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Sensory processing disorder: raising awareness

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Sensory Processing Disorder: Raising Awareness

by

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Submitted to the Occupational Therapy Department
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This Scholarly Project Paper, submitted by Stephanie Thomas and Karla Emmerich in partial fulfillment of the requirement for the Degree of Master's 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.

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Date
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Title Sensory Processing Disorder: Raising Awareness

Department Occupational Therapy

Degree Master’s of Occupational Therapy

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TABLE OF CONTENTS

LIST OF TABLES..................................................................................................................... v

ACKNOWLEDGEMENTS............................................................................................................ vi

ABSTRACT.................................................................................................................................. vii

CHAPTER

I. INTRODUCTION..................................................................................................................... 1

II. REVIEW OF LITERATURE.................................................................................................... 7

   Introduction............................................................................................................................ 7

   Sensory Processing Disorder............................................................................................... 8

   Implications of Sensory Processing Disorder...................................................................... 19

   Intervention.......................................................................................................................... 28

   Summary............................................................................................................................... 38

III. METHODOLOGY.................................................................................................................. 40

IV. PRODUCT............................................................................................................................. 43

V. SUMMARY............................................................................................................................ 46

REFERENCES.......................................................................................................................... 50

APPENDICES............................................................................................................................ 58

   Appendix A: Sensory Processing Disorder: Raising Awareness

           PowerPoint Teaching Unit............................................................................................ 59

   Appendix B: Course Schedule............................................................................................ 136

   Appendix C: Adult Sensory Preference Survey................................................................. 138
Appendix D: Handout for Learners: PowerPoint Slides, Reference List, Resource List,
Case Studies, and Sensory Diet Handout.................................141
Appendix E: Case Study Lesson Plan..................................................174
Appendix F: Program Evaluation.........................................................176
Appendix G: Authorization for Pictures...............................................178
LIST OF TABLES

Table | Page
---|---
1. Classification of Sensory Processing Disorders | 10
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ABSTRACT

It is estimated by Miller (2006) that 1 in 20 children are impacted by Sensory Processing Disorders (SPDs). The Individuals with Disabilities Education Act of 1990 is legislation that places families at the core of the intervention process and acknowledges the importance and the influence families have on a child’s development (Cohn, Miller, & Tickle-Degnen, 2000). Cohn et al. stress family-centered practices require therapists to understand and listen to the hopes and outcomes that are most important for the children’s families. At STRIDE Learning Center, a developmental preschool in Cheyenne, Wyoming, parents and teachers have requested more information on Sensory Processing Disorders (SPDs) and how to help children who struggle with sensory processing.

The purpose of this scholarly project was to review the literature and research on SPDs in order to develop relevant, up-to-date educational materials, specifically to inform parents and teachers about SPD and provide resources to assist children to be more appropriate and functional within different environments. During a review of the literature, research was found that supported the importance of family education, family-centered practices, and the involvement of the family in the care of a child with a disability. Miller, Colligan, and Colver (2003) confirm that families value information received from professionals regarding the condition of their children. Cohn, Miller, and Tickle-Degnen (2000) also validated the importance families put on education and strategies they learn to help their children.
Based on the literature, a workshop was developed to meet the needs of parents and teachers. The workshop materials include information on how sensory processing disorders affect children in different contexts. It provides information on how to support children in a variety of ways in order to improve a child’s function in areas where the child is experiencing deficits. In addition, resource materials were summarized and provided for future reference. The Power Point presentation, handouts, and resource materials were critiqued using principles of adult education. Learning activities were developed to apply course content. A workshop evaluation was developed to gain feedback following the workshop and refine materials for future presentation.
CHAPTER I
INTRODUCTION

Sensory Processing Disorder (SPD) is a condition that affects at least one in twenty children in a conservative estimate by Miller (2006). Sensory processing disorders affect the ability of a child to interpret sensory input and respond appropriately. Difficulties in sensory processing can impact a child in a variety of ways. Children with a SPD can have difficulties in academics, social/emotional problems, difficulties playing with peers, and motor skills deficits (Parham & Mailloux, 2001). Symptoms of SPD are often misdiagnosed or confused with other impairments due to lack of information on SPD, and/or due to controversies within the medical community.

Parents and teachers are often unaware of how deficits in sensory processing can affect the child in different environments. Treatment alternatives for children with SPD are not well known and sometimes not well supported by the medical community due to flaws in previous research (Miller, 2003). In our work parents and teachers have requested information on how SPDs affect a child, what the indicators of SPDs are, and how they can support a child with sensory processing difficulties. Research by Cohn (2001) found that parents value learning how their children’s behaviors are affected from a sensory processing viewpoint, and through this understanding they learn to accept the differences and advocate for their children. In a study by Cohn, Miller, and Tickle-Degnen (2000), parents reported a desire to learn more strategies to help their children and a need for personal validation of their parenting experiences. The purpose of this
project is to raise an awareness of signs, symptoms, and affects of SPDs, to inform parents and teachers about the research on the topic, and to provide information and resources to help children with SPDs.

The information gained through reading the literature and research articles on this topic was incorporated into the project in order to provide parents and teachers with the most current and relevant information to help children with SPD function in the most optimal way in their environments. Educational materials were developed into a workshop which includes a PowerPoint presentation and resource materials. The PowerPoint presentation includes educational materials for parents and teachers to inform them about SPD, and information for parents and teachers to support children at home, school, and in the community. Learning activities were incorporated into the workshop to assist parents and teachers with integration of the information that was covered within the presentation. A list of resources was also provided in order to support a continuation of learning on this topic.

The Ecology of Human Performance Model (Dunn, Brown, & Youngstrom, 2003) was incorporated in the development of this project. The Ecology of Human Performance is a framework that considers the relationships among person, task, context, and how the interactions between these three affect the performance. Using this model allows therapists to look at many dimensions of treatment with a child who has SPD and how these dimensions are interrelated and affect the child's performance in different areas, such as play, academics, and social/ emotional. The interactions between the person, task, and context are important to take into consideration when looking at how best to look at typical patterns of children with SPD and how to educate parents and
teachers in looking at the difficulties that are affecting children’s performance. The Ecology of Human Performance Model outlines five intervention approaches when working with clients; they include establish/restore, adapt/modify, alter, prevent, and create (Dunn et al. 2003). The purpose of this workshop for parents and teachers is consistent with these approaches. The workshop’s goal is to teach parents and teachers to identify aspects of the environment that may need to adapted or modified in order for the child to be able to process sensory input more efficiently and have an appropriate response so that the child’s performance is improved. Parents and teachers are provided with strategies to prevent predictable situations that are difficult for children by either adapting the environment, altering the demands of the situation, or creating new routines in order to prevent these difficult situations.

The Ecology of Human Performance Model emphasizes client-centered practices and how intervention should be driven from the needs and wants of the client (Dunn, Miller, & Youngstrom, 2003). This aspect of the model was consistent with the philosophy of the project. Cohn, Miller, and Tickle-Degnen (2000) stress the importance of listening to the needs and hopes of clients and incorporating these into the goals of the clients.

This chapter concludes with a glossary of terminology used throughout the document. Chapter II provides a review of the literature including background information on SPD, current definitions of categories of SPD, implications of SPD, and the validity of the diagnosis and sensory integration treatment. Chapter II also covers the role of the occupational therapist, parents, and teachers and the importance of these roles within the treatment of children with SPD. Chapter III explains the methodology used to
gather information in order to incorporate the most current and relevant information into this project. Included in Chapter IV is a description of the project. (The complete project is found in the appendices.) Chapter V is the summary of information and recommendations for using the project, as well as suggestions for future actions and development of research in this area.
Glossary of Terms

Adaptive response: An adjusted behavior or action that effectively and efficiently meets an environmental demand or challenge.

Dyspraxia: Dysfunction in praxis; difficulty in conceiving, planning, and carrying out a novel motor action.

Just right challenge: An experience that encourages a person to stretch beyond her ability to reach a little further, climb a little higher, swing a little longer, etc.

Occupational therapy (OT): The use of activity to maximize the independence and maintenance of health of an individual who is limited due to a disability, impairment, illness, injury, etc.

Postural Disorder (PD): Difficulty maintaining enough control of one’s body to meet the demands of a given motor task due to poor muscle tone, stabilization of joints, or weak muscles.

Proprioceptive sense: The sense that comes from the receptors in one’s joints, muscles, tendons, and ligaments that provides information about when and how muscles contract or stretch. It provides information about movements and position of the body.

Sensory-Based Motor Disorder (SBMD): A problem with stabilizing, moving, or planning a series of movements in response to sensory demands.

Sensory diet: The multi-sensory experiences that one normally seeks on a daily basis to satisfy one’s sensory appetite; a planned and scheduled activity program that an occupational therapist develops to help a person become more self-regulated and at the optimal state of arousal.

Sensory Discrimination Disorder (SDD): A problem with sensing similarities and differences between sensations.

Sensory integration therapy: Therapeutic intervention with the goal of improvement in the way the brain processes and organizes sensations. The emphasis is on improving sensory-motor processing rather than on skill training.

Sensory Modulation Disorder (SMD): A problem with turning sensory messages into controlled behaviors that match the nature and intensity of sensory information.

Sensory Over-Responsivity (SOR): A response to sensory messages more intensely, more quickly, and/or for a longer time than in children with normal sensory responsivity.
**Sensory processing**: A term that refers to the way the nervous system receives sensory messages from the body and the environment in order to produce adaptive and purposeful responses for use in daily life.

**Sensory Processing Disorder (SPD)**: The inabilities to modulate, discriminate, coordinate, and organize sensations adaptively, leading to difficulties in learning, development, and behavior.

**Self-regulation**: The ability to control one’s activity level and state of arousal, as well as one’s emotional, mental, or physical responses to sensations; self-organization.

**Sensory Seeking (SS)**: To have an insatiable craving for sensory experiences and actively seek sensation, often in ways that is socially unacceptable.

**Sensory integration theory**: Was pioneered 40 years ago by A. Jean Ayres, Ph. D., OTR. Dr. Ayers developed the sensory integration theory to explain the relationship between behavior and brain functioning.

**Sensory Under-Responsivity (SUR)**: Found in someone who has less of a response to sensory information than the situation demands, takes longer to react, and/or requires relatively intense or long-lasting sensory messages before he or she is moved to action.

**Vestibular sense**: The sensory system that responds to changes in head position, to body movement, and to the pull of gravity.

These terms have been adapted from the works of Kranowitz (1998) and Miller (2006).
CHAPTER II
REVIEW OF LITERATURE

Introduction

Lack of awareness of Sensory Processing Disorder (SPD) symptoms and lack of information on how to support children with SPD continue to cause problems for families and within schools. SPD can affect children socially, emotionally, and academically. Children with SPD struggle at home, at school, and in the community. Ayres stated that five to ten percent of children experience enough sensory integration (SI) problems that lead to significant issues in learning and behaviors (1979). Based on parents' perceptions 5.3% of kindergarten children in the United States may suffer from SPD (Ahn, Miller, Milberger, & McIntosh, 2004). According to Miller (2006), professionals have estimated people diagnosed with developmental disabilities have a rate of comorbid SPD estimated to be from 40% to 85%, depending on the specific developmental condition. Children are often mislabeled and not given the proper support due to the lack of awareness of this disorder.

The literature review summarizes key findings on the most current information on SPD, the variety of implications SPD has on children's lives, and the importance of teachers and parents within the interventions. In addition, it reviews parental expectations regarding therapy outcomes, what parents and teachers report is the best way for therapists to support them, and the efficacy of SI interventions.
Sensory Processing Disorder

In order to discuss SPD, first sensory processing must be defined and discussed. Sensory processing refers to the way the nervous system receives messages from the senses and turns information into appropriate behavioral and motor responses (Miller, 2006). The world is full of sensory experiences, and throughout daily routines brains are constantly organizing and responding to sensory inputs. Sensory information taken in through the senses helps children understand and respond to the world around them (Dunn, 2008). Sensory input is received through the seven senses. Five of these senses are very familiar; they are vision, hearing, touch, smell, and taste. The other two senses are sometimes referred to as the hidden senses, and they are the vestibular and the proprioceptive senses. The vestibular sense has to do with sensory information that is received through the inner ear and is related to movement, gravity, and balance (Kranowitz, 1998). The proprioceptive sense is information that is received from the muscles, joints, and ligaments; it gives information about where body parts are and what they are doing (Kranowitz).

