org/10.5014/ajot.2018.019919

Dole, R., Arvidon, K., Bryne, E., Robbins, J., & Schasberger, B. (2003). Consensus among experts in pediatric occupational and physical therapy on elements of individualized education programs. *Pediatric Physical Therapy, 15*(3), 159–166.

Dunn, W. (2001). The 2001 Eleanor Clarke Slagle Lecture. The sensations of everyday life: empirical, theoretical, and pragmatic considerations. *American Journal Of Occupational Therapy*, *55*(6), 608-620.

Dunn, W., Brown, C., & McGuigan, A. (1994). The ecology of human performance: A framework for considering the effect of context. *American Journal of Occupational Therapy*, *48*(7), 595-607. doi: 10.5014/ajot.48.7.595.

Fisher, A. V., Godwin, K.E., & Seltman, H. (2014). Visual environment, attention allocation, and learning in young children: When too much of a good thing may be bad. *Psychological Science*, *25*, 1362-1370. http://dx.doi.org/10.1177/0956797614533801

Hillier, S. L., Civetta, L., & Pridham, L. (2010). A systematic review of collaborative models for health and education professionals working in school settings and implications for training. *Education for Health, 23*(3), 1-12.

Hinckson, E., Salmon, J., Benden, M., Clemes, S. A., Sudholz, B., Barber, S. E., Aminian, S., & Ridgers, N. (2016). Standing classrooms: Research and lessons learned from around the world. *Sports Medicine*, *46*(7), 977-987. doi:10.1007/s40279-015-0436-2

Hinojosa, J., Kramer, P., & Royeen, C. B. (2017). The ecological model of occupation. In W. Dunn (Ed.), *Perspectives on human occupation: Theories underlying practice* (2nd ed., p. 207-233). Philadelphia: F.A. Davis Company.

Hong, C. & Hong, C. S. (2004). Helping children with learning disabilities: Making sense of multisensory environments. *Journal Of Family Health Care*, *14*(2), 35-38.

Harris, H. B., Cortina, K. S., Templin, T., Colabianchi, N., & Chen, W. (2018). Impact of coordinated-bilateral physical activities on attention and concentration in school-aged children. *Biomed Research International*, 1-7. doi:10.1155/2018/2539748

Jimenez, T., Graf, V., & Rose, F. (2007). Gaining access to general education: The promise of universal design for learning. *Issues in Special Education*, *16*(2), 41–52.

Kinnealey, M., Pfeiffer, B., Miller, J., Roan, C., Shoener, R., & Ellner, M. L. (2012). Effect of classroom modification on attention and engagement of students with autism or dyspraxia. *American Journal Of Occupational Therapy*, *66*(5), 511-519. doi:10.5014/ajot.2012.004010

Kumari Sahoo, S. & Senapati, A. (2014). Effect of sensory diet through outdoor play on functional behaviour in children with ADHD. *Indian Journal Of Occupational Therapy*, *46*(2), 49-54.

Lang, R., O'Reilly, M., & Healy, O., (2012). Sensory integration therapy for autism spectrum disorders: A systematic review. *Research in Autism Spectrum Disorders, 6*(3): 1004–1018.

Learning disabilities information page. (2018). Retrieved from: https://www.ninds.nih.gov/Disorders/All-Disorders/Learning-Disabilities-Information-Page

Lipkin, P. H. & Okamota, J. (2015). The individuals with disabilities education act (IDEA) for children with special needs. *American Academy of Pediatrics*, *136*(6), DOI: 10.1542/peds.2015-3409

Little, L. M., Dean, E., Tomchek, S., & Dunn, W. (2018). Sensory processing patterns in autism, attention deficit hyperactivity disorder, and typical development. *Physical & Occupational Therapy In Pediatrics*, *38*(3), 243-254. doi:10.1080/01942638.2017.1390809

McDowell, N. & Budd, J. (2018). The perspectives of teachers and paraeducators on the relationship between classroom clutter and learning experiences for students with cerebral visual impairment. *Journal Of Visual Impairment & Blindness*, *112*(3), 248-260.

McHenry, S. (1997). IDEA & Section 504 of the Rehabilitation Act -- advocating for school children. *New Jersey Nurse*, *27*(1), 6.

Menzinger, B. & Jackson, R. (2009) The effect of light intensity and noise on classroom behavior of pupils with Asperger syndrome. *Support for Learning, 24*(4)*,* 170-175. http://dx.doi.org/10.1111/j.1467-9604.2009.01420.x

Miguel, H., Sampaio, A., Martínez-Regueiro, R., Gómez-Guerrero, L., López-Dóriga, C., Gómez, S., Carracedo, A., & Fernández-Prieto, M. (2017). Touch processing and social behavior in ASD. *Journal Of Autism & Developmental Disorders*, *47*(8), 2425-2433. doi:10.1007/s10803-017-3163-8

Miller-Kuhaneck, H. & Kelleher, J. (2015). Development of the classroom sensory environment assessment (CSEA). *American Journal Of Occupational Therapy, 69*(6)*,* 1-9. doi:10.5014/ajot.2015.019430

Miller-Kuhaneck, H. & Watling, R. (2018). Parental or teacher education and coaching to support function and participation of children and youth with sensory processing and sensory integration challenges: A systematic review. *American Journal Of Occupational Therapy*, *72*(1), 1-11.

Mills, C. & Chapparo, C. (2018). Listening to teachers: Views on delivery of a classroom based sensory intervention for students with autism. *Australian Occupational Therapy Journal*, *65*(1), 15-24. doi:*f*pi10.1111/1440-1630.12381

Mills, C., Chapparo, C., & Hinitt, J. (2016). The impact of an in-class sensory activity schedule on task performance of children with autism and intellectual disability: A pilot study. *British Journal Of Occupational Therapy*, *79*(9), 530-539. doi:10.1177/0308022616639989

Moses, M., Gilchrest, C. & Schwab, N. (2005). Legal and ethical issues. Section 504 of the rehabilitation act: Determining eligibility and implications for school districts [corrected] [published erratum appears in J SCH NURS 2005 Apr;21(2):126]. *Journal Of School Nursing*, *21*(1), 48-58.

Orentlicher, M. L., Handley-More, D., Ehrenberg, R., Frenkle, M., & Markowitz, L. (2014). Interprofessional collaboration in schools: A review of current evidence. *American Occupational Therapy Association, 21*(2), 1-4.

Sadr, N. M., Haghgoo, H. A., Samadi, S. A., Rassafiani, M., Bakhshi, E., & Hassanabadi, H. (2017). The impact of dynamic seating on classroom behavior of students with autism spectrum disorder. *Iranian Journal Of Child Neurology*, *11*(1), 29-36.

Schaaf, R. C., Dumont, R. L., Arbesman, M., & May-Benson, T. A. (2018). Efficacy of occupational therapy using ayres sensory integration®: A systematic review. *American Journal Of Occupational Therapy*, *72*(1), 1-10. doi:10.5014/ajot.2018.028431

Scheerer, C. (1992). Perspectives on an oral motor activity: The use of rubber tubing as a 'chewy'. *American Journal Of Occupational Therapy*, *46*(4), 344-352.

Schell, B.A.B., Gillen, G., & Scaffa, M.E. (2014). Ecological models in occupational therapy. In C. E. Brown (Ed.) *Willard & Spackman's occupational therapy (12th ed., p. 494-504).* Baltimore: Lippincott Williams & Wilkins, a Wolters Kluwer Business.

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

Shimizu, V. T., Bueno, O. A., & Miranda, M. C. (2014). Sensory processing abilities of children with ADHD. *Brazilian Journal Of Physical Therapy / Revista Brasileira De Fisioterapia*, *18*(4), 343-352. doi:10.1590/bjpt-rbf.2014.0043

Smith, T. (2005). IDEA 2004: another round in the reauthorization process...Individuals with Disabilities Education Act (IDEA). *Remedial & Special Education*, *26*(6), 314-319.

Sood, D., LoCure, G., Schranz, C., & Morrison, C. (2018). In the classroom. Supporting participation for children with sensory processing differences in an early childhood center. *OT Practice*, *23*(12), 23-25.

Stewart, C., Sanchez, S., Grenesko, E., Brown, C., Chen, C., Keehn, B., Velasquez F., Lincoln, A. J., & Müller, R. (2016). Sensory symptoms and processing of nonverbal auditory and visual stimuli in children with autism spectrum disorder. *Journal Of Autism & Developmental Disorders*, *46*(5), 1590-1601. doi:10.1007/s10803-015-2367-z

Stonefelt, L. & Stein, F. (1998). Sensory integrative techniques applied to children with learning disabilities: an outcome study. *Occupational Therapy International*, *5*(4), 252-272.

Suarez, M. (2012). Sensory processing in children with autism spectrum disorders and impact on functioning. *Pediatric Clinics Of North America*, *59*(1), 203-214.

Subtypes of SPD. (2018). Retrieved from https://www.spdstar.org/basic/subtypes-of-spd

Taipalus, A. C., Hixson, M. D., Kanouse, S. K., Wyse, R. D., & Fursa, S. (2017). Effects of therapy balls on children diagnosed with attention deficit hyperactivity disorder. *Behavioral Interventions*, *32*(4), 418-426. doi:10.1002/bin.1488

Umeda, C. & Deitz, J. (2011). Effects of therapy cushions on classroom behaviors of children with autism spectrum disorder. *American Journal of Occupational Therapy*, *65*(2), 152–159. doi: 10.5014/ajot.2011.000760

Weitlauf, A. S., Sathe, N., McPheeters, M. L., & Warren, Z. E. (2017). Interventions targeting sensory challenges in autism spectrum disorder: A systematic review. *Pediatrics*, *139*(6), 1-22. doi:10.1542/peds.2017-0347

Wilson, A. L. & Harris, S. R. (2018). Collaborative occupational therapy: Teachers' impressions of the partnering for change (P4C) model. *Physical & Occupational Therapy In Pediatrics*, *38*(2), 130-142. doi:10.1080/01942638.2017.1297988

APPENDIX

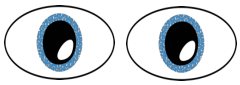
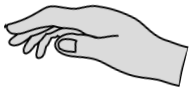
Creating a Sensory Inclusive Classroom: A Guide for Teachers

By: Bobbie Bertsch, MOTS and Kylie Browen, MOTS

Table of Contents

Thank you for your interest in creating a sensory inclusive classroom for your students! This guide will provide information on the sensory system, suggestions on how to design and implement appropriate sensory activities in your classroom, specific diagnosis information, and how all of this may impact your students' ability to learn. The goal for this guide is to combine occupational therapy (OT) knowledge with your knowledge as a teacher in order to promote sensory inclusion for the children in your classroom. Because OT is offered within the education system, you should have access to an occupational therapist within your school at least one day a week. If at any point you have questions about information from this guide, we encourage you to go directly to the occupational therapist. Collaboration with the occupational therapist is essential to ensure that children are safely engaging in sensory activities within the classroom. Occupational therapists have a unique set of skills to assess and implement sensory specific interventions for children that require it, but some strategies could be aversive if not used correctly. This guide should be used to ensure that optimal sensory experiences are available within the classroom without providing specific sensory intervention. That being said, *you* are the expert on *your* classroom and students. This product is intended to provide recommendations and give you the knowledge and resources to choose what you think will be feasible and useful within your classroom.

The Sensory Systems

Sense	Description
Sound (Auditory)  3	"The ability to perceive sound by detecting vibrations, changes in the pressure of the surrounding medium through time, through an organ such as the ear. Auditory processing relies on how the brain interprets, recognizes and differentiates sound stimuli."
Sight (Visual)  4	"The capability of the eyes to focus and detect images of visible light and generate electrical nerve impulses for varying colors, hues, and brightness. Visual perception is how the brain processes these impulses – recognizing, differentiating and interpreting visual stimuli through comparison with experiences made earlier in life."
Touch (Tactile)  5	"A perception resulting from activation of neural receptors, generally in the skin including hair follicles and a variety of pressure receptors respond to variations in pressure (firm, light, sustained, etc.)."
Smell (Olfactory)  6	"Our ability to detect scent – chemical, odor molecules in the air. Our olfactory system begins in our nose which has hundreds of olfactory receptors. Odor molecules possess a variety of features and, thus, excite specific receptors more or less strongly. This combination of excitement is interpreted by the brain to perceive the 'smell'."
Taste (Gustatory)  7	"The capability to detect the taste of substances such as food, certain minerals, and poisons, etc. The sense of taste is often confused with the "sense" of flavor, which is a combination of taste and smell perception. Humans receive tastes through sensory organs called taste buds concentrated on the upper surface of the tongue. There are five basic tastes: sweet, bitter, sour, salty and umami (savory)."
Body Position (Proprioception)  8	"The sense of the relative position of neighboring parts of the body and strength of effort being employed in movement. This sense is important as it lets us know exactly where our body parts are, how we are positioned in space and to plan our movements. Examples include being able to clap our hands together with our eyes closed, write with a pencil and apply with correct pressure, and navigate through a narrow space."
Movement (Vestibular)  9	"The perception of our body in relation to gravity, movement, and balance. The vestibular system measures acceleration… body movements and head position. Examples of the vestibular system in practice include knowing that you are moving when you are in an elevator, knowing whether you are lying down or sat up, and being able to walk along a balance beam."

What are the 7 Senses? (2018)

Sensory processing is the process of the brain receiving, interpreting, and organizing sensory information from the environment. An individual's ability to take in different sensory input and respond indicates their sensory processing abilities. If a person has an aversive response to any form of sensory input, it may be categorized as **sensory processing difficulties**. Sensory processing difficulties happen when the brain can't synthesize all the information coming in simultaneously. It can be described as, "a traffic jam in your head, with conflicting signals quickly coming from all directions, so that you don't know how to make sense of it all" (Arky, 2018). Sensory processing difficulties are often first recognized during toddler years, when parents notice that their child has an unusual aversion to noise, light, shoes that are "too tight" and/or clothes that are irritating. They may also notice clumsiness and difficulty with fine motor skills like fastening buttons (Arky, 2018). This can happen with any child, not just those children with a specific diagnosis. Evidence suggests that up to 16% of typically developing children demonstrate difficulties with sensory processing (Sood et al., 2018).

10

An individual's sensory processing pattern can be explained using the metaphor of cups. When sensory processing patterns are occurring at an optimal level, they have a normal sized cup. This means they are recognizing, interpreting, and organizing sensory input in a way that allows them to respond appropriately. When a person does not recognize sensory input easily, they have a large cup. A lot of liquid (sensation) is required to be poured in their cup before they notice the sensory input they are receiving. This means that the child may not be appropriately recognizing the sensory input, which interferes with their response and learning abilities. When a person responds too easily or too intensely to sensory information, they have a small cup. Only a small amount of liquid (sensation) is needed to fill the cup and it can easily overflow if too much is added. This means that the child is recognizing the sensory input, but it is overwhelming for them to interpret and organize, which negatively impacts learning. The size of cup an individual has can be different for each of their senses. For example, they may have a large cup for proprioceptive input and a small cup for auditory input. Each child's sensory patterns are unique and complex and response to sensory input may vary.

When a child's sensory patterns aren't occurring at an optimal level, they may respond in various unique ways to regulate their senses. In an attempt to "fill their cup," individuals may actively seek sensory input, such as jumping, fidgeting, etc. These individuals are sometimes considered **sensory seekers** as they are self-regulating by adding sensory input. On the other

hand, individuals who have small cups that are full or overflowing may respond by avoiding sensory input, such as covering their ears with loud noise. They may be considered **sensory avoiders** as they are self-regulating by removing sensory input.