Most children are born with the ability to receive sensory messages from the environment and, without thinking, they organize this information and respond appropriately, both behaviorally and physiologically (Miller, 2006). Sensory information is automatically translated into behavioral and motor responses, and at the same time the nervous system produces a physiological response such as an increase in heart rate, sweaty palms, or an increase in blood pressure. If these sensory signals do not get organized into appropriate responses and a child’s daily routines are disrupted as a result of this unorganized response, this is considered a sensory processing disorder (Miller).
Jean Ayres developed the theory of sensory integration, and Sensory Processing Disorders have evolved from this theory. Ayres (1979) theorized that the impairment of sensory processing may lead to difficulties in social, emotional, motor, and academic skills.

Since its inception SI theory and SI therapy has received much controversy. Over the years therapists have used a variety of terms to describe and explain the theory and the symptoms of SI dysfunction. In recent years Lucy Miller has used the term Sensory Processing Disorder to describe this complex neurological disorder. Miller and her colleagues held focus groups from 1998-2000 attempting to achieve a consensus on an alternative taxonomy for diagnosis, and agreement on terminology used when discussing and researching SPD (Miller, Anzalone, Lane, Cermak, & Osten, 2007). A nosology was proposed at these focus groups that differentiates diagnostic subtypes using three classic categories of SPD, and within these categories each pattern is further refined into subtypes (Miller et al., 2007). These three categories that Miller identified are Sensory Modulation Disorder, Sensory-Based Motor Dysfunction, and Sensory Discrimination. (See table 1 for the proposed nosology of the three classic categories of patterns of SPDs and the subtypes and within these categories.) This project will use the proposed nosology to discuss and define SPDs. Throughout this paper the current term of SPD will be used when referring to SI dysfunction. The term SI therapy will be used to refer to different types of treatments for SPD.
Table 1: Classification of Sensory Processing Disorders

<table>
<thead>
<tr>
<th>I. Sensory Modulation Disorder (SMD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subtypes: Sensory Over-Responsivity (SOR)</td>
</tr>
<tr>
<td>Sensory Under-Responsivity (SUR)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>II. Sensory-Based Motor Disorder (SBMD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subtypes: Dyspraxia</td>
</tr>
<tr>
<td>Postural Disorder</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>III. Sensory Discrimination Disorder (SDD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subtypes: Vision</td>
</tr>
<tr>
<td>Hearing</td>
</tr>
<tr>
<td>Touch</td>
</tr>
<tr>
<td>Taste/Smell</td>
</tr>
<tr>
<td>Position/Movement</td>
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</tbody>
</table>

*Note. Adapted from (Miller, 2006)*
Unfortunately, there are not one or two different symptoms that lead to identifying a child with sensory processing difficulties. Sensory Processing Disorders have many different behavioral and physiological patterns or symptoms within different individuals. Children can have symptoms within one or in a combination of the patterns of symptoms, and the intensities of responses can vary from mild to severe. The following sections will define these different areas in greater detail and discuss the implications of having some of the different patterns. Research that has occurred over the years in the area of sensory processing will be reviewed and discussed as it is relevant to this project.

**Sensory Modulation Disorder**

Sensory Modulation Disorder (SMD) is defined as having difficulties turning sensory messages into controlled behaviors that match the nature and intensity of the sensory information (Miller, 2006). When sensory modulation occurs efficiently, the nervous system responds to some sensory input while disregarding other input (Smith & Gouze, 2004). This can explain why one child can sit by a door or a window in a classroom and not be distracted, and another child is distracted by the noises in the hallway or outside. A child that experiences a SMD problem may spend the majority of his day in discomfort or in an overwhelmed state when he is unable to adjust to the intensity of sensory input he is experiencing in his environment (Smith & Gouze). The child may not be able to pick and choose what he wants or needs to be attending to in his environment. Smith and Gouze refer to this as a problem of dysregulation, the inability to adjust to the input and modulate the response.
Miller (2006) identifies three different subtypes of Sensory Modulation Disorder: sensory over-responsivity, sensory under-responsivity, and sensory seeking. Sensory over-responsivity occurs when a child responds to a sensory message more intensely, more quickly, and/or for a longer duration than children with normal sensory responsivity (Miller). Sensory over-responsivity is sometimes referred to as sensory defensiveness. Children can experience sensory over-responsivity in one of the senses or a combination of senses. Dunn has developed a model that hypothesizes there is an interaction between neurological thresholds and behavioral responses. Neurological thresholds refer to the amount of stimuli required for a neuron to respond (Dunn, 1999). In Dunn’s model a person with sensory over-responsivity has a low neurological threshold. It takes very little stimuli for the nervous system to respond when the pattern of habituation is not working properly.

Habituation is the ability of the nervous system to recognize something familiar has occurred and no longer needs attention (Dunn). Habituation is employed in order to focus on relevant sensory messages and make appropriate responses. Children with these patterns may overly attend to things in their environment because they are unable to pick and choose what is important and where attention should be focused. A child may be distracted by the feeling of clothing he or she is wearing and be unable to attend or follow directions during classroom activities. A child may be overly sensitive to different textures of food and may not be able to tolerate certain textures in his or her food. There are many different ways these patterns can manifest and may affect the way a child functions in environments including home, school, and out in the community. Children that have these difficulties can often be misclassified with a variety of labels which may
include: Attention Deficit Disorder, disruptive child, picky eater, difficult or defiant child, or a withdrawn child.

Children with sensory under-responsivity display less of a response to sensory input than the situation demands (Miller, 2006). Dunn’s model refers to these children as having a high neurological threshold (1999). They require much more sensory input for the nervous system to respond. These children take longer to respond to sensory information or they may need more intense and/or longer lasting sensory information before they are able to make a behavioral response (Dunn). Again, these patterns may be in only one of the sensory systems or a combination of the different systems. Children who experience this pattern of SMD may not notice when they hurt themselves, or they may not dress appropriately for different weather conditions. They may not be able to tell when the water is too hot; therefore, they are at risk of burning themselves. Parents and teachers may think the child is ignoring them when the child does not respond when being spoken to, when the child is actually not registering the sensory input. These children may take longer to potty train due to under-responsiveness of their sensory systems. Due to the subtle patterns of this subtype of SMD, these children can sometimes go overlooked or undetected (Miller).

Miller (2006) identified a third subtype under the SMD patterns which is sensory seeking. Children who are sensory seekers have a nearly insatiable craving for sensory experiences, and they often go out of their way to get this input. According to Miller, they often display behaviors which are not safe or socially acceptable. Dunn’s model refers to these children as experiencing a high neurological threshold and acting in a way
to counteract these thresholds (1999). These children are very active and try to add sensory input and intensity to every aspect of their lives. A child who is a sensory seeker may take unnecessary risks, such as jumping off surfaces that are too high, or crashing into things or people in order for their bodies to register the sensory input. They may crave foods that are spicy or have extreme flavors in food. They may constantly touch things or people and intrude into people’s space. They may crave swings, spinning, and intense movement activities in order to get extremes in their sensory messages. These symptoms can often get confused with and are difficult to differentiate from Attention Deficit Hyper-Active Disorder (ADHD).

**Sensory-Based Motor Disorder**

Miller defines Sensory-Based Motor Disorders (SBMD) as a problem with stabilizing, moving, or planning movement activities in response to sensory demands (2006). This second pattern of SPD describes the dysfunction that occurs when there is impairment in the proprioceptive and vestibular senses. These are referred to as the hidden senses, and are used to help our bodies move and identify where body parts are in relationship to one another (Miller). She refers to the two subtypes within this pattern of SPD as dyspraxia and postural disorder.

Dyspraxia occurs when a child has difficulties in conceiving of, planning, organizing, and carrying out a sequence of unfamiliar activities (Kranowitz, 2003). Dyspraxia can present itself in gross motor, fine motor, and the oral motor areas (Miller, 2006). It can occur in one area or a combination of these areas. Children with difficulties in the gross motor area often struggle with team sports. They have difficulties
learning how to ride a bike, and may appear clumsy or uncoordinated due to lack of body awareness. Children with dyspraxia in the fine motor area may have difficulties learning how to hold utensils such as pencils, markers, and scissors correctly. They may struggle learning how to write letters of the alphabet correctly, and they may have difficulties dressing themselves or attending to other self-care activities. Children who have symptoms of oral dyspraxia may have difficulties coordinating lips/tongue and mouth movements which leads to problems in eating and/or forming sounds and words properly.

Miller’s second subtype of SBMD is postural disorder (2006). Children who struggle with postural disorder symptoms have difficulty stabilizing muscles of their bodies to meet the demands of a motor activity (Miller). Children with these symptoms generally have low muscle tone throughout their muscles. These children tend to have poor balance, tire easily and may appear to be weak. They may have messy handwriting because of the lack of stability and muscle tone in their hands and shoulders. They often slump over the desk or table because of poor muscle tone and fatigue. This postural disorder subtype is frequently seen in combination with other subtypes of SPD (Miller).

**Sensory Discrimination Disorder**

Sensory Discrimination Disorder (SDD) is Miller’s third pattern of sensory processing disorders (2006). SDD consists of a problem differentiating among and between sensory stimuli in any of the seven sensory systems (Kranowitz, 2003). The nervous system within a child who has SDD has difficulty accurately processing sensory messages; as a result of this, the child has difficulty using the information to make appropriate responses throughout his day (Kranowitz). A child with poor tactile
discrimination may have difficulty locating familiar objects in a desk or draw by feel alone; he or she may need to use vision to help. A child with poor discrimination of balance and movement may have problems with directionality, or may move in uncoordinated or awkward ways (Kranowitz). Children who experience SDD use an enormous amount of effort and energy to interpret and respond to ordinary sensory input. This may account for difficulties noted in attending to activities, or inappropriate responses to what seems like everyday demands.

*Research and the Implications*

As stated earlier, SI theory, SPDs, and treatment of these disorders have been and continue to be controversial issues in the medical and occupational therapy communities. Research has continued over the years in order to build evidence validating the diagnosis and different treatment considerations. Ayres’s theory proposed that behavioral responses of SI dysfunction are related to immaturity or malfunction in the brain processing (Ayres, 1972). This assumption leads to the hypothesis that, when given discrete sensory stimuli, the brain activity will be different in children whose behaviors are indicative of a SPD than those of typically developing children (Davies & Gavin, 2007). Even though studies of SI have dated back to the 1960’s, research attempting to validate Ayres’s theory monitoring physiological changes within the body has only recently begun.

Davies and Gavin’s (2007) research was set up to test the assumptions of SI theory, by demonstrating that behavioral responses of children with SPD are related to dysfunction or malfunctions in brain processing. Davies and Gavin measured brain
activity using electroencephalography (EEG) in children with SPDs and compared them to children who were typical developing in development. They studied two auditory paradigms that seemed most likely to explain the underlying brain functions reflecting the type of behaviors observed in children with SPD. The first is the sensory gating paradigm, which addresses function of the brain’s ability to filter sensory input, (Davies & Gavin). The second was the sensory registration paradigm, which addresses the brain’s ability to organize sensory information. Research indicated children with SPD were deficient in their abilities to filter out repeated or irrelevant sensory input as compared to typical children. The authors also found auditory gating abilities in children with SPD do not change with maturity or with exposure to experience, whereas in typical children, auditory gating does change with these factors. Analysis of the sensory registration paradigm found that brain processing of simple auditory stimuli may be less organized in children with SPD. The results of this research support the assumption of SI theory, which states neural processing mechanisms are different in children with SPD when compared to age-matched typically developing children. In addition, they demonstrated that brain activity as measured in the two paradigms could be used to classify children with SPD from a group of typically developing children with 86% accuracy. These neurophysiological findings provided evidence that is needed to support the validity of the diagnostic category of SPD.

Other research in the area of physiological differences in children with SPD was conducted by McIntosh, Miller, Shyu, and Hagerman (1999). They measured the electrodermal responses in children identified with SMD and compared their responses to typically developing children. They also correlated behavioral responses. The research
by McIntosh et al. found evidence to support the hypothesis that children with SMD show a consistent physiological difference from children without SMD in response to sensory stimuli. They also found that children who have abnormal electrodermal response patterns exhibited more behaviors associated with abnormal responses to sensation. The authors’ findings imply that SMD may be a valid syndrome, although further preliminary research should continue in this area to validate the findings.