Examples of what sensory processing difficulties might look like in the classroom:

- Covering eyes or ears
- Moving around or standing up
- Fidgeting
- Chewing on non-food objects
- Running into objects
- Being overly "touchy" to classmates
- Clumsiness
- Poor balance
- Poor attention
- Avoiding touch
- Avoiding being close to peers
- Excessive talking
- Aggression/Violence
- Fine motor difficulties
- Difficulties with transitions
- Tantrums or meltdowns

11

Disclaimer: It is important to separate a child's behaviors from a sensory processing issue. There are numerous factors that may contribute to a child's behavior such as lack of sleep, nutrients, or exposure to certain experiences due to home life. Sensory processing difficulties may or may not be the reason for the behaviors listed above. Consult with the occupational therapist in your building if specific children are repeatedly engaging in behaviors, such as the ones listed above, to further investigate the underlying problem.

Learning Styles

Each child experiences the world differently, and with that comes a variety of ways that each child learns best. There are four main types of learning styles that you may see in the classroom, and some children might have multiple preferred ways of learning. The four styles include: visual, auditory, kinesthetic, and reading/writing. Below is an outline of each style along with characteristics of each that may be observed. Additionally, there are some suggestions for you to create an environment and curriculum that utilizes various learning styles so that each child is getting what they need in order to process and learn the presented material.

Visual Learners

Someone with a preference for visual learning appreciates seeing and observing things, including pictures, diagrams, written directions, etc. (Elrick, 2018).

What might this look like in students?

- Doodling
- Making lists
- Taking notes

What can you do for them?

- Write on the whiteboard or Smartboard
- Make handouts and presentations
- Show pictures or diagrams
- Allow students time to process

12

Auditory Learners

Auditory learners tend to learn better when the subject matter is reinforced by sound (Elrick, 2018).

What might this look like in students?

- Listen to lecture rather than read notes
- Read aloud to themselves
- Repeat things that you say
- Speak up in class often
- Great at verbally explaining concepts


13

What can you do for them?

- Ask questions and let them answer

- Facilitate group discussions
- Watch videos or use audiotapes

Kinesthetic Learners

Kinesthetic or tactile learners learn through experiencing or doing things (Elrick, 2018).

What might this look like in students?

- Enjoy acting concepts out
- Use their hands to touch/handle objects
- Have difficulty sitting still

What can you do for them?

- Get them moving!
- Play learning games
- Engage them through use of a whiteboard or other hands-on activities


14

Reading/Writing Learners

While there is some overlap with visual learning, reading/writing learners prefer to learn through written words (Elrick, 2018).

What might this look like in students?

- Reading articles on the internet often
- Writing in diaries/notebooks
- Looking up words in the dictionary

What can you do for them?

- Assign written essays
- Provide opportunities for research
- Suggest and assign reading material
- Allow students time to process


15

Main Diagnoses with Sensory Sensitivity Characteristics

Though you are not diagnosing your students or implementing specific intervention strategies, it is important to understand the specific characteristics that a diagnosis may have regarding sensory processing. The following section includes an outline of several diagnoses that have specific and observable sensory difficulties that present in children and what they may look like in your classroom or the school environment as a whole. If you have individuals with these diagnoses within your classroom and have concerns about their performance in the classroom, it may be helpful to collaborate with the school occupational therapist to determine specific sensory strategies for that student. Acknowledging these sensory characteristics and supporting the learning environment as much as possible for these specific children will facilitate optimal learning for all.

Learning Disability

A learning disability is defined as a disorder that affects the ability to understand or use spoken or written language, do mathematical calculations, coordinate movements, or direct attention (Learning Disabilities Information Page, 2018). Many children with learning disabilities also have underlying difficulties integrating their senses (Stonefelt & Stein, 1998). Children with learning disabilities who have difficulty making sense of their environment may give up trying to make sense of it all together. As a result, the child may appear to have very little interaction with the environment, including the classroom, gym, playground, etc., as well as with their peers (Hong & Hong, 2004).

Children who have difficulty coping with cognitive demands appear to benefit from basic sensory experiences, and gentle stimulation appears to have a soothing effect on children with learning disabilities (Hong & Hong, 2004). One way to incorporate this type of stimulation may be by providing a multisensory environment. Multisensory environments are specially designed spaces that enable individuals to engage with a wide range of sensory experiences including visual effects, special sounds, scents, and tactile sensations (Hong & Hong, 2004). Sensory experiences include: bean bags, bubble tubes, fiber optics, dimmed lights, sound and light floor, tactile panels, etc., some of which are also contained in the general modification and activities sections above (Hong & Hong, 2004). Multisensory environments appear to benefit children with learning disabilities if there is an opportunity to use them (Hong & Hong, 2004).

Attention Deficit Hyperactivity Disorder (ADHD)

ADHD interferes with an individual's ability to stay on task and to maintain age-appropriate inhibitions (Attention Deficit-Hyperactivity Disorder Information Page, 2018).

Common characteristics of ADHD include failure/difficulty listening to instructions, inability to organize self-and/or school work, fidgeting with hands/feet, excessive talking, leaving work unfinished, and having trouble paying attention and responding to details (Attention Deficit-Hyperactivity Disorder Information Page, 2018). Sensory sensitivities and avoidance have been highly reported in children with ADHD (Little et al., 2018). Researchers estimate the extent of sensory over-responsivity in children with ADHD varies from 46% to 69% (Ben-Sasson et al., 2017). For example, a child with these sensory challenges may appear inattentive during tasks in which he/she finds aversive (Little et al., 2018). Additionally, sensory sensitivity in ADHD is related to anxiety, socialization difficulties, and aggressive behaviors (Little et al., 2018).

Sensory Processing (SPD) / Sensory Modulation Disorder (SMD)

SPD occurs when sensory signals are either not detected or do not get organized into appropriate responses (About SPD, 2018). SMD refers to a complex process of perceiving sensory information and generating responses that are appropriate based on the situation (Bar-Shalita et al., 2008). Sensory modulation is the ability to simultaneously regulate and organize reactions to sensory input, filter out unwanted stimuli while attending to relevant stimuli, and maintain an optimal arousal level (Bar-Shalita et al., 2008). Individuals diagnosed with SMD may display a wide range of behaviors relating to their sensory patterns (Bar-Shalita et al., 2008). This is due to typical sensory stimuli being experienced as unpleasant, painful, or irritating, which can lead to defensive behaviors and/or withdrawal from daily tasks (Bar-Shalita et al., 2008).

Autism Spectrum Disorder (ASD)

ASD is a disorder characterized by social and communication impairments, restricted interests, and repetitive behaviors. Many children with ASD appear to react differently to sensory input or have unusual interest within the sensory environment (American Psychiatric Association, 2014). Although patterns of sensory processing differ from child to child, the sensory processing difficulties associated with academic underachievement in children with ASD have been found to be tactile and auditory sensitivity, and under-responsiveness or sensory seeking, which means they don't recognize sensory input easily or may try and find ways to get additional input. Reactions to uncomfortable sensory stimuli could present in a variety of ways including: avoidance, violence, and/or aggression (Menzinger & Jackson, 2009). The educational progress of children with ASD can be affected by their limited capacity to self-regulate emotional and behavioral responses and remain on task (Ashburner et al., 2008).

One study poses that sensations that are expected, predictable, controllable, as well as self-selected are more likely to be perceived as pleasant (Ashburner et al., 2013). Conversely, sensations that are unexpected and outside of the individual's control are perceived as unpleasant (Ashburner et al., 2013). Children with ASD are especially impacted by unpredictable auditory stimulation in that they become either easily distracted or tune out auditory input all together (Ashburner et al., 2008). Research suggests that auditory difficulties in individuals with ASD can include lack of response to one's name, distress over sound, or distractibility by background noise (Stewart et al., 2016). This may be observable by children covering their ears with their hands. Environment modifications and support may allow for greater participation in meaningful activities for children with ASD (Suarez, 2012). Another common characteristic of a child with ASD is lack of eye contact. It is important to remember that though they may not be looking directly at a person or in a particular direction, they are still aware and engaged in what is going on around them.