Miller has developed a foundation that continues to research SPDs and provide documentation and research to validate SPD as a medical diagnosis in the next publication of the American Psychiatric Association’s Diagnostic and Statistical Manual (DSM), (SPD Foundation, 2008). The foundation has until 2010 to provide research to support inclusion of SPD in the DSM-V, which is scheduled for publication in 2012. The SPD Foundation reports SPD has recently been recognized in two diagnostic manuals for health care providers: the Diagnostic Classification: Zero to three: Diagnostic Classification of Mental Health and Developmental Disorders of Infancy and Early Childhood, Revised (known as the DC: 0-3R) and the Diagnostic Manual for Infancy and Early Childhood. Research into the validity of SPD continues to build. The research reviewed within this project and the inclusion of SPD into the above mentioned diagnostic manuals is a strong indication of its validity, although further research is needed to continue to support the diagnostic classification.
Implications of Sensory Processing Disorder

Ayres’ ideas created a new way of looking at children and understanding many of the developmental, learning, and emotional problems that arise during childhood. Her innovative practice and groundbreaking research met a tremendous amount of resistance within the profession when introduced in the late 1960s and 1970s. Today the treatment methods that she pioneered continue to be questioned; yet there is little doubt that it has made an impact on occupational therapy practice. Ayres (1972) defined sensory integration as the brain’s ability to organize sensory information for use. She described a major role played by structures of the central nervous system (CNS) at anatomically lower levels of the brainstem that were instrumental in the initial processing and integration of sensory information. She recognized that the suppression of input was as vital to the process of neural integration as the activation of input, and the sensory integration was an intricate and complex process performed at all levels of the CNS (Reeves, 1998).

Occupational therapy practitioners increasingly deal with children whose responses to sensory input and environmental demands reflect an imbalance of internal regulation. Any child whose CNS does not appropriately interpret and respond to incoming signals from the environment may have complications in daily functioning and the inability to engage in purposeful interactions with the environment. The result of having sensory processing difficulties may impact a child’s life in different areas. These areas may include social/play skills, motor skills, academic skills, and emotional or behavioral responses.
Play

One of the most important areas of a young child's development is the involvement in play. According to Burke (1998), play is open-ended, self-initiated, self-directed, and unlimited in its variety. It gives the child the opportunity to develop and practice skills to provide the foundation for later occupational tasks such as the ability to manipulate objects, problem solve, and attend to a task. To play optimally and interact successfully with peers, players must act effectively and efficiently in the environment. Because deficits in sensory processing disorder interfere with the ability to interact with people and objects, it seems logical that children with SPD may have difficulty playing.

SI theory describes play as the medium for intervention. Occupational therapists have used this theory to provide direct “playful” interventions for children with SPD. However, many conflicting conclusions are associated with studies that have evaluated the effectiveness of sensory integration intervention. In a study exploring how SPD affects playfulness, the authors asked the following questions: Does SPD interfere with play and how does the major manifestations (poor modulation and dyspraxia) of SPD relate to playfulness (Bundy, Shia, Qi, & Miller, 2007)? The study found that Test of Playfulness (ToP) scores of the children who were typically developing were significantly higher in play than those children with SPD. However, the authors cautioned these scores were not as straightforward as they seemed and recommended more research in this area. ToP scores also strongly correlated with Short Sensory Profile scores. The children with SPD engaged in relatively sedentary activity most of the time (23 of 32 observations). Active play, in general, is more demanding of both motor skills
and the ability to maintain optimal arousal. In conclusion, it is safe to predict that
children with SPD will have a more difficult time engaging in higher-level play.

When children are not engaged in their environments, they are not exploring,
learning, and developing problem-solving skills that are critical to building feelings of
competency and mastery. In general, they are not developing the skills necessary to
interact with peers and successfully participate in occupations.

Motor

Ayres (1979) believed that sensory integration develops primarily in the first
seven years of life. By the time most children reach seven or eight years of age, their
sensory integrative capabilities are almost as mature as an adult’s. Development, from a
sensory integrative standpoint, occurs as the CNS organizes sensory information and
adaptive responses with increasing degrees of complexity. Sensory integration enables
adaptive responses to occur, which, in turn, promote the development of sensory
integration. Inner drive leads the child to search for opportunities in the environment that
are “just right challenges.” Typically developing children require minimal adult guidance
or teaching to acquire basic developmental skills such as manipulating objects, sitting,
walking, and climbing (Parham & Mailloux, 2001). Little help is needed to help
typically developing children to learn daily occupations such as playing on the
playground equipment, dressing and feeding themselves, or manipulating toys. These
achievements are a product of a healthy and organized nervous system that is ready for
the next challenge. Unfortunately, not every child experiences competency in sensory
integration, and, as a result, motor skills can be affected.
Motor development is important for exploring, playing, and engaging in the environment. Motor responses contribute to the organization of the world. Infants learn how to orient, attend, and habituate to visual, auditory, and tactile stimulation. The proprioceptive and vestibular systems are also being integrated at this time. Proprioception occurs when the infant is being held close to its mother or father and is establishing a bond with her or him. The vestibular system has an influence on the infant's arousal level and is appreciated instinctively by most caregivers, who use rocking and carrying to soothe and calm the infant. The sensory systems continue to develop as the child develops and makes his way through developmental milestones such as crawling, sitting, standing, and walking (Parham & Mailloux, 2001).

Dysfunction in motor, vision, somatosensory, and/or vestibular systems may limit the child's ability to move through space for exploration. With disruptions in development, children use compensations, which most often inhibit the development of more advanced skills. One of those skills is praxis, which is the ability to conceptualize, plan, and execute a nonhabitual motor act (Ayres, 1979). In general, praxis is the ability to motor-plan actions. Dyspraxia refers to a condition characterized by difficulty with praxis. Children with dyspraxia have difficulty translating sensory information into physical movements, unfamiliar physical movements, or movements with multiple steps. The child may appear clumsy and awkward. Novel motor activities are performed with great difficulty and can result in failure. Transitioning from one body position to another may pose as a great challenge, as well as sequencing and timing a motor action. In addition, these children often have difficulty imitating actions of others and generating ideas of what to do in a novel situation. This affects play skills. Instead of jumping in
with peers to play, children with dyspraxia may wander aimlessly, performing simple repetitive actions and not knowing what to do (Parham & Mailloux, 2001).

White, Mulligan, Merrill, and Wright (2007) sought to determine whether children with possible sensory processing deficits, as measured by the Sensory Profile, performed less well on an occupational performance measure (Assessment of Motor and Process Skills or AMPS) compared to children with typical Sensory Profile scores. In addition, this study explored possible links that would help interpret how different sensory tendencies might influence motor and process skills associated with occupation. Outcomes of the study found that children with SPD scored significantly lower on the AMPS process and motor skills measure than the typical group. In addition, scores on various sections of the Sensory Profile and the AMPS correlated high with each other. The strongest relation was with the vestibular area. This would be expected since this sensory system is most closely related to movement and motor performance (Fisher, Murray, & Bundy, 1991). Although this is a preliminary study, it can be hypothesized that children who exhibit atypical sensory processing behaviors as assessed by the Sensory Profile appear likely to demonstrate difficulties with occupational performance, in regards to activities of daily living (such as the ones on the AMPS). Ultimately, motor skills have an impact on the functioning of daily occupations. Fisher et al. suggested that a deficiency in motor skills may possibly be related to some underlying sensory processing abilities (1991).
Social/Emotional

Behavioral concerns arise when children's behaviors are bothersome, interfere with the ability to learn or function, or are harmful. These behaviors may include crying, running away, temper tantrums, yelling, or poor work habits such as distractibility, inattention, and inability to focus. Behaviors of these children may also be more aggressive, such as hitting, biting, or pushing. When thinking about a child's behavior, it is common to think the behavior is willful of the child or the child is behaving on purpose and it is within his control (Slutsky, & Paris, 2005). It is important to know why a child is acting as he is and the focus needs to be on the function of the behavior rather than the actual behavior. Understanding the function of the behavior allows adults to teach the child more effective behaviors or coping strategies.

Children react to sensory input in a variety of ways. Inattention, distractibility, fidgeting, acting without thinking, and aggressive or defiant behaviors, such as pushing or striking out, all may have sensory causes (Slutsky & Paris, 2005). It is important for the child to be able to self-regulate and maintain a state of homeostasis. A child with the inability to do so may have difficulty adjusting and coping with a variety of changes in the environment.

The ability to integrate sensory information is one source of variation that accounts for individual differences in self-regulation. Self-regulation refers to a person's abilities to regulate his or her responses to specific stimuli and is purported to include physiological, emotional, and behavioral factors that are interdependent. Poor self-
regulation is related to disruptive and aggressive behaviors, poor attention, and lower scores on cognitive measures (Calkins & Dedmon, 2000).

Dunn’s (1999) conceptual model hypothesizes that a continuum of interaction exists between neurological processing of sensory input and behavioral responses. Children with SPD typically develop behaviors to either avoid sensory input or to seek sensory input. Sensory Modulation Disorder describes problems in regulating and organizing the degree, intensity, and nature of responses to sensory input in a graded manner that interferes with age-expected social, cognitive, or sensory functioning. Persons with SMD display over-responsivity, under-responsivity, or lability in response to sensory stimuli (Dunn, 1997). Depending on where these children fall on the continuum of sensory processing, behaviors can interfere with their daily living and functioning.

Franklin, Jirikowic, and Astley (2008) completed a study of children with fetal alcohol syndrome (FAS) who demonstrated sensory processing deficits. Results of this study indicated that children with FAS demonstrated more externalizing behavior problems and problems in the specific domains of socialization, attention, rule breaking, and thought problems. These findings paralleled those of Miller, Reisman, McIntosh, and Simon (2001), who compared 46 typically developing children with 32 children with sensory modulation dysfunction. They found that children with sensory modulation dysfunction, as measured by the Short Sensory Profile, demonstrated more thought problems, aggressive behaviors, social problems, and attention problems as measured by the Child Behavior Checklist. For children with Autism Spectrum Disorder (ASD), associations have been found between atypical sensory processing and behavioral and
emotional problems, as well as sensory over-reactivity and anxiety (Baker, Lane, Angley, & Young, 2008). Maladaptive responses to classroom sensory environments have been assumed to underlie some of this behavior. When the brain is not processing sensory input well, it is usually not directing behavior or emotions effectively. According to Ayres, “When the flow of sensation is disorganized, life can be a rush-hour traffic jam” (1979, p.51).

**Academic**

“Learning is a function of the brain. A child’s brain is designed to follow an orderly, predictable, inter-related sequence of development that results in the capacity for learning” (Ayres, 1972, p. 4). Learning might be defined as acquiring the capacity to interpret the environment and to respond appropriately to it. The brain allows for a child to know his environment and to interact with it.

In Ayres’s theory of SI, she hypothesized that some children with learning disorders experience difficulty processing and integrating sensory information, and that this, in turn, affects their behaviors and learning. She theorized that the behavior and learning problems were, in part, due to faulty integration of sensory information and inability of higher centers to modulate and regulate lower brain sensory-motor centers (Ayres, 1972). Sensory integration (now known as sensory processing) is the ability to organize sensory information for use and can be improved through controlling its input to activate brain mechanisms.

Dunn (1999) stated that when a person cannot habituate to everyday sensory input, he or she may exhibit agitated and inattentive behavior. These behaviors may
include hyperactivity, inattention, restlessness, agitation, and stereotopic behaviors such as rocking or flapping. Learning requires a child to be receptive and alert. When a child is agitated or inattentive due to poor sensory processing it in turn, is difficult for him or her to learn.

Ayres (1972) hypothesized some aspects of language development depended upon the maturation and processing of somatosensory and vestibular input and the generalized capacity to make adaptive responses. de Quiros (1976) also linked vestibular hyporeflexia to language and learning disorders. Stillwell, Crowe, and McCallum (1978), found a statistically significant frequency of shortened-duration postrotary nystagmus among children with communication disorders. They proposed that the “development of the language center is in some way dependent on previous, as well as ongoing subcortical sensory integration” (p.226).

Parham (1990) used the Sensory Integration and Praxis Test (SIPT) to investigate the relationship between SI functioning and academic achievement in elementary school children with and without learning disabilities. The result of this longitudinal study suggests that SI measures are related to academic achievement, especially arithmetic in the primary school years. Praxis and visual perception at the age of six to eight years was a significant predictor of arithmetic and reading ability.

According to Mulligan (2001), children diagnosed with ADHD often experience significant academic and sensory motor problems that make typical school activities a challenge. Sitting and paying attention are problems for these children in the classroom, and they typically need support and strategies in order to learn. Interactions between
tasks, environments, and people continually change, so a person’s responses may fluctuate considerably, not only day to day, but within an activity (Hanft, Miller, & Lane, 2000).

Sensory processing needs to be addressed when it comes to academic learning. Poor sensory processing can affect language and communication skills, the ability to attend to a learning task, and reading and writing skills. If a child is having difficulties with sensory processing, she is more likely to experience difficulty learning in the classroom. When a child is unable to learn, this affects her functioning and abilities to fulfill the student role.

Intervention

Intervention strategies for children with SPD may involve a variety of people with different roles and responsibilities. Some of the people discussed in the literature review that are important components of a child’s intervention will include the occupational therapist (OT), the parent, and the teacher. The following sections will discuss and review literature on different roles and responsibilities of different people that interact with and work with the child, and how these roles affect each other and the child’s outcomes.

Occupational Therapist Role

Prior to initiating treatment with a child with SPD, the OT must evaluate the child and establish goals with the child and family. There is no one test or assessment tool that is used among therapists to assess children with suspected SPD. One well known test for SPD is the Sensory Integration and Praxis Tests (SIPT) developed by Jean Ayres (Bundy,
The SIPT is designed for children ages four to eight years with learning or motor delays, especially motor planning, tactile discrimination, and/or vestibular and proprioceptive deficits (Bundy). Bundy states that although the SIPT is the most comprehensive and statistically sound measure of SI, it is not always the most practical. The test is not available to all therapists due to the training that it entails to perform the test. The SIPT is also a lengthy process taking 1.5 to 2 hours to administer. The Sensory Profile and the Sensory Processing Measure are screening tools used to determine if further evaluations are needed (SPD Foundation, 2008). These two tools are questionnaires that parents and teachers complete to assist in making a determination if the child’s sensory processing issues are affecting the performance of daily activities. Since these tools are subjective measurements based on the judgment of the parent/teacher, they should be used in conjunction with other assessments/observations in order to determine if a child has a SPD. The DeGangi-Berk Test of Sensory Integration (TSI) provides a measure of SI for preschool children ages three to five years (Berk & DeGangi, 1983). This test was developed as a criterion-referenced test for preschool children with deficits in sensory, motor, and perceptual skill. The TSI is designed specifically to measure areas of postural control, bilateral integration and reflex integration, as these areas have significant impacts on the development of sensory integrative functions in preschool children (Berk & DeGangi). The TSI’s main limitation is that it only assesses children from three to five years old. Therapists also use a variety of behavior checklists along with clinical observations to assist them in correctly identifying the sensory processing difficulties the child is experiencing. Although these checklists and clinical observations are important aspects of the evaluation process, they
should be used cautiously and in conjunction with other assessment tools due to the subjectivity of their nature.

After the assessment has been completed, the therapist then works with the child and family to identify problem areas and establishes goals for the child in order to improve the child’s function or adapt the environment so the child can function better. Treatment strategies are then chosen based on evaluation results and established goals.

Sensory integration treatment continues to be controversial, especially outside the occupational therapy community. Within the occupational therapy community, it is a widely accepted treatment strategy, but there continues to be pressure to find evidence to confirm the validity of using the SI frame of reference within treatment sessions. Research is building to establish the efficacy of SI treatment strategies, but it has been difficult to get sound research over the years. Miller (2003) reports there have been both evidence for and against the efficacy of SI intervention, but she noted the majority of these research studies have had flaws. Boruch found that in order for research to be considered reliable and valid, randomized clinical trials must adhere to four key standards: replicable intervention, homogenous sample, sensitive and relevant outcome measures, and rigorous methodology (as cited in Miller, 2003). Miller reported that in the 80 identified studies, none satisfied all four criteria for a rigorous clinical trial. She concluded that until a series of studies have been conducted that meet this criteria, the only unbiased scientific conclusion is that no definitive, reliable, and valid evidence exists either supporting or refuting the effectiveness of SI intervention.
Mulligan (2003a) identified one of the issues in the research was the difficulty in measuring the fidelity of sensory integration treatments, which contributes significantly to the validity of efficacy research. Parham et al. (2007) stated the systematic evaluation of fidelity is crucial to ensure that the intervention under study can be replicated by other researchers and to clearly differentiate this from other types of interventions. It is important that interventions are consistent with the main characteristics of SI interventions, and they should be described in enough detail that they can be duplicated (Mulligan). This can be difficult, as treatment strategies for each child may vary significantly. It can be challenging to compare and measure a child’s individualized treatment strategy against that of another child when therapists are following the principles of the SI frame of reference, such as providing the child with a just-right challenge, following the child’s lead, and selecting activities that are purposeful for each child.

In a client-centered approach the therapist and the clients work together to define the nature of the occupational performance problem, the expected goals or outcomes of the therapy, and the type of interventions that can lead to these outcomes (Baum & Law, 1997). It is the role of the therapist to look at different treatment approaches that may lead to the client’s desired outcomes and then present these alternatives to the clients. Clients need to be informed of the controversy both for and against SI approaches (Mulligan, 2003b). It is the responsibility of the therapist to constantly monitor the progress towards the client’s outcomes and monitor if the chosen interventions are effective in making gains towards the outcomes. The available research suggests that SI interventions should be combined with other treatment approaches (Mulligan; Stonefelt
& Stien, 1998). According to Mulligan, as well as, Stonefelt and Stien, some of the common techniques that are often combined with SI interventions include: behavior modification, neurodevelopmental, visual perception, visual motor, and motor planning.

*Value of Parental Role*

The Individuals with Disabilities Education Act of 1990 is legislation that places families at the core of the intervention process and acknowledges the importance and the influence families have on a child’s development (Cohn, Miller, & Tickle-Degnen, 2000). Cohn et al. stress family-centered practices require therapists to understand and listen to the hopes and outcomes that are most important for the children’s families. Parents identified three themes describing important outcomes for their children with SMD these were: social participation and acceptance, self-regulation, and self-esteem and confidence (Cohn et al.). Parents also identified two themes for themselves; these included learning strategies to support their child and personal validation of the challenges of living with a child with SMD. In a family-centered practice, parents are the experts on their children, and they identify what is important for the children and family to be working towards. When therapists utilize a family-centered model correctly, parents and therapists work together using a specialized way of thinking about everyday-life situations in order to achieve the outcomes that reflect the family’s culture and values (Miller, 2006).

An important role of parents within the intervention process of a child with SPD is learning from the therapist how to integrate treatment suggestions into the child’s daily routines and in some cases how to adapt the environment to better fit their child’s sensory
needs. Wilbarger (1995) stated that although direct treatment intervention is important in working with children who have SPD, another important aspect of intervention is the implementation of an individualized sensory diet that addresses the child’s sensory processing needs throughout the day. Nackley (2001) concluded that a sensory diet allows children to receive sensory input throughout their day, particularly at home and at school, in order for them to participate more fully in activities that are challenging for them. It is important to provide parents and teachers with resources that can help children function more appropriately in these environments.

Bailey et al. (2005) found parental involvement was one of the keys to a child’s success. Hinojosa, Sproat, Mankhetwit, and Anderson (2002) identified similar results in a study where therapists reported that working with parents optimized the effects of the interventions with children. Hinojosa and Anderson (1990) found that parents reported the importance of home programs within their child’s interventions. With the importance therapists place on home programs, Novak, Cusick, and Lowe, (2007) reported there have been no significant studies to prove the efficacy of home programs on children’s outcomes; instead, most research has been on parental compliance and qualitative analysis of the parents’ experiences of the home program. Although Novak et al.’s findings suggest home programs given to parents of children with spastic hemiplegic cerebral palsy may be effective in producing better outcomes, they report more empirical research is needed to substantiate these findings.

Although there is not enough evidence on the effectiveness of home programs as it correlates to increased outcomes for children, there is sufficient research on the positive
effects of educating parents about their child’s disability and the positive effect of working with families in a collaborative family-centered approach. Cohn (2001) found parents value learning to understand their child’s behavior from a sensory processing perspective when working with OTs. This understanding allowed parents to validate their parenting, which enabled them to support and advocate for the child. Miller, Colligan, and Colver (2003) found families valued information and education they received regarding their child’s condition. Hinojosa and Anderson (1991) and Segal and Beyer (2006) found parents are more compliant with home programs if they can be included in family routines. Segal and Beyer also found that if parents could see a difference in the effect of the home program and if the child enjoyed the activities, they were more apt to continue with the home program. Hinojosa, Sproat, Mankhetwit and Anderson, (2002) surveyed occupational therapists about their attitudes and values in working with parents, and the therapists indicated the amount of time spent working with parents and other family members was just as important as the time spent working with the child. Seventy-six percent of therapists agreed that the time spent with parents had a greater impact on a child than any other aspect of the intervention.

It is critical when working with families to keep in mind their values and what they consider to be important for their child. It is also important to provide them information on their child’s condition, as well as keeping in mind teaching parents how they can incorporate activities into their child’s normal routines.
Value of Teacher Involvement

The *Occupational Therapy Practice Framework: Domain and Process, 2nd Edition* (Framework; AOTA, 2008) identifies education as one of the key areas of occupation. The Framework guides occupational therapists to consider a range of supports and services by addressing the child, task or activity, and environmental or contextual components to help students reach their goals. Occupational therapy is a related service in the schools for children 3-21 years of age. The decision to provide a student with occupational therapy is made by the individualized education plan (IEP) team, which collaboratively considers all evaluative evidence and develops the student’s IEP, which is intended to be a collaborative and coordinated effort (Block & Chandler, 2005).

The emphasis of the Individuals with Disabilities Education Act (IDEA, 1990) on inclusionary programming and partnerships between parents, educational professionals, and the educational process has expanded the models of service delivery and team interaction. In the education literature, collaboration routinely refers to a process of problem solving by team members all having equal status who share their knowledge on behalf of a student (Rainforth, York, & MacDonald, 1992 as cited in Smith, 1996). Collaboration among the members of the preschool child’s educational team (e.g. parent, teacher, occupational therapist, physical therapist, and speech-language pathologist) results in examination of performance and behavior problems from multiple perspectives. A team that works well together can find creative and effective solutions to a defined problem.
OTs typically serve children in the preschool classroom so that they can work on a skill within the context of the problem. Both the teacher and OT can benefit in working this way. The OT can model for the teacher and the teacher can learn what strategies the OT is using. One of the models used in practice to help promote collaboration is called the interdisciplinary model. An interdisciplinary approach consists of a team comprised of professionals from several disciplines involved with the child. These professionals have continuing, direct involvement with the child and collaborate with each other in carrying out the child's program (Stephens & Tauber, 1996). Dunn reports that “Interdisciplinary evidence is growing to indicate that providing intervention within everyday routines leads to stronger and more generalized participation in children and more competence in supporting children by the teachers and parents,” (as cited in Strzelecki, 2008, p.18). However, this is not the only way occupational therapy services are provided. IDEA mandates that the education of students with disabilities are to be provided with services in the “least restrictive environment” (IDEA, 1997). At times OTs use a consultative model, where direct services are not required. The OT may provide suggestions to the team, including the teacher, and they are the ones who would be responsible for carrying out the strategies. Teachers are extremely important in providing services to those children who have disabilities, including sensory processing difficulties. Teachers spend a considerable amount of time with all the children in the classroom and have the opportunity to make an impact on a child’s learning.

How a teacher approaches the teaching and learning process has tremendous implications for the kind of classroom that he or she creates, as well as teaching strategies, learning expectations, materials used, and ways in which students are expected
to demonstrate mastery of the material. A teacher’s philosophy or culture in the classroom will affect the methods that the occupational therapist may use or provide to assist a student in meeting school-based expectations (Block & Chandler, 2005). It is important for teachers to keep in mind that every child is different and presenting learning materials to a group of children while acknowledging and appealing to each individual is necessary to ensure success of each child.

*Sensory Integration Framework In The Schools*

The American Occupational Therapy Association’s (AOTA’s) statement, *Applying Sensory Integration Framework in Educationally Related Occupational Therapy Practice* (2003) describes ways to appropriately use the sensory integrative frame of reference in school-based practice. One of the questions an occupational therapist has to ask is: Can the intervention be integrated into the student’s daily routine? Supporting a student’s education means allowing him or her to be present in the classroom. Occupational therapy interventions used in the school setting should be those that allow the student to remain in the least restrictive environment (IDEA, 1997).