16

Specific Modifications for Children with a Diagnosis

These specific modifications can be implemented with collaboration and guidance from the occupational therapist and according to the child's IEP:

- More time for note taking and fine motor activities
- Oral tests
- Writing alternatives (tape recorder, word processor)
- Limit grading on fine motor performance if it is a determined area of weakness
- Utilizing weighted vests or weighted lap pads
- Chewelry


17


18

Please Note: Many of the environmental modification and sensory activity ideas listed in the universal design section of this product are beneficial to children with a diagnosis as well. This section is intended to briefly educate about some of the sensory sensitivities that children with specific diagnoses may experience. But remember - some diagnosis have multiple sensory patterns, so it is important to choose strategies to improve classroom participation on the basis of patterns of sensory processing for each child and not based on a diagnosis (Bagatell et al., 2010). Consult the occupational therapist in your building if you are interested in learning more about specific sensory techniques for a student in your classroom, or if you believe OT services may benefit an individual.

Universal Design for the Classroom

Universal design for learning includes providing access to learning and curriculum for all students, not just those who are identified as having a disability (Post, 2016). Universal design looks different in each classroom because each classroom is unique and composed of students with a variety of learning strengths and needs (Clark & Chandler, 2013). Universal design is challenging as it takes time and requires collaboration. However, educators and OT practitioners must shift their thinking to view universal design as an opportunity to partner and combine experiences and expertise to create more effective learning environments (Clark & Chandler, 2013). Because sensory patterns are unique to each individual, the sensory environment should be considered in universal design in order to promote inclusion in the classroom. Incorporating a variety of sensory experiences while teaching will help optimize learning for all students. The following pages include universal design classroom modifications, sensory sensitive modifications, and sensory activities relating to each individual sense.

19

Visual Environmental Modifications and Sensory Activities

The visual environment should be as "relevant" to what the students are learning as possible. Lighting should also be considered, as certain types of lighting may impede learning for those who are sensitive to it. Various ways to optimize the visual environment within your classroom are listed below, but feel free to contact your school occupational therapist for more specific ideas.

Environmental Modifications

- Limit the amount of decor on walls
- Pay attention to colors within the room
    - Find a balance between under stimulation and overstimulation
    - Incorporate different colors in different sections of the room based on the activities that take place there (for example: quiet corners should have calm/soothing colors, while active work spaces can have more stimulating colors)
        - Yellow- warm, cheerful, pleasing
        - Red- stimulating, exciting
        - Gray- neutral, calming
        - Blue- cool, protective, calming

20

- Blank spaces on the walls is okay!
- Limit visual distractions
- Use natural lighting as much as possible
- Utilize high quality lighting vs fluorescent lights
    - LED lighting
    - Halogen lights such as lamps
- Install light dimmers to control the intensity of the light
- Provide curtains/blinders/room dividers
- Provide pictures to support auditory lecture


21

Sensory Activities

- Bubble machines
- Multicolored lights (i.e. disco balls, flashing, etc.)
- "Calm down" bottles

Desk Modifications

- Paper placement outlined with tape
- Visual timers
- Visual schedules
- Sunglasses
- Visors
- Visual barrier around desk, such as cardboard or folders

22

Proprioceptive / Vestibular Environmental Modifications and Sensory Activities

The proprioceptive and vestibular senses main functions are controlling balance, movement, and body awareness. When used correctly, proprioceptive and vestibular input can have a calming effect on students and allow them to feel more oriented in space (Morin, 2014). The following recommendations can be used to provide proprioceptive and vestibular activities and exposure within your classroom.

Seating

When a child is sitting in a desk, the optimal seating position is when the hips, knees, and ankles are at about a 90-degree angle. Flexible seating options can be a way to provide proprioceptive or vestibular input for a child and allow them to move more freely. Seating options should be available for use along with a regular desk to ensure that the child's body is in an optimal position for learning.

Options

- Therapy Balls
    - Sitting on a therapy ball allows children to release energy and receive sensory stimulation at the same time, reducing the need for disrupting sensory seeking behaviors (Sadr et al., 2017).
- Therapy Cushions
    - In one study, the use of therapy cushions improved sitting times for most of the students. The authors state "unlike the ball, a cushion provides a more stable surface for sitting, and the children do not need more muscle activity to keep balance on seats" (Sadr et al., 2017).
- Standing Work Areas
    - Children spend between 50-70% of their time sitting while at school, and research suggests that prolonged sitting is associated with poor health outcomes in adulthood (Hinckson et al., 2016).
    - Benefits of height-adjustable desks or standing work stations include increased energy expenditure and potential for improved management of students' behavior in the classroom (Hinckson et al., 2016).
- Rocking Chairs
    - Sitting in a rocking chair allows children to get both vestibular and proprioceptive input and allows them more movement than a typical chair.

- Alternative Positioning Options During Work Time
    - Feel free to get creative in your classroom and change up seating for specific activities. However, keep in mind the optimal seating positions suggested above. The following are additional seating examples that can be used intermittently within the classroom:
        - Laying on stomach and using clipboards
        - Sitting on cushions or bean bags on the floor
        - Comfortable furniture (i.e. couch, cushioned chairs, etc.)


23


24

25

Sensory Activities

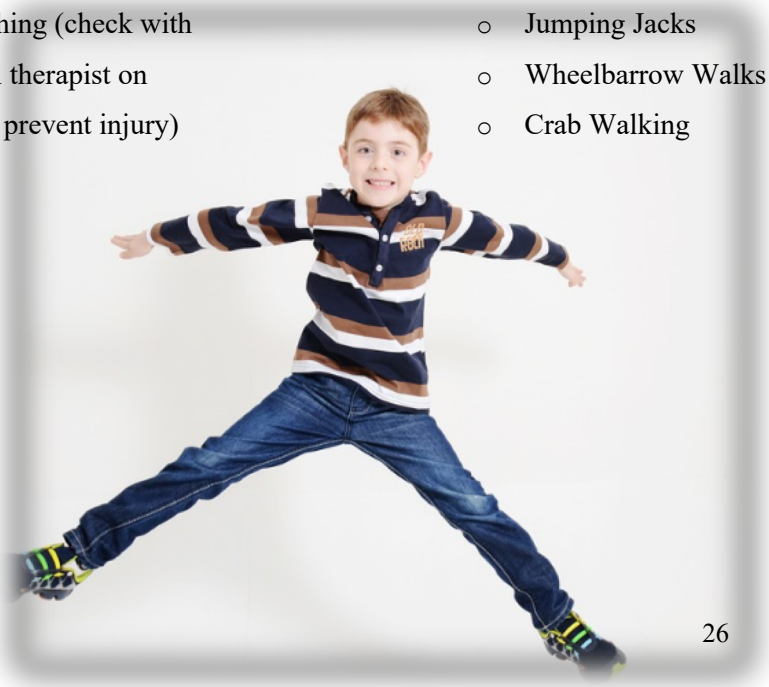
Listed below are desk activities that can be suggested to a student that may be inattentive or feeling restless during class time:

- Chair push ups
- Chair/body squeezes
- Hand gripper exercises
- Rubber band stretches
- Put an elastic band around the legs of the chair so the student can push on it while seated

Movement Breaks

Breaks are an essential part of learning. Particularly for younger students, regular breaks throughout the school day can be an effective way to reduce disruptive behavior. Recent studies suggest that short physical activity breaks in the classroom improved students' behavior, increasing the effort they put into their activities as well as their ability to stay on task (Terada, 2018). Recess is one sure way that your students are moving and releasing some energy.