Children with sensory integrative disorders have difficulty organizing themselves, selecting what is appropriate to attend to and what is extraneous to the task at hand. This can interfere with classroom learning. There are numerous strategies that can be implemented in the natural setting of the classroom that will promote learning. For example, sensory integration can be addressed in the classroom by modifying activities and tasks across the curriculum, providing planned sensory breaks, facilitating motor skills or modulation control through sensory regulation and coping strategies, and
creating and promoting healthy sensory integration through sensory opportunities. Overall it is going to take the efforts of all team members, including the OT and the teacher, to effectively communicate with each other to create the best learning environment.

Summary

The literature review described current research on the validity of the diagnosis of SPDs, the effects SPDs have on children, and the validity using SI treatment approaches. The roles and the importance of the OTs, teachers, and parents play within the treatment process are also discussed.

SPD and SI therapy are both controversial, but research is building both to validate the diagnosis and the treatment outcomes of SI therapy. The research regarding the field of SI, sensory processing and SI therapy is essentially in the very early stages. The most significant research has occurred is in the area of relating certain behaviors to physiological changes in the body, as this goes beyond clinical observations. There has been reliable research as covered in the literature review, which validates the diagnosis of SPD. Research needs to continue in this area to support the addition of SPD into the next edition of the DSM-V.

Research in the area of outcomes of SI therapy in the past has been weak, due to the difficulty in setting up reliable research designs. As Miller (2006) indicated, there have been flaws in previous studies; therefore, no conclusions can be made for or against the validity of SI therapy based on the past research. More research is required that meets the standards of providing reliable and valid results. In the meantime, clinicians
have to rely on the clinical experience and reasoning to provide families with up-to-date information regarding these issues.

The purpose of this project is to help support children with SPD within their environments at home, school, and in the community. Since children spend the majority of their time in school and at home, it is felt that this is also where they need to be supported in their individual sensory needs. The project focuses on raising awareness among teachers and parents about SPD symptoms in children. It also provides information on ways teachers and parents can help support children with SPD in their daily routines so these children can function appropriately in their environments.
CHAPTER III

METHODOLOGY

The Individual with Disabilities Education Act (IDEA) is a law ensuring services to children with disabilities ages birth to twenty-one throughout the nation (IDEA, 2004). STRIDE Learning Center, located in Cheyenne, Wyoming, is a developmental preschool that services children ages birth to six years old in Laramie County under IDEA. Under Part B of IDEA, STRIDE provides early intervention services to children ages three to six years old in the preschool setting. Early interventionists in the Part B program at STRIDE include occupational therapists, speech language pathologists, physical therapists, and early childhood special education teachers. In this program it was determined through informal interviews with teachers, staff meetings, and feedback from parents that there needed to be more education on sensory processing disorder (SPD) and sensory processing.

The methodology used to gather information for the training on sensory processing and SPD included an extensive review of the current literature, discussions with occupational therapists who service children with sensory processing difficulties and continuing education training through workshops and conferences on SPD.

According to the Occupational Therapy Practice Framework: Domain and Process 2nd Edition, areas of occupation include, but are not limited to, education, play, and social participation (2008). It was found that SPD affects a child’s occupation in all of these areas. The contribution of sensory processing to functioning in various daily occupations has been well documented (Ayres, 1979; Bundy et al., 2002; Dunn, 1997;
Parham & Mailloux, 2001; Miller et al., 2001). From the literature, it was found that caregivers and teachers are significant to the success of treating children with SPD. Parents are at the core of the intervention process, and they are the primary influence on a child’s development (Cohn, Miller, & Tickle-Degnen, 2000). It is important for parents to learn from the therapist how to integrate treatment suggestions into the child’s daily routines and in some cases how to adapt the environment to better fit their child’s sensory needs. Bailey et al. (2005) found parental involvement was one of the keys to a child’s success. Collaboration among the members of the preschool child’s educational team results in cohesiveness of the team and creative solutions to problems. In addition, it is vital for therapists to respect the family and classroom culture and values when working with children (Miller, 2006). Dunn reports that “evidence is growing to indicate that providing intervention within everyday routines leads to stronger and more generalized participation in children and more competence in supporting children by the teachers and parents,” (as cited in Strzelecki, 2008, p.18). In order for a child to have success with early intervention services such as occupational therapy, collaboration with parents and teachers is important. Through this workshop, parents, teachers, and therapists can come together in a cooperative effort to ensure more success with children with SPD and sensory processing difficulties.

Based on the findings of the literature, workshop materials were developed to aid in the collaboration and education of SPD. These resources include a PowerPoint presentation, course handouts, and reference materials. Content of the material was critiqued for readability, an inclusion of learning activities was included for participants to apply and understand the content, and open discussions time was included so that
content could be geared to specific participant needs. The desired outcome of this workshop is to provide parents, teachers, and therapists with the opportunity to come together in a collaborative effort to ensure more success with children with SPD and sensory processing difficulties.
CHAPTER IV

PRODUCT

Through a review of literature it was found that Sensory Processing Disorder (SPD) is a condition that affects at least one in twenty children in a conservative estimate by Miller (2006). SPDs impact children in many aspects of development which affects their performances in different areas. At STRIDE Learning Center, a developmental preschool in Cheyenne, Wyoming, a need was identified by parents and teachers in regards to providing more information about SPD’s in order to enable parents and teachers to provide support for children in their development. The development of this project was based out of the need to help parents, teachers, and caregivers gain more information on SPDs in order to improve a child’s function in different areas of development.

Children who have symptoms of SPD frequently struggle in one or more of the following areas: academics, play with peers, motor skills, and social/emotional skills. Parents and teachers are often frustrated and confused with the difficulties a child with SPD has at school and home and in knowing how they can support the child to help them become more successful. Caregivers frequently are not aware of how an SPD affects a child’s functions at home, school, and out in the community due to lack of education in this area. Due to the lack of information available to parents and teachers, there was a need to develop educational materials to fill this gap and meet their needs.
Information gained through the literature review supported the need for providing education and resources for parents (Cohn, 2001; Cohn, Miller, & Tickle-Degnen, 2000; Miller, Colligan, & Colver, 2003; Segal & Beth, 2006). Cohn found that parents value learning how the child’s behaviors are affected from a sensory processing viewpoint, and through this understanding parents learn to accept the differences and advocate for their child. Parents also benefit from learning strategies to support their children and validate parenting experiences (Cohn, Miller, & Tickle-Degnen, 2000; Miller, Colligan & Colver 2003). Segal and Beyer (2006) found in their research that if parents could see the effect of home programs and if the child is enjoying the activities, the parents were more likely to continue with the home programs. Therefore, this project was developed in an effort to increase the awareness of the affects SPDs have on children and to teach the importance of the roles teachers and parents have in identifying symptoms and supporting the child in their individual sensory needs within different environments.

The Ecology of Human Performance Model was utilized to guide the development of this project. The Ecology of Human Performance Model (Dunn, Brown, & Youngstrom, 2003) considers the relationships among person, task, context, and how the interactions between these three impact performance. This corresponds with areas that need to be evaluated in children with SPDs. It is important to look at the person, task, context, and the interactions between all of these factors when looking at a child’s performance. It is also important to consider these three factors in planning treatment interventions for the child. The interventions that are taught within the workshop are consistent with the intervention approaches of the Ecology of Human Performance.
Model. These interventions include, establish/restore, adapt/modify, alter, prevent, and create (Dunn et al., 2003).

The education materials for this project were developed into a PowerPoint presentation along with handouts for parents, teachers, and other caregivers to use to support a child in different contexts. The PowerPoint presentation was organized in a manner to help caregivers initially come to an understanding of the importance that sensory processing plays in our daily lives, both as adults and as typically developing children. Next the presentation defines SPDs and the impact that they may have in a child’s life. The presentation reviews the controversies in the research both in the diagnosis and treatments. The significance of the roles that the OT, teacher, and parent have in helping a child with SPD are covered in the presentation. Learning activities are provided within the workshop to identify the importance of sensory processing in the daily lives of both children and adults with and without SPDs. The presentation concludes with a learning activity and handouts to be used to help teachers and parents integrate and implement the information covered. A handout of resources for parents and caregivers to further educate themselves in this area was developed. This handout provides descriptions of books, websites, and equipment that may be beneficial in understanding and working with children with SPDs. All of the workshop materials are found in the appendices.

Chapter IV provided a summary of the workshop materials and resources developed as part of this scholarly project. The complete workshop, handouts, and resource materials can be found in the appendices. Chapter V provides a conclusion and recommendations for implementation and future research.
CHAPTER V

SUMMARY

The purpose of this project was to develop educational materials for parents and teachers, to enable them to actively participate in their child’s treatment program. It was the authors’ intent that with more knowledge on sensory processing and Sensory Processing Disorder (SPD), parents and teachers would understand this type of processing and be able to implement sensory processing strategies in their classrooms and/or home environments. The authors ultimately aspire to have the children of these parents and teachers benefit. It is the goal for these children to be able to engage in daily activities for participation at home and school.

The project is a workshop on sensory processing and SPD for caregivers of pre-school age children. The workshop includes information on sensory processing, SPD, environmental structure, sensory supports, and sensory diet activities. Included in the workshop are learning activities to aid in the participants’ learning. These learning activities would allow for the learners to be active in participation and help assure that they are meeting the workshop objectives.

Based on the literature review, SPD is controversial and more research is required to meet the standards of providing reliable and valid results. The status of the research presents a dilemma for occupational therapists (OTs) who strive to provide evidence-based, family-centered practice and makes it a difficult subject for OTs to present to other people and professions. Recognizing this as a limitation, the authors felt that it was a necessary teaching tool designed to benefit children of pre-school age in their
development, as well as aid with their sensory processing needs as it relates to their daily functioning.

Due to the content of sensory processing and SPD, this workshop may not meet the needs of all caregivers and teachers who are new to these concepts. It was the intent of the authors to provide this workshop to learners who are ready to learn more about SPD. This workshop may be at a high level and only attract those learners who have had some background on SPD. Assessing the learning needs of the learners will be crucial and may present a challenge to the presenters.

This project was intended for both parents and teachers, and appealing to both learners with one workshop was a challenge. It was difficult to address the learning needs of each population specifically. The learning needs of teachers may be very different to the needs of the caregivers given the setting, culture, and values in the way they work with children. This will have to be addressed during each workshop, and the presenters will have to be ready for the challenge of presenting to various people.

Lastly, it was the intent of the authors to provide this workshop as a long range-learning tool. The long-term goal is for parents and teachers to implement strategies within daily routines. Assessing this goal is a challenge and beyond the scope of this project. A follow-up plan is needed to determine the long-term effects and outcomes of this workshop.

The information contained in this learning workshop is relevant to teachers and parents of pre-school age children. This workshop is necessary to implement initially at the beginning of the school year. It will be open to the teachers and families of STRIDE
Learning Center who are interested in sensory processing and SPD. It will then be available for the remainder of the school year based on the needs of the community.

This workshop was designed for a full day. Space requirements include a spacious room in order for learners to sit comfortably and presenters to be able to walk around the room in order to engage the audience; two examples are conference rooms and classrooms. The materials that are required for this project include tables and chairs for the learners to be comfortable for sitting and writing, a wall and a screen with a projector for presenting the PowerPoint as a visual aid, and a computer in order to present the PowerPoint.

This workshop needs to be presented by OTs who have a strong knowledge base on SPD and the development of children ages 3-5. The presenters need to be able to answer questions regarding sensory processing, SPD, self-regulation, behaviors, sensory diet, environmental modifications, and other questions that may arise. The presenters need to be able to problem-solve questions and encourage an environment where people are able to share and support each other. It is strongly recommended that the presenters provide the learners with different styles of sensory supports such as candy, gum, fidget toys, and various seating devices (such as balls, cushions, etc.). This will aid in learning and help the learners to identify their own sensory needs.

This workshop is in the beginning stages of its implementation; therefore, program evaluation is recommended to determine whether it was successful or not. A follow-up plan will help determine whether teachers and parents were responsive to the information and were able to implement it. Furthermore, future studies of the program,
with the teachers’ and parents’ input, will help to promote its development and advancement.

Sensory processing is a normal process that supports people’s behaviors and actions. SPD is a disorder when a person cannot process sensory input in a way to support their daily functioning. It can be difficult for parents, teachers, and caregivers to recognize and understand a child who may be experiencing signs of SPD. Intervention based on sensory integration theory (Ayres, 1972) is widely used among OTs working with various children with developmental, learning, and behavior problems; however, there is a need for further research on SPD (Parham et al., 2007). Despite the controversies surrounding the research on SPD, caregivers of children should be educated on different teaching methods. This workshop is designed to bridge an information gap amongst therapists, parents, and teachers on sensory processing and SPDs. Sensory processing has been pivotal in the development of children and aids in building the foundational skills necessary for learning, and, therefore, should be given value and importance when working with children.
References


Appendix A

Sensory Processing Disorder: Raising Awareness
PowerPoint Teaching Unit
Learning activity #1: As participants register and get their materials for the workshop, hand them a sensory survey and instruct them to complete the survey questions in order to participate in discussions during the workshop.
Workshop Objectives

The learner will be able to:

- Define sensory processing and sensory processing disorder (SPD).
- Identify and describe symptoms and warning signs of SPD.
- Explain the affects SPDs has on the daily functions of children.
- Describe the benefits of a sensory diet, and be able to incorporate sensory diet activities into a child’s daily routines.
- Adapt the environment in order to meet the sensory needs of a child.
What is Sensory Processing?

• Sensory Processing is the way our brain receives input from our senses and how it responds to that input.

“We experience life through our senses. We hear, touch, taste, smell, see, and move around.”

(Dunn, 2008)

• Daily routines are filled with sensory processing experiences.

• Sensory processing is a normal neurological process of organizing sensations for use in everyday life. We use sensations to survive, to learn, and to function well in daily routines. Whether you are riding a bike, eating ice-cream, or applying lotion, our neurological system is processing sensory information and we are responding to that input.

• Examples: Adjusting the water temperature for showers/baths, being able to find things in drawers, by feeling with our hands and not being able to see things, being able to tune out noises in the environment that are irrelevant in order to pay attention and listen. These are just a few examples of how we experience the world through the 7 senses.
Sensory Systems

- The five familiar senses:
  - Touch/Tactile
  - Taste
  - Smell/Olfactory
  - Vision
  - Hearing/Auditory

Two less familiar senses, often referred to as the “hidden senses”:
- Proprioception
- Vestibular

(Kranowitz, 1998)
What is the Proprioceptive Sense?

- The proprioceptive sense is information received from the muscles, joints, and body parts. It tells us about movement and body positions.

- It gives us the ability to know where our hand is even though we are not looking.

  (Kranowitz, 1998)

- The receptors for proprioception are located in our muscles, joints, ligaments, tendons, and connective tissue.
What is the Vestibular Sense?

- The vestibular sense has to do with sensory information received through the inner ear and tells us where our head is in space.

- The vestibular sense provides information related to movement, balance, and head position.

(Kranowitz, 1998)

- The vestibular sense is important for development of balance, coordination, eye control, attention, and being secure with movement.
Why is Sensory Processing Important?

- Sensory Processing helps with:
- Academic skills
- Attention
- Fine and gross motor skills
- Emotional security
- Speech and language skills
- Play skills
- Healthy relationships with others
- And much more.....
Most people are born with the ability to receive sensory input and organize input effortlessly in order to respond with correct behavioral and physiological responses.

Although we are all born with this ability, we may not all experience sensory input the same. What may calm one person, may overexcite or overwhelm another person.

Some examples of how people may experience sensory input differently:
- Some people study or concentrate better with background music on, while it may distract others.
- Some people enjoy roller coaster rides, while it may make others feel sick.
- These are just a few examples of the differences in our sensory systems, this is why it is important to take these differences into consideration when you are considering the sensory needs of others, your children, or students.

Discuss the sensory survey and talk about how everyone has different sensory preferences. This is a good example of how we embed sensory input throughout our day to help us function optimally in our daily routines.

Discussion Questions:
- Through completing the sensory questionnaire, did you recognize things that you do to increase your alertness at different times of the day when needed?
- What types of things help calm you down or relax you?
- Are the things you do different from family members, roommates, students?
- How might the difference you might have in sensory preference interfere with people around you at work, home, or school?
Self-Regulation

- Self-regulation is the ability to attain, maintain, and change levels of arousal/alertness in order to participate or respond to a task or situation appropriately.

(Williams & Shellenberger, 1994)

- Arousal can be considered a state of the nervous system, describing how alert one feels, which affects the ability to attend, concentrate, and participate in tasks or activities.

- There is a continuum of states of arousal from: 1. deep sleep, 2. drowsy, 3. quiet alert, 4. active alert, 5. agitated, and 6. extremely dysregulated.

- The attainment of an optimal state of arousal is directly correlated with a child’s ability to be available for learning in a variety of situations.
What is Sensory Processing Disorder? (SPD)

- A condition that exists when sensory signals (sensory input) do not get organized into appropriate responses, and a child’s daily routines and activities are disrupted as a result.

- Some other names for sensory processing disorder: sensory integration disorder, sensory integration dysfunction, sensory processing dysfunction.

- Sensory integration dysfunction has been described as a sensory processing breakdown, or a “traffic jam in the brain” (Smith & Gouze, 2004).

- A child with a sensory processing disorder is not processing sensory information correctly, therefore they may have difficulty responding appropriately to their environment due to the way they are misinterpreting information from their senses.

- Only considered a disorder when causes significant difficulties in daily activities.
SPD produces three symptom categories that may occur independently or in combination with one another, and they can range in severity from mild to severe.

(Miller, 2006)

These three categories are:

- Sensory Modulation Disorder
- Sensory Based Motor Disorder
- Sensory Discrimination Disorder
Overview of SPD Categories

1) Sensory Modulation Disorder (Problem with turning sensory messages into controlled behaviors that match the nature and intensity of the sensory information.)
   - Sensory over-responsivity
   - Sensory under-responsivity
   - Sensory seeking

2) Sensory Based Motor Disorder (Problem with stabilizing, moving, or planning a series of movements in response to sensory demands.)
   - Dyspraxia
   - Postural Disorder

3) Sensory Discrimination Disorder (Problem with sensing similarities and differences between sensations.)
   - Vision
   - Hearing
   - Touch
   - Taste/Smell
   - Position/Movement

(adapted from Miller, 2006)
Sensory Modulation Disorder (SMD)

Definition: SMD is a problem turning sensory messages into controlled behaviors that match the intensity of the sensory information we receive through our senses.

There can be three types of SMD:
- Sensory Under-Responsivity
- Sensory Seeking/Craving
- Sensory Over-Responsivity

(Miller, 2006)

• Sensory Modulation is the ability to manage one’s reaction to sensation, and is reflected by the child’s sensory or neurological threshold, which correlates with a child’s ability to be able to self-regulate in different situations.

• The ability to effectively modulate sensory input or self-regulate correlates to a child’s neurological thresholds. Neurological thresholds refer to the amount of sensory input required for a neuron to respond.

• A child with a high sensory threshold requires a lot of sensory input to respond. These children are usually under-responsive and/or sensory seeking.

• A child with a low sensory threshold requires very little sensory input to cause a response. These children are usually over-response.
Sensory Over-Responsivity (SOR)

- These children respond to sensory messages more intensely, more quickly, and for a longer time than children with normal sensory responsivity.

- Low neurological thresholds are associated with SOR. (Miller, 2006)

- SOR is also known as Sensory Defensiveness.

- The child who has SOR is overwhelmed by ordinary sensory input and reacts defensively to it, often with strong negative emotion. This condition may occur as a general response to all types of sensory input or it may be specific to one or a few sensory systems.

- The child can have an overreaction to touch, movement, sounds, odors, and tastes, any of which may create discomfort, avoidance, distractibility, and anxiety.

- These are children that have a low sensory/neurological threshold.
Behaviors Often Indicative of Over-Responsivity

- Picky eater
- Reacts negatively to smells which do not usually bother other people
- Easily distracted by other visual stimuli in the room
- Distracted by sounds not normally noticed by others
- Avoids playground equipment
- Becomes anxious with light or unexpected touch
Sensory Under-Responivity (SUR)

- These children have less of a response to sensory information, taking longer to react and requiring intense messages before they act.
- High neurological thresholds are associated with SUR. (Miller, 2006)

- SUR has also been called sensory registration problem due to the difficulty of the child to register relevant environmental stimuli.

- When SUR occurs the child often seems oblivious to touch, pain, movement, taste, smells, sights, or sounds.

- These are children that have a high sensory/neurological threshold.

- Usually more than one sensory system is involved, but for some children one system may be particularly affected.

- It is common for children with severe developmental problems, such as autism, to lack sensory registration in some situations but react with extreme sensory defensiveness in other situations.
Behaviors Indicative of Sensory Under-Responsivity

- Prefers foods with intense flavor
- Difficulty finding items among other items
- Unaware of what is going on around them
- Does not respond when calling their name
- Needs to touch everything and everyone
- Prefers sedentary activities to more physical activities
- Slow to respond to directions or to complete assignments
- Does not cry when seriously hurt
Sensory Seeking  
(SS)

- These children have a nearly insatiable craving for sensory experience and actively seek sensation often in ways that are socially unacceptable.

- Associated with high neurological thresholds

  (Miller, 2006)

- These children are very active and try to add sensory input and intensity to every aspect of their lives.

- A child who is a sensory seeker may take unnecessary risks, such as jumping off surfaces that are too high, or crashing into things or people in order for their body to register the sensory input. They may crave swings, spinning, and extreme movement activities in order to get extremes in their sensory messages.

- These children have high sensory/neurological threshold and act in a way to counteract these thresholds.

- These symptoms may often get confused with and are difficult to differentiate from Attention Deficit Hyper-Active Disorder (ADHD).
Behaviors Often Indicative of Sensory Seeking

- Seeks out jumping, bumping, and crashing activities
- Excessive banging on objects
- Loves “roughhousing”
- Loves jumping off furniture
- Frequently hits, bumps or pushes other children
- Chews on pens, straws, shirt sleeves, etc.
Sensory-Based Motor Disorder (SBMD)

- This disorder occurs when the "hidden" proprioceptive and vestibular senses that allow our bodies to move and sense our position in space are impaired.
- Children with SBMD have trouble with stabilizing, moving, or performing movement sequences.

The two types of SBMD:

- Dyspraxia
- Postural Disorder

(Miller, 2006)

- This second pattern of SPD describes the dysfunction that occurs when there is impairment in the proprioceptive and vestibular senses.

- These are referred to as the hidden senses, and are used to help our bodies move and identify where body parts are in relationship to one another.
• Motor planning is the ability to smoothly coordinate muscles in order to plan and perform new movements and activities (Kranowitz, 1998). Children with dyspraxia have difficulty motor planning activities that are new unfamiliar activities, or activities with multiple steps. These children are often seen as being uncoordinated, or parents and teachers may think they are not listening to directions because they have difficulties completing multi-step activities.

• Dyspraxia can occur in gross motor (large movements), fine motor (small movements of the hands), oral motor (movements of the mouth) activities, or in a combination of any of these (Miller, 2006).

• Children who are clumsy or awkward and have difficulty learning new activities often have dyspraxia. They require much repetition to learn new activities.
Behaviors Often Indicative of Dyspraxia

- Slow to sit up, roll, crawl, run, or walk
- Difficulty learning new motor activities, such as riding bike
- Clumsy, awkward, and accident prone
- Often trips or bumps into things
- Difficulty keeping personal spaces organized
- Poor ball skills and other sporting games
Postural Disorder

- These children have difficulty maintaining enough control of their bodies to meet the demands of a given motor activity.

(Miller, 2006)

- Children with these symptoms generally have low muscle tone throughout their muscles.

- These children tend to have poor balance, tire easily, and may appear to be weak.

- They may have messy handwriting because of the lack of stability and muscle tone in their hands and shoulders.

- This postural disorder subtype is frequently seen in combination with other subtypes of SPD (Miller, 2006).
Behaviors Often Indicative of Postural Disorder

- Children seem weak or tire easily, poor endurance
- Poor balance and falls easily
- Slumped posture over desk or table
- Illegible handwriting
- Do not consistently use dominant hand
- Difficulty climbing a jungle gym or hanging from bars
Sensory Discrimination Disorder (SDD)

- The impaired ability to interpret and distinguish between similar sensations in one or more of the sensory systems.

- Impairment is in one or more of several systems: touch, vision, hearing, taste, smell, vestibular, and/or proprioceptive.