- Examples of movement breaks that can be done in the classroom:
  - Gonoodle.com
  - Donkey kicks
  - Jumping/Hopping
  - Stretching
  - Heavy marching (check with occupational therapist on technique to prevent injury)
  - Wall pushups (check with occupational therapist on technique to prevent injury)
  - Sit-ups
  - Jumping Jacks
  - Wheelbarrow Walks
  - Crab Walking



26

Playtime or Free time Options

The following list includes child-led play time activities that could benefit students by providing proprioceptive and/or vestibular input. Your role during these activities would be to simply provide an environment that enables them to occur, encourage *safe* execution, and avoid penalizing for engaging in these movement activities during the allotted time.

- Leapfrog
- Tug-of-war
- Wheelbarrow walking
- Jumping on a small trampoline
- Crawling under mats/pillows
- Play with weighted bean bags
- Jumping/crashing onto mats
- Pushing each other on swing
- Foot-to-foot bicycling with friend
- Sitting on rocking chair
- Playing on swings, slides, seesaws, ladders, monkey bars, gliders, etc.

Errands/Jobs

Giving students jobs can not only give them a sense of helpfulness, but it can also be a way to facilitate sensory input. The following are examples of "jobs" to allow students to help with. It can be especially helpful to give these jobs to students who appear to be having a difficult time with attentiveness that day, without bringing attention to the behavior.

- Carrying books
- Moving chairs
- Carrying lunch boxes
- Erasing the board
- Passing things out
- Sweeping
- Stacking chairs
- Wiping the table or desk

Additionally, weighted lap pads or vests are ways to provide proprioceptive input for children, which can lead to increased concentration. Consult with the occupational therapist if you are concerned about a child's attentiveness and/or restlessness in class to determine if a weighted vest or lap pad could be an option.

28

Disclaimer: The proprioceptive and vestibular systems can produce negative symptoms if the child is overstimulated (i.e. change in skin color, vomiting, etc.). It is important to consult with the occupational therapist if there are specific concerns relating to a student's functioning within their environment after movement activities.

Tactile Environmental Modifications and Sensory Activities

Tactile input can be interpreted in numerous ways. In some circumstances it can be used to provide additional sensory input or help calm an individual, while in others it may be alarming and lead to decreased attentiveness (Ashburner et al., 2008). Listed below are some recommendations that may assist you in preventing or reducing aversive responses to tactile input within your classroom.

Environmental Modifications

- Separate spaces for each child
    - Reduce incidental touch which can be alarming or overwhelming for some
- Designate spaces for circle time (i.e. carpet square or colored dots)
- Approach students from the front and get down on their level
- Warn students before touch
- Avoid touching sensitive areas
    - i.e. hair, face, neck, stomach
- Increase predictability of classroom activities
    - Outline instructions prior to activities
    - Utilize a visual schedule
- Use firm touch
    - Avoid light touch


29

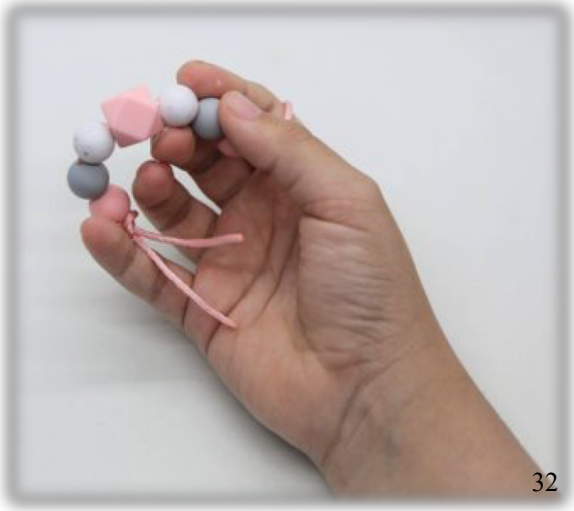
Desk Work (have the following options available if possible)

- Gripper on pencil/pen
- Pencils of different hardness's
- Felt-tip pens
- Ballpoint pens
- Vibratory pens
- Layers of paper
- Raised-line paper
- Textured papers
- Blotters


30

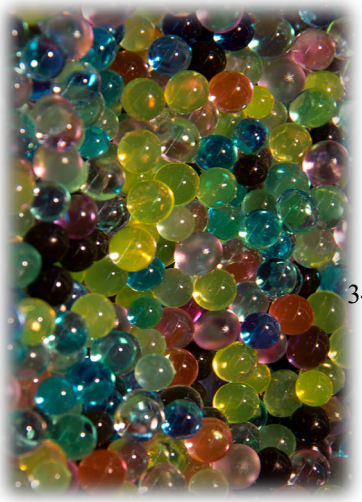
- Fidgets
    - Examples:
        - Water beads, rice, slime, flour, or small beads inside a plastic baggie and taped/glued closed
        - Tube sock filled with dry rice or beans
        - Beads strung on jumbo paper clip or pipe cleaner
        - Rubber band or hair tie around wrist
        - Attach binder clip to pencil

31



32

33



34

Sensory Activities for Experiences and Exposure

- Sensory stations with different textured mediums
    - i.e. water, beans, dry pasta, rice, shaving cream, play-dough, etc.
- Hidden objects in sandbox
- Wet/Messy Play
    - i.e. slime, wet noodles, etc.
- Practicing spelling in different mediums
    - i.e. sand, shaving cream, etc.
- Resistive hand activities
    - i.e. cutting, erasing, hand grippers, etc.

35

Snacks and Meals

- Time before and after meals to wash hands
- Dishes stabilized with Dycem (ask the occupational therapist if you have questions or where you can access this material)

Arts/Crafts

- Provide a variety of tactile art media
    - Never force a child to complete the activity if they are aversive to it.
      If it is noted that a child is frequently overwhelmed by certain textures, consult with the occupational therapist.
- Provide glue stick and glue paste options
- Provide paintbrush and finger paint options

36

37

Auditory Environmental Modifications and Sensory Activities

Limiting additional/extra noise within the classroom is one of the most effective ways to control adverse reactions to auditory stimuli. For example, installation of sound absorbing walls or panels can improve attention and engagement of students with auditory sensitivities (Kinnealey et al., 2012). Various suggestions to reduce/limit extraneous sounds within the classroom environment are listed below.

Environmental Modifications


38

- Quiet corners
    - Bean bags
    - Blankets
- Add Insulation Materials to Reduce Noise/Echo
    - Large area rugs
    - Bookshelves against walls to absorb sounds
    - Apply acoustic foam to walls in neutral colors
    - Hang tapestry or curtains in neutral colors to absorb sound
- Use a decibel app/device to ensure that the noise in the room is appropriate,
    - Optimal decibel level in classroom during work time is 30-40 dB
    - During group activities comfortable decibel level is 40-60 dB (National Center for Environmental Health, 2017)
- Provide auditory stimuli that is predictable and repetitive
- Close classroom door
- Desk blotters (reduces sound of writing)
- Use rubber bottoms on chairs and desks (reduce sound of movement)
- Ear plugs
- Hoodies
- Sound proof headphones


39

Sensory Activities for Auditory Exploration and Exposure

- Sound Table
    - Rain Stick
    - Musical Instruments
    - Sound Shakers (filled with water, rice, beans, beads, etc.)

40

41

42

Oral-Motor and Oral-Sensory Experiences

The oral-motor aspect of eating involves how the mouth muscles function such as how strong they are and how far they can move as they manipulate food in the mouth. The oral-sensory aspect of eating involves how the mouth tissues perceive sensory information such as the taste, temperature, and texture of food. Some children may be sensitive to oral stimuli, causing them to gag or have other negative reactions to certain types of food. Others may be under-responsive to oral stimuli meaning they may not feel food in their mouths or may let it drop out of their mouths without realizing it (What are oral-motor and oral-sensory problems?, 2018). The following ideas provide guidance for how to support oral motor and oral-sensory aspects within your classroom, whether it is prepping the mouth before eating, or giving options during snack time to allow children to explore different tastes and textures.