(Miller, 2006)

- The nervous system within a child who has SDD has difficulty accurately processing sensory messages; as a result of this, the child has difficulty using the information to make appropriate responses throughout his day (Kranowitz, 1998).

- Children with SDD often need extra time to process sensory information because they have difficulty figuring out what they are perceiving as quickly as other children do.
Behaviors Often Indicative of SDD

- Difficulty feeling what is in hands
- Not sure how much pressure to use when grasping items
- Difficulty hearing what is said if there is background noise
- Difficulty differentiating smells, tastes
- Gets lost easily, difficulty following directions
- Aversion to puzzles or other visual games
Behaviors Often Indicative of SDD Continued

- Difficulty telling difference between similar words
- Difficulty identifying shapes and letters
- Difficulty following multi-step or complex directions
- Difficulty organizing writing on a page, such as spacing between letters or words
- Difficulty distinguishing what is touching him or where on his body he is being touched

(Miller, 2006)
Impact of SPD

Sensory processing disorders can negatively affect development and function in the following areas:

- Social/emotional
- Play
- Motor
- Cognitive/academic

• The affects of SPD can be in one area or a combination of different areas.
- It is important for the child to be able to self-regulate and maintain an optimal state of alertness or arousal. A child with the inability to do so may have difficulty adjusting and coping with a variety of changes in the environment.

- The ability to integrate sensory information is one source of variation that accounts for individual differences in self-regulation. Self-regulation refers to a person’s ability to regulate his or her responses to specific stimuli and is purported to include physiological, emotional, and behavioral factors that are interdependent. Poor self-regulation is related to disruptive and aggressive behavior, poor attention, and lower scores on cognitive measures (Calkins & Dedmon, 2000).

- Miller, Reisman, McIntosh, and Simon, (2001) compared 46 typically developing children with 32 children with sensory modulation dysfunction. They found that children with sensory modulation dysfunction, as measured by the Short Sensory Profile, demonstrated more thought problems, aggressive behaviors, social problems, and attention problems as measured by the Child Behavior Checklist.

- In the picture above the child is resistant to go shopping due to difficulties she has in self-regulating responses to sensory input she experiences. She may experience the store as too loud and over-whelming for her. In response to this sensory input, she may become over-stimulated, aggressive, and/or disruptive when she is forced into situations like this.
• In a study exploring how SPD affects playfulness, the authors asked the questions: does SPD interfere with play and how do the major manifestations (poor modulation and dyspraxia) of SPD relate to playfulness? (Bundy, Shia, & Miller, 2007).

• The study found that Test of Playfulness (ToP) scores of the children who were typically developing were significantly higher in play than those children with SPD. (However, the authors cautioned that these scores were not as straightforward as they seemed and recommended more research in this area).

• ToP scores also strongly correlated with Short Sensory Profile scores (SSP is a tool to help assess SPD). The children with SPD engaged in relatively sedentary activity most of the time (23 of 32 observations). Active play in general, is more demanding of both motor skills and the ability to maintain optimal arousal.

• In this picture a child may become over-stimulated and choose to go to a more quiet or solitary activity instead of engaging in play with peers.

• Sometime children can become over aggressive with peers due to the inability to control how much force they are using during play activities. These children can be overwhelming to their peers and their peers may start excluding them during play activities.
• Typical developing children require minimal adult guidance or teaching to acquire basic developmental skills such as manipulating objects, sitting, walking, and climbing (Parham & Mailloux, 2001).

• Dysfunction in motor, vision, somatosensory, and/or vestibular systems may limit the child’s ability to move through space for exploration.

• Children who experience motor difficulties may appear clumsy or uncoordinated in some of their movements.
Children who experience sensory processing difficulties in the motor area may be overwhelmed by the motor demands of activities. They may appear uninterested or unwilling to participate or engage in motor activities that appear overwhelming to them. A child may see a playground like the one in the picture and be overwhelmed by the motor demands that are required to play on the equipment. The child may refuse to go to the playground or he/she may find one area and primarily stay in one place where the demands are familiar and safe.
In Ayres theory of SI, she hypothesized that some children with learning disorders experience difficulty processing and integrating sensory information and that this, in turn, affects their behavior and learning.

This picture shows a child who is reluctant to getting his hands dirty, which can interfere with a child's participation in activities and learning.

Learning requires a child to be receptive and alert. When a child is agitated or inattentive due to poor sensory processing it in turn, is difficult for them to learn.
Prevalence of SPD with Other Disabilities

- 40% – 48% of children who have other disabilities also have sensory processing problems.

(Miller, 2006)
Coexisting Conditions

- Attention Deficit Hyperactivity Disorder (ADHD)
- Attention Deficit Disorder (ADD)
- Autism Spectrum Disorders
- Bipolar Disorder
- Depression and Anxiety
- Fragile X Syndrome
- Fetal Alcohol Syndrome
- Obsessive Compulsive Disorder (OCD)
- Cerebral Palsy

- These are conditions that also have a high incidence of SPD’s (Miller, 2006).
Prevalence of SPD in Children Without Disabilities

• One recent study of surveyed parents of kindergartners found that 14% of the 703 surveys returned had symptoms.  
  (Ahn, Miller, Millberger, & McIntosh, 2004)

• Another recent survey of kindergartners used a conservative estimate of 5% or 1 in 20 of incoming kindergartners have symptoms, based on screening results.  
  (Miller, 2006)
What is Occupational Therapy?

- Specialize in assisting people with the everyday activities that make life meaningful and productive.

- Occupational therapy with infants and young children: Assist children with daily life tasks such as playing, sleeping, eating, learning, relating, and developing.

- Occupational Therapy services are provided to children by an occupational therapist or an occupational therapy assistant. Both of these individuals have received courses in the biological, physical, medical, and behavioral sciences, and they have completed internships during and following the completion of their course work (Kranowitz, 1998).

- For a child, meaningful and purposeful activities may include jumping, playing games, drawing, writing, making mud pies, dressing, riding bikes, eating, bathing, etc.
Benefits of Occupational Therapy in Relationship to Treating SPDs

- Can help identify the difficulties a child is having in response to inefficient sensory processing
- Helps children with self-regulation
- Helps families and teachers modify the environment to improve functional activities
- Helps children improve functional skills at home and at school
Occupational Therapist Roles

Assessment

- Clinical observation
- Interviews with parents/caregivers and teachers
- Evaluation tool/tests

- These are some of the assessments used to determine if a child has a SPD.

  - SIPT: Offers a complete assessment of sensory integration. Ages 4 year to 8 years, 11 months. 17 subtests requiring children to perform visual, tactile, kinesthetic, and motor tasks.

  - Test of sensory functions in infants: Offers an objective way to determine whether and to what extent an infant has sensory processing deficits. Ages 4-18 months. It is individually administered, requiring simple interaction with the infant.

  - Miller Assessment of Preschoolers: Helps evaluate children 2.9-5.8 years of age for mild to moderate developmental delays. Five area of performance measured include: foundations (basic motor tasks and awareness of sensations), coordination (complex gross, fine, and oral motor abilities), verbal (focuses on memory, sequencing, comprehension, association and expressions in a verbal context), nonverbal (examines, memory, sequencing, comprehension, and performance of mental manipulation not requiring spoken language), complex tasks (measures sensorimotor abilities in conjunction with cognitive abilities that require interpretation of visuospatial information).

  - Sensory Profile: A 125-question profile reporting the frequency with which their child responds to various sensory experiences. The profile contributes to a comprehensive picture of a child’s performance. It should be used in combination with other evaluation data to create a complete picture of the child’s status for diagnostic and intervention planning.

  - Sensory Processing Measure: The SPM is a norm-referenced evaluation tool that uses standard scores for two higher level integrative functions: praxis and social participation. It includes five sensory systems: visual, auditory, tactile, proprioceptive, and vestibular functioning. The SPM gives a complete measure of the child in different environments: home, school, and community.
Occupational Therapist/Occupational Therapy Assistant Roles

Treatment

- Sensory integration therapy
- Collaboration
- Consultation
- Environmental modifications

- Collaboration and consultation involves working with teachers using SI principles in the classroom.

- Environmental modifications involve changing things within the environment to help a child process information more effectively and become more successful within his/her environment.
Classic Sensory Integration Therapy

Key Principles of Sensory Integration Therapy:

- Just right challenge
- The adaptive response
- Active engagement
- Child directed

(Schaff & Miller, 2005)

• In providing a “just right challenge” the therapist creates playful activities that create achievable challenges for the child. The activities are challenging for the child but they are able to be successful in the activity.

• The adaptive response is a response to the “just right challenge”, the child adapts or alters his/her behavior with new and useful strategies in order to further their development.

• Active engagement is the therapist’s ability to create challenges that the child will be interested and engaged in actively. Sensory-rich play scenarios that the child will actively participate in during therapy sessions should be developed.

• In child-directed therapy, the therapist constantly observes the child’s behavior and follows their lead to create enticing sensory-rich activities that the child is interested in and is actively engaged in to provide the “just right challenge”.

(Schaff & Miller, 2005)
• Left side: This child is using his motor planning skills, leg strength, eye-hand coordination, and bilateral coordination in order to climb the wall. He has to integrate his sensory systems (proprioceptive, tactile, and vestibular) in order to get where he wants to go. The therapist stands by for safety and guidance as needed. The child’s sensory-motor system will better adapt and progress when he is being actively engaged, directing the movement himself, adjusting his movements as they occur, and being given the “just-right-challenge”.

• It is important to meet the child where he is currently and then challenge him to go one step further.

• Right side: This child is actively engaged in climbing a rope and is using his upper-body strength and trunk control. In addition, he has to integrate the proprioceptive, tactile, and vestibular systems. He is receiving proprioceptive input at his shoulders, wrists, and hands. His vestibular system is letting him know his head is upright and there is slight movement in the rope as he is attempting to climb up. His tactile sensory system provides input as to where his body is on the rope (foot and hands).
• Left side: Activation of many sensory systems occurred in order for this child to scooter-board down a ramp while laying on his stomach. His postural system was activated in order for him to sustain extension at his trunk, head, arms, and legs. The ability to assume and maintain good extension is an indication that the vestibular and proprioceptive systems are functioning. His vestibular system allowed him to understand and process the movement of going forward in a linear motion down the ramp, which also challenges his balance reactions. The tactile, proprioceptive, visual and vestibular systems worked in conjunction for him to have good body awareness of where he was in space.

• Right side: This activity also activates many of the sensory systems, which include the vestibular, tactile, proprioceptive and visual system. His postural muscles are activated while he is lying on his stomach (prone) over the platform swing, which activates the vestibular and proprioceptive systems. He is able to keep his head upright while looking up and pulling himself up the rope in order to grab a bean bag and drop it into the basket. Motor planning and bilateral coordination are also required as he pulls himself up the rope. The visual system and motor planning are challenged as the child has to plan when to throw the bean bag while he is moving in order to hit the basket (projected action sequences).
The activities above can be seen in a progression from having a child sit on the swing and throw bean bags to increasing the demand as the child is more comfortable and gains confidence until he can stand on the swing and throw bean bags. This activity activates the vestibular, visual, and tactile system, provides many different challenges to a child and can be adapted to meet the needs of the child. The child’s postural and balance reactions are being challenged and you can increase the demands by the intensity of movement provided and the direction of movement (linear vs. rotational). The child’s motor planning, eye-hand coordination, and projected action sequencing is being challenged by having to throw a bean bag into a basket from a moving surface.

The previous slides all involve applying the principles of SI therapy. The activities are child-directed so that the child is engaged and actively participating in the activity. The activities are developed in order to give the child a “just right challenge” in order to facilitate an appropriate adaptive response.
Controversies of SI Therapy

- Lack of valid research
- Validation of diagnosis
- Consistency within treatment sessions among therapists
- Effectiveness of other therapies

- Research is building to establish the efficacy of SI treatment strategies but it has been difficult to get sound research over the years. Miller (2003) reports there has been both evidence for and against the efficacy of SI intervention, but she noted the majority of these research studies have had flaws.

- Research in the area of outcomes of SI therapy in the past has been weak, due to the difficulty in setting up reliable research designs (Mulligan, 2003a).

- The research regarding the field of SI, sensory processing and SI therapy is essentially in the very early stages, (Miller, 2003).

- The most significant research has occurred is in the area of relating certain behaviors to physiological changes in the body, as this goes beyond clinical observations (Miller, 2003).