Chewelry

- Provides children with an appropriate medium to place in their mouth if seeking oral motor stimulation versus non-food items such as clothing, pencils/pens, etc.
- Consult with occupational therapist if a specific child is noted to be placing non-food items in their mouth frequently
- Determine with occupational therapist, parents, and student which option might be of best fit for the child:
    - Necklace
    - Bracelet

43

Before Snack - Oral Motor Prep

- Bite down hard on teeth and release
- Suck in cheeks
- Flap tongue
- Clicking tongue
- Blow up balloons (consider latex allergies)

Snack Time

Be sure to consider the allergies of your students before providing various snacks.

- Incorporate strong flavors such as sour and spicy
- Provide Healthy Crunchy Foods
    - Celery
    - Carrots
    - Apples
    - Pretzels
    - Crackers
    - Popcorn
    - Chickpeas
- Provide Healthy Chewy Foods
    - Fruit Leather
    - Beef Jerky
    - Granola Bars
- Have options of different textured foods
    - Applesauce
    - Cottage Cheese
    - Yogurt
    - Bananas


44


45


46

Disclaimer: Avoid forcing students to eat foods they dislike and/or allow students to respectfully and appropriately dispose of a food they tried but are unable to chew or swallow it completely. Consult with occupational therapist if specific feeding difficulties are repeatedly noted with a specific student.

Olfactory Environmental Modifications and Sensory Activities

Children can be overly sensitive to smells - they may pick up on and become distracted by smells that most people don't even notice (i.e. the smell of the cleaner used on their desk). Children can also demonstrate decreased sensitivity to smells - they seem to crave certain smells, often holding non-food items to their noses to smell them (i.e. markers). Due to the fact that you are unable to control all the scents and accommodate for each specific child, listed below are recommendations for classroom modifications with regards to general olfactory sensitivities, as well as suggestions for activities that promote exploration of this sense.


47

Classroom Modifications

- Eliminate/reduce aromas in room
    - Such as cleaning supplies, air fresheners, essential oils, etc.
- Use non-scented items
    - Such as hand-sanitizer, soaps, lotions, etc.
- Avoid wearing perfume or body mists/sprays

Sensory Activities for Exploration and Exposure

- Use containers filled with different cotton balls containing essential oils, spices, smelly objects, etc.
- Use scented play-doh or modeling clay
- Provide snack options with strong smells
- Have scented markers available as an option for use during specific times
- Place coffee beans in the sensory station

Disclaimer: Avoid forcing a child to smell certain things during exploration activities. Smell is a sense that can trigger a specific memory the child has experienced, positive or negative. Though it is difficult to control all possible scents, it is important to be aware that certain smells can be associated with trauma. Consult with the school's occupational therapist if you are concerned about a child's behavior relating to something that might be registered through the olfactory system.

Sensory Checklist

Lindsey Biel, OTR/L created a Sensory Checklist that was featured in a novel she co-authored, *Raising a Sensory Smart Child*. We have been granted permission by Lindsey Biel to include the checklist within this product, which can be found in the pages to follow.

About the Sensory Checklist

The Sensory Checklist includes sections that are separated by sense including: touch, proprioception (body sense), vestibular (movement sense), auditory/listening, vision, and taste and smell. This may be completed by you or sent home to the parents of a child with the intent to gain a better understanding of their sensory processing pattern. The individual completing the form is required to read various every day experiences relating to each sense and determine if the student avoids, seeks, mixed (both), or is neutral about the experience described. This will provide a basic understanding pertaining to how the child responds to various environmental stimuli based on their senses.

Intended Application

This checklist is not intended to diagnose a student in your classroom or make any adjustments based on the results, however, it can be used to provide the occupational therapist with an objective measure and open the door to a collaborative process combining both professionals' knowledge and expertise. Consulting with the occupational therapist in your building will ensure accurate interpretation of the material and help to develop a plan for the future, whether that may include an OT evaluation, simple day-to-day modifications, and/or specific sensory strategies to implement that may help.

If you have any questions regarding how to complete the checklist itself or concerning language used, do not hesitate to ask the occupational therapist in your building.

You can find a version of the Sensory Checklist to print for use in your classroom at: https://www.sensorysmarts.com/sensory-checklist.pdf

Sensory Checklist

From *Raising a Sensory Smart Child, © Biel & Peske, 2005*

TOUCH	AVOIDS	SEEKS	MIXED	NEUTRAL
Being touched on some body parts, hugs and cuddles	❑	❑	❑	❑
Certain clothing fabrics, seams, tags, waistbands, cuffs, etc.	❑	❑	❑	❑
Clothing, shoes, or accessories that are very tight or very loose	❑	❑	❑	❑
Getting hands, face, or other body parts "messy" with paint, glue, sand, food, lotion, etc.	❑	❑	❑	❑
Grooming activities such as face and hair washing, brushing, cutting, and nail trimming	❑	❑	❑	❑
Taking a bath, shower, or swimming	❑	❑	❑	❑
Getting toweled dry	❑	❑	❑	❑
Trying new foods	❑	❑	❑	❑
Feeling particular food textures and temperatures inside the mouth—mushy, smooth, etc.	❑	❑	❑	❑
Standing close to other people	❑	❑	❑	❑
Walking barefoot	❑	❑	❑	❑

PROPRIOCEPTION (BODY SENSE)	AVOIDS	SEEKS	MIXED	NEUTRAL
Activities such as roughhousing, jumping, banging, pushing, bouncing, climbing, hanging, and other active play	❑	❑	❑	❑
High-risk play (jumps from extreme heights, climbs very high trees, rides bicycle over gravel)	❑	❑	❑	❑
Fine motor tasks such as writing, drawing, closing buttons and snaps, attaching pop beads and snap-together building toys	❑	❑	❑	❑
Activities requiring physical strength and force	❑	❑	❑	❑
Eating crunchy foods (pretzels, dry cereal, etc.) or chewy foods (e.g., meat, caramels)	❑	❑	❑	❑
Smooth, creamy foods (yogurt, cream cheese, pudding)	❑	❑	❑	❑
Having eyes closed or covered	❑	❑	❑	❑

VESTIBULAR (MOVEMENT SENSE)				
	AVOIDS	SEEKS	MIXED	NEUTRAL
Being moved passively by another person (rocked or twirling by an adult, pushed in a wagon)	❑	❑	❑	❑
Riding equipment that moves through space (swings, teeter-totter, escalators and elevators)	❑	❑	❑	❑
Spinning activities (carousels, spinning toys, spinning around in circles)	❑	❑	❑	❑
Activities that require changes in head position (such as bending over sink) or having head upside down (such as somersaults, hanging from feet)	❑	❑	❑	❑
Challenges to balance such as skating, bicycle riding, skiing, and balance beams	❑	❑	❑	❑
Climbing and descending stairs, slides, and ladders	❑	❑	❑	❑
Being up high, such as at the top of a slide or mountain overlook	❑	❑	❑	❑
Less stable ground surfaces such as deep pile carpet, grass, sand, and snow	❑	❑	❑	❑
Riding in a car or other form of transportation	❑	❑	❑	❑

AUDITORY/LISTENING				
	AVOIDS	SEEKS	MIXED	NEUTRAL
Hearing loud sounds—car horns, sirens, loud music or TV	❑	❑	❑	❑
Being in noisy settings such as a crowded restaurant, party, or busy store	❑	❑	❑	❑
Watching TV or listening to music at very high or very low volume	❑	❑	❑	❑
Speaking or being spoken to amid other sounds or voices	❑	❑	❑	❑
Background noise when concentrating on a task (music, dishwasher, fan, etc.)	❑	❑	❑	❑
Games with rapid verbal instructions such as Simon Says or Hokey Pokey	❑	❑	❑	❑
Back-and-forth, interactive conversations	❑	❑	❑	❑
Unfamiliar sounds, silly voices, foreign language	❑	❑	❑	❑
Singing alone or with others	❑	❑	❑	❑

VISION				
	AVOIDS	SEEKS	MIXED	NEUTRAL
Learning to read or reading for more than a few minutes	❑	❑	❑	❑
Looking at shiny, spinning, or moving objects	❑	❑	❑	❑
Activities that require eye-hand coordination such as baseball, catch, stringing beads, writing, and tracing	❑	❑	❑	❑
Tasks requiring visual analysis like puzzles, mazes, and hidden pictures	❑	❑	❑	❑
Activities that require discriminating between colors, shapes, and sizes	❑	❑	❑	❑
Visually "busy" places such as stores and crowded playgrounds	❑	❑	❑	❑
Finding objects such as socks in a drawer or a particular book on a shelf	❑	❑	❑	❑
Very bright light or sunshine, or being photographed with a flash	❑	❑	❑	❑
Dim lighting, shade, or the dark	❑	❑	❑	❑
Action-packed, colorful television, movies or computer/ video games	❑	❑	❑	❑
New visual experiences such as looking through a kaleidoscope or colored glass	❑	❑	❑	❑

TASTE AND SMELL				
Smelling unfamiliar scents	AVOIDS	SEEKS	MIXED	NEUTRAL
Strong odors such as perfume, gasoline, cleaning products	❑	❑	❑	❑
Smelling objects that aren't food such as flowers, plastic items, playdough, and garbage	❑	❑	❑	❑
Eating new foods	❑	❑	❑	❑
Eating familiar foods	❑	❑	❑	❑
Eating strongly flavored foods (very spicy, salty, bitter, sour, or sweet)	❑	❑	❑	❑

References

About SPD. (2018). Retrieved from https://www.spdstar.org/basic/about-spd

American Psychiatric Association (2014). Diagnostic and Statistical Manual for Mental Disorders, 5th ed (DSM-V). Washington, DC: APA.

Arky, B. (2018, August 17). Sensory processing issues explained. Retrieved from https://childmind.org/article/sensory-processing-issues-explained/

Ashburner, J., Bennett, L., Rodger, S., & Ziviani, J. (2013). Understanding the sensory experiences of young people with autism spectrum disorder: A preliminary investigation. *Australian Occupational Therapy Journal*, *60*(3), 171-180. doi:10.1111/1440-1630.12025

Ashburner, J., Ziviani, J., & Rodger, S. (2008). Sensory processing and classroom emotional, behavioral, and educational outcomes in children with autism spectrum disorder. *American Journal of Occupational Therapy*, *62*(5), 564–573. doi:10.5014/ajot.62.5.564

Attention deficit-hyperactivity disorder information page. (2018, June). Retrieved from https://www.ninds.nih.gov/Disorders/All-Disorders/Attention-Deficit-Hyperactivity-Disorder-Information-Page

Bar-Shalita, T., Vatine, J. J., & Parush, S. (2008). Sensory modulation disorder: A risk factor for participation in daily life activities. *Developmental Medicine and Child Neurology, 50*, 932–937. https://doi.org/10.1111/j.1469- 8749.2008.03095.x

Ben-Sasson, A., Soto, T. W., Heberle, A. E., Carter, A. S., & Briggs-Gowan, M. J. (2017). Early and concurrent features of ADHD and sensory over-responsivity symptom clusters. *Journal of Attention Disorders*, *21*(10), 835–845.

Biel, L., & Peske, N. K. (2005). *Raising a sensory smart child: The definitive handbook for helping your child with sensory integration issues*. New York: Penguin Books.

Clark, G. F., & Chandler, B. E. (2013). *Best practices for occupational therapy in schools*. Bethesda: AOTA Press/American Occupational Therapy Association.

Dunn, W. (2001). The 2001 Eleanor Clarke Slagle Lecture. The sensations of everyday life: empirical, theoretical, and pragmatic considerations. *American Journal of Occupational Therapy*, *55*(6), 608-620.

Elrick, L. (2018, August 9). 4 Types of Learning Styles: How to Accommodate a Diverse Group of Students. Retrieved from https://www.rasmussen.edu/degrees/education/blog/types-of-learning-styles/

Environmental Health. (2017). *National Center for Environmental Health*. Retrieved from https://www.cdc.gov/nceh/hearing_loss/what_noises_cause_hearing_loss.html

Essential Components of RTI. (2018). *American Institutes for Research*. Retrieved from https://rti4success.org/essential-components-rti

Hillier, S. L., Civetta, L., & Pridham, L. (2010). A systematic review of collaborative models for health and education professionals working in school settings and implications for training. *Education for Health, 23*(3), 1-12.

Hinckson, E., Salmon, J., Benden, M., Clemes, S. A., Sudholz, B., Barber, S. E., Aminian, S., & Ridgers, N. (2016). Standing classrooms: Research and lessons learned from around the world. *Sports Medicine*, *46*(7), 977-987. doi:10.1007/s40279-015-0436-2

Hinojosa, J., Kramer, P., & Royeen, C. B. (2017). The ecological model of occupation. In W. Dunn (Ed.), *Perspectives on human occupation: Theories underlying practice* (2nd ed., p. 207-233). Philadelphia: F.A. Davis Company.

Hong, C. & Hong, C. S. (2004). Helping children with learning disabilities: Making sense of multisensory environments. *Journal of Family Health Care*, *14*(2), 35-38.

Kinnealey, M., Pfeiffer, B., Miller, J., Roan, C., Shoener, R., & Ellner, M. L. (2012). Effect of classroom modification on attention and engagement of students with autism or dyspraxia. *American Journal of Occupational Therapy*, *66*(5), 511-519. doi:10.5014/ajot.2012.004010

Learning disabilities information page. (2018). Retrieved from: https://www.ninds.nih.gov/Disorders/All-Disorders/Learning-Disabilities-Information-Page

Little, L. M., Dean, E., Tomchek, S., & Dunn, W. (2018). Sensory processing patterns in autism, attention deficit hyperactivity disorder, and typical development. *Physical & Occupational Therapy in Pediatrics*, *38*(3), 243-254. doi:10.1080/01942638.2017.1390809

Menzinger, B. & Jackson, R. (2009) The effect of light intensity and noise on classroom behavior of pupils with Asperger syndrome. *Support for Learning, 24*(4)*,* 170-175. http://dx.doi.org/10.1111/j.1467-9604.2009.01420.x

Morin, A. (2014). Heavy work and sensory processing issues: What you need to know. *Understood for Learning & Attention Issues*. Retrieved from https://www.understood.org/en/learning-attention-issues/child-learning-disabilities/sensory-processing-issues/heavy-work-activities

Pyramid Model Overview. (2018). Retrieved from http://challengingbehavior.cbcs.usf.edu/Pyramid/overview/tiers.html

Sadr, N. M., Haghgoo, H. A., Samadi, S. A., Rassafiani, M., Bakhshi, E., & Hassanabadi, H. (2017). The impact of dynamic seating on classroom behavior of students with autism spectrum disorder. *Iranian Journal of Child Neurology*, *11*(1), 29-36.

Schell, B.A.B., Gillen, G., & Scaffa, M.E. (2014). Ecological models in occupational therapy. In C. E. Brown (Ed.) *Willard & Spackman's occupational therapy (12th ed., p. 494-504).* Baltimore: Lippincott Williams & Wilkins, a Wolters Kluwer Business.

Sood, D., LoCure, G., Schranz, C., & Morrison, C. (2018). In the classroom. Supporting participation for children with sensory processing differences in an early childhood center. *OT Practice*, *23*(12), 23-25.

Stewart, C., Sanchez, S., Grenesko, E., Brown, C., Chen, C., Keehn, B., Velasquez F., Lincoln, A. J., & Müller, R. (2016). Sensory symptoms and processing of nonverbal auditory and visual stimuli in children with autism spectrum disorder. *Journal of Autism & Developmental Disorders*, *46*(5), 1590-1601. doi:10.1007/s10803-015-2367-z

Stonefelt, L. & Stein, F. (1998). Sensory integrative techniques applied to children with learning disabilities: An outcome study. *Occupational Therapy International*, *5*(4), 252-272.

Suarez, M. (2012). Sensory processing in children with autism spectrum disorders and impact on functioning. *Pediatric Clinics of North America*, *59*(1), 203-214.

Terada, Y. (2018, March). Research-Tested Benefits of Breaks. Retrieved from https://www.edutopia.org/article/research-tested-benefits-breaks

What are oral-motor and oral-sensory problems? (2018). Retrieved from https://www.chw.org/medical-care/gastroenterology-liver-and-nutrition-program/conditions/oral-motor-and-oral-sensory-problems

What are the 7 Senses? (2018). Retrieved from http://www.7senses.org.au/what-are-the-7-senses/

The images used within this product were marked "labeled for reuse" and downloaded from the following websites; the numbers correspond directly with the ones located next to the image within the guide.

1. https://pixabay.com/en/education-back-to-school-1545578/
2. https://www.flickr.com/photos/armymedicine/13584535514
3. http://worldartsme.com/ear-clipart.html#gal_post_3118_ear-clipart-1.jpg
4. https://clipartix.com/big-cartoon-eyes-clipart-image-58007/
5. http://www.clipartpanda.com/categories/hand-clip-art-free
6. https://www.pinterest.com/pin/575968239822463371/?lp=true
7. http://worldartsme.com/mouth-black-and-white-clipart.html#gal_post_6042_mouth-black-and-white-clipart-1.jpg
8. https://commons.wikimedia.org/wiki/File:Hands-Clapping.jpg
9. https://www.mcbhawaii.marines.mil/Photos/igphoto/2000710340/
10. https://pixabay.com/en/hand-prints-colourful-print-hand-2374234/
11. https://commons.wikimedia.org/wiki/File:Ru%C3%ADdo_Noise_041113GFDL.JPG#/media/File:Ru%C3%ADdo_Noise_041113GFDL.JPG
12. https://upload.wikimedia.org/wikipedia/commons/e/e7/SmartBoard.JPG

13. https://pixnio.com/people/crowd/male-student-who-was-holding-up-the-book-while-the-seated-classmates-were-raising-their-hands-to-answer
14. https://www.flickr.com/photos/wwworks/4005631298/
15. https://pixabay.com/en/writing-boy-child-student-kid-711286/
16. https://www.todaysparent.com/family/does-your-child-need-a-tutor/
17. https://www.arktherapeutic.com/girl-power-chew-pack/?gclid=Cj0KCQiA8f_eBRDcARIsAEKwRGceTRr-tOGE-fC5TOhQmIvE3Y9HCT5xCevSHM-rGy9WRi5PUajU3jsaAiEGEALw_wcB
18. https://www.arktherapeutic.com/girl-power-chew-pack/?gclid=Cj0KCQiA8f_eBRDcARIsAEKwRGceTRr-tOGE-fC5TOhQmIvE3Y9HCT5xCevSHM-rGy9WRi5PUajU3jsaAiEGEALw_wcB
19. https://smithsystem.com/smithfiles/2015/03/21/activity-tables/
20. http://cacestsobanks.com/the-most-elegant-creative-classroom-furniture-regarding-home/pan-american-academy-charter-school-bellia-office-interiors-inside-creative-classroom-furniture/
21. https://www.etsy.com/listing/582197566/diy-sensory-discovery-calm-down-bottles?gpla=1&gao=1&&utm_source=google&utm_medium=cpc&utm_campaign=shopping_us_a-toys_and_games-other&utm_custom1=99169767-e2e4-484e-9a55-6a089387e8d4&utm_content=go_304504235_22746244475_78727479875_pla-106553263955_c__582197566&gclid=Cj0KCQiA8f_eBRDcARIsAEKwRGcqCbdXf0E96GRycBHgI7aaSYeM2TG-wO0F-p_lkvKhwJaEPW9M_ScaAofKEALw_wcB
22. https://www.dvidshub.net/image/2362723/student-wins-national-geography-bee-with-harry-potter-question
23. https://www.maxpixel.net/Library-Teaching-School-Classroom-Room-732409
24. http://cacestsobanks.com/the-most-elegant-creative-classroom-furniture-regarding-home/the-creative-colorful-classroom-flexible-seating-inside-creative-classroom-furniture/
25. https://www.travis.af.mil/News/Article/153396/reading-program-gives-kids-head-start/
26. https://pixabay.com/en/action-fun-jump-child-3362815/
27. https://www.acc.af.mil/News/Article-Display/Article/200104/month-of-the-military-child/
28. https://www.misawa.af.mil/News/Article-Display/Article/1002340/cdc-ensures-mission-readiness-peace-of-mind/

29. https://commons.wikimedia.org/wiki/File:Empty_classroom_at_CommuniKids.jpg
30. https://calicospanish.com/engage-students-beyond-the-classroom-tools-to-connect-with-target-language-communities/
31. https://commons.wikimedia.org/wiki/File:Martenitsa-bracelet-02.jpg
32. https://www.etsy.com/listing/563712104/sensory-toy-handheld-sensory-toy-fidget?gpla=1&gao=1&&utm_source=google&utm_medium=cpc&utm_campaign=shopping_us_e-bath_and_beauty-baby_and_child_care-other&utm_custom1=99169767-e2e4-484e-9a55-6a089387e8d4&utm_content=go_304501115_22746014675_78727245275_pla-106551483635_c__563712104&gclid=Cj0KCQiAlIXfBRCpARIsAKvManwGXpiKYtVY4H1tO-6ExMumpTbycyXqna2o_SlaN2dE9dw80uL7AqQaAjnlEALw_wcB
33. https://www.officeoxygen.com/walk-away-fiddle-set-25-set.html?utm_source=Google&utm_medium=cpc&utm_campaign=Feed&gclid=Cj0KCQiA8f_eBRDcARIsAEKwRGcpjIgfv6lTCKZSXAkp1eHxSru4xeRhnLO9MoQXLbydow15pn9w4SoaAqe6EALw_wcB
34. https://commons.wikimedia.org/wiki/File:Gel_Water_Beads_(6477584337).jpg
35. https://pixabay.com/en/play-sensory-child-kid-playing-2457318/
36. https://www.buckley.af.mil/News/Photos/igphoto/2000305688/
37. https://commons.wikimedia.org/wiki/File:Ru%C3%ADdo_Noise_041113GFDL.JPG#/media/File:Ru%C3%ADdo_Noise_041113GFDL.JPG
38. https://www.flickr.com/photos/26880148@N03/3857173076
39. https://www.flickr.com/photos/30478819@N08/36462024592
40. https://www.musiciansfriend.com/classroom-kids/hohner-kids-rainmaker/585609000901000?cntry=us&source=3WWRWXGP&gclid=CjwKCAiAiarfBRASEiwAw1tYvyKoagpwjejnpLxkGdaoudaUcFKvASPVZJ1J0idQxRawNsWwiQlteRoCNtIQAvD_BwE
41. https://www.westmusic.com/drums-percussion/hand-mounted-percussion/shakers-rattles-guiros/202376?ppc_keyword=&gclid=Cj0KCQiA8f_eBRDcARIsAEKwRGfC956FRfnwHQX5m6euNh85noZ2W--2imWCaYRhIJmO8zq4UJAaNh8aAvRvEALw_wcB
42. https://www.flickr.com/photos/cafemama/3699715125
43. https://www.arktherapeutic.com/arks-brick-stick-textured-chew-necklace/?gclid=Cj0KCQiA8f_eBRDcARIsAEKwRGdJCVIMihiyRhDPPC3UHBNpMTXdkF28E5TCMUtYm5ObiB8SzesL7VMaAg35EALw_wcB
44. https://www.publicdomainpictures.net/en/view-image.php?image=31937&picture=carrots-amp-celery
45. https://www.flickr.com/photos/yourbestdigs/34400226722

46. https//pixabay.com/en/apple-sauce-chunky-applesauce-bowl-544676/ :
47. https://www.flickr.com/photos/135213460@N06/21473796202