- More research is required that meets the standards of providing reliable and valid results. In the meantime, clinicians have to rely on clinical experience and reasoning to provide families with up-to-date information regarding these issues (Miller, 2003).

- SI interventions have been found to be as effective as various other alternative treatment approaches (Mulligan, 2003b).
Parent and Teacher Considerations

- Mindfulness of different sensory needs of each child
- Different learning styles
- Mindfulness of the environment
- Culture influences/philosophies
What Can Parents and Teachers Do To Help Children with SPD?

- Sensory diets
- Environmental modifications
What is a Sensory Diet?

- Sensory diets are sensory activities that are included in a child’s day at regular intervals to help meet specific sensory needs.

- These activities give the child the sensory input their body needs throughout the day to help the child remain in a calm, alert state so they can function at their optimal level throughout the day.

  (Nackley, 2001)
Every child has unique sensory needs, and their sensory diet must be customized for individual needs and responses.

An occupational therapist needs to be involved in the development of an individualized sensory diet.

(Nackley, 2001)

Indiscriminately adding more sensory stimulation into a child’s routines can sometimes intensify negative reactions. An occupational therapist should be consulted in order to help evaluate the child’s sensory needs and help parents and teachers identify appropriate activities to include in a child’s sensory diet.

When starting a sensory diet with a child remember the following guidelines:

- Routines are important, so start simple
- Start with activities the child has an interest in, as this may reduce conflicts or resistance
- General rule - use calming or alerting activities prior to a period of time where child may have to sit, listen and attend
- Alternate sitting and movement activities throughout a child’s day
- Change the activities and routines occasionally for variety because this will help keep the sensory diet interesting to the child
- Watch your child’s reactions during and after the activities and make notes on what helps calm, alert, or over-stimulates your child
Indications for a Sensory Diet

- Frequently zones out
- Seems sleepy when should be attentive
- Needs frequent movement
- Understands things sometimes, sometimes does not
- Often appears agitated
- Difficulty settling down after recess or movement activities
- Sucks or chews on clothing or other objects
- Clumsy and uncoordinated
- Temper tantrums for no apparent reason or in loud environments
Benefits of a Sensory Diet

- Prevent sensory and emotional overload
- Prevent challenging behaviors
- Decrease anxiety
- Increase attention and ability to focus during activities
- Increase positive interactions with peers and adults
- Calming and organizing effects
Implementing a Sensory Diet is *Detective Work*

Look at child’s behavior for subtle cues to strategies he or she is using

- What is the child seeking or avoiding?
- Does it work for the child?
- Is change needed? Why?
- If change is required, can you help the student replace the behavior with a strategy that works but is more appropriate?

- When applying sensory diet activities, it is important to note what activities help your child with alerting, calming, and organizing. Activities that calm one child may alert or over-stimulate another child. You have to be a detective to find what works best for your child.

- You may want to keep notes or make a chart of activities that work and what areas they help.
Heavy Work
“The Great Organizer”

- Heavy work is the most effective and easiest strategy for self-regulation at home and school.
- Heavy work can either be used for calming or alerting.
Heavy Work Activities at Home and School

- Pushing and pulling games
- Playground activities (hanging from monkey bars, climbing up slides)
- Chewing chewy foods
- Carrying heavy items

See handouts
Calming Activities

- Deep pressure
- Slow rocking, swinging, or swaying
- Soft music
- Dim lights
- Wrap in blanket

See handouts
Alerting Activities

- Running, jumping, biking
- Bouncing on a therapy ball or trampoline
- Eating crunchy foods, ex. apple, carrots, ice cubes
- Using bright colored paper for increased contrast

See handouts
Environmental Modifications

- Environmental modifications are changes you can make within a child’s environment that will help the child process sensory information and help them function better within his or her environment.

These are recommendations the occupational therapist will make based on the child’s sensory needs.
Examples of Environmental Modifications

Structure the environment:
- Use consistent routines and/or visual schedules
- Placement of a desk within the classroom based on sensory needs
- Provide quiet, cozy places for the child when over stimulated
- Wear headphones/earphones or music to block out noises or use for calming
- Provide seating options that allow for additional movement

- Decrease visual distractions in rooms and on desks when possible

- Use weighted blankets or heavy sleeping bags to sleep under

- Adapt lighting in room when possible

- Use color-coded files to organize papers or for contrast
Environmental Modifications

- Neutral tones with natural lighting can help create a calming affect.

- Decreasing clutter in the room and not having a lot of things hanging from the ceiling or on the walls can help children that are over-responsive and tend to get over-stimulated.
Environmental Modifications

- Bright colors can be over-stimulating for children who are over-responsive

- Having a lot of things hanging from the ceiling and on the walls can create an over-stimulating environment.

Learning Activity:

Identify the things in each one of these different environments on the two previous slides that can positively or negatively affect a child with a sensory processing disorder.

Are there things in your environment at home and/or school that could be changed to help your child or a child in your classroom that struggles with these deficits?
Environmental Modifications
(Fidgets)

- Fidgets can help some children maintain an optimal state of alertness, which can increase their ability to attend during listening activities.

- Chewing on a chewy necklace/bracelet, chewing gum, or sucking on candy can also be organizing for a child and help them attend and listen.

- Think of things you do to help you during times such as this workshop when you have to sit and listen for extended periods of time, (doodling, drinking hot/cold beverages, eating, twisting a paperclip, etc.).

Have you used any of the fidgets provided in the workshop or do you have something you use to help you attend and listen during times of prolonged sitting and listening activities?
Environmental Modifications
(Seating Devices)

- The picture above shows a variety of seating devices that allow a child to move and fidget. These different seating options can help alert, calm, or organize a child, in order to increase his/her attention and listening skills (t-stools, sofa, therapy balls, bolster, peanut ball, move n sit cushions, air cushions).
• Visual schedules can help a child who has difficulties with transitions or learning routines.

• Above is an example of a horizontal visual schedule using real pictures. Some children benefit from real pictures because they are literal in their learning and picture drawings are too abstract.

• This picture schedule contains the activities that are expected of this child i.e. play-time, table work, circle, potty, outdoor play, and so on. This can help a child transition from one activity to another because then he knows what is expected of him.

• Visual schedules may contain objects, pictures, or computerized pictures, depending on the needs of the child. They can be horizontal, vertical, contained within a notebook, on a clipboard, or on a ring to be carried around by the student or teacher.
Environmental Modifications  
(Visual Schedule)

• Above is an example of a vertical visual schedule using pictures from a Boardmaker computer program. To the right is a finished envelope for pictures to be placed in as the tasks are completed.

• This child is able to understand the picture drawings, and therefore, Boardmaker was used. Again, this schedule lays out each activity for the school day to help the child transition and understand what is happening in his day.
Modifications Continued

Leisure Activities – Allow for a more typical and natural sensory diet

- Sports
- The arts
- Dance
- Playground activities
Sensory Diet Activities

The playground is an example of how sensory diet activities are embedded in the routines of a child’s play.
Sensory Diet Activities
Modifications Continued

Interactions

- Modify tone of voice
- Modify voice quality and rate of speech
- Use touch
- Reduce demand for eye contact
Learning Activities: Case Studies

- Read the case studies and identify the type of SPD patterns the child is experiencing.
- Break out into small groups of teachers and parents and discuss case studies.
- Based on the information you have received, come up with ideas to help support each child at home and at school.
- Come back together as a large group and discuss the ideas.
Review of Workshop Objectives

- Define sensory processing and sensory processing disorder (SPD).
- Identify and describe symptoms and warning signs of SPD.
- Explain the effects SPDs has on the daily functions of children.
- Describe the benefits of a sensory diet and be able to incorporate sensory diet activities into a child’s daily routines.
- Adapt the environment in order to meet the sensory needs of a child.
Conclusion and Review

• The first step to helping your child is understanding sensory processing disorders and how they can affect your child.

• The next step is recognizing your child’s individual needs and what can be done to help him/her.

• It is important to educate yourself and work closely with a professional that is familiar with sensory processing disorders.

Questions & Answers....
Questions

?
References


References Continued


Appendix B

Course Schedule
Workshop Schedule

9:00 – 9:30  Registration

   Adult sensory preference survey (found in handout section.)

9:30 – 9:40  Introductions

   Overview of workshop objectives

9:40 – 10:15  Sensory processing

   Sensory Processing Disorders (SPD)

   Review adult sensory preference survey

10:15 – 11:00  SPD categories and their indicators

11:00 – 11:15  Break

11:15 – 12:00  Impacts of SPD and co-existing conditions

12:00 – 1:00  Lunch

1:00 – 1:30  Occupational therapist role

   Sensory integration therapy

   Controversies

1:30 – 1:40  Parents and teachers in treatment of SPD

1:40 – 2:15  Sensory diets

2:15 – 2:30  Break

2:30 – 3:00  Environmental modifications

3:00 – 4:00  Case studies

4:00 – 4:30  Review/Questions/Wrap-Up
Appendix C

Adult Sensory Preference Survey
Adult Sensory Preference Survey

Please complete the following questions to become familiar with your individual sensory preferences.

Keep all of the following senses in mind: hearing, seeing touching, moving, smelling, muscles/joints, and taste.

1. In order to wake up in the morning, I usually need to

(choose one or more)

2. When I read or study, I do the following things to help me concentrate

(choose one or more)

3. When I am frustrated, or upset it helps if I

(choose one or more)

4. When I wind down at night in order to get ready for bed or calm myself, I prefer to

(choose one or more)

5. The areas and things I like most about my home are

(choose one or more)
6. The environment I create when I need to concentrate includes

(bright or dim light, quiet areas, areas with others around, music in background)

7. When I attend a meeting/lecture, I usually do these things to help me stay focused and listen

(drinks hot or cold, doodle on paper, chewing gum or snacks, playing with small object in hands,)

It is a good idea to be aware of our sensory preferences and become aware of the things we do to calm, organize, or alert our body. It is a good idea to learn the sensory preferences of those around us, and keep in mind that we do not all have the same sensory preference. How similar or different are your sensory needs from those people that you spend a lot of time around?

(Adapted from Henry OT Services, 2001)
Appendix D

Handouts for Learners: PowerPoint Slides, Reference List, Resource List, Case Studies, and Sensory Diet Handout
Sensory Processing Disorder: Raising Awareness
Stephanie Thomas, OTR/L
Karla Emmerich, OTR/L

Workshop Objectives
The learner will be able to:
- Define sensory processing and sensory processing disorder (SPD).
- Identify and describe symptoms and warning signs of SPD.
- Explain the effects SPD has on the daily functions of children.
- Describe the benefits of a sensory diet, and be able to incorporate sensory diet activities into a child’s daily routines.
- Adapt the environment in order to meet the sensory needs of a child.

What is Sensory Processing?
- Sensory Processing is the way our brain receives input from our senses and how it responds to that input.

“We experience life through our senses. We hear, touch, taste, smell, see, and move around.”

(Dunn, 2008)
Sensory Systems

- The five familiar senses:
  - Touch/Tactile
  - Taste
  - Smell/Olfactory
  - Vision
  - Hearing/Auditory

- Two less familiar senses, often referred to as the "hidden senses":
  - Proprioception
  - Vestibular

What is the Proprioceptive Sense?

- The proprioceptive sense is information received from the muscles, joints, and body parts. It tells us about movement and body positions.
- It gives us the ability to know where our hand is even though we are not looking.

(Kranowitz, 1998)

What is the Vestibular Sense?

- The vestibular sense has to do with sensory information received through the inner ear and tells us where our head is in space.
- The vestibular sense provides information related to movement, balance, and head position.

(Kranowitz, 1998)
Why is Sensory Processing Important?

- Sensory Processing helps with:
  - Academic skills
  - Attention
  - Fine and gross motor skills
  - Emotional security
  - Speech and language skills
  - Play skills
  - Healthy relationships with others
  - And much more......

Sensory Processing Continued

- Most people are born with the ability to receive sensory input and organize input effortlessly in order to respond with correct behavioral and physiological responses.

Self-Regulation

- Self-regulation is the ability to attain, maintain, and change levels of arousal/alertness in order to participate or respond to a task or situation appropriately.

(Williams & Steffenberge, 1994)
What is Sensory Processing Disorder? (SPD)

- A condition that exists when sensory signals (sensory input) do not get organized into appropriate responses, and a child's daily routines and activities are disrupted as a result.

Overview of SPD Categories

1) Sensory Overload Disorder (feeling overwhelmed when faced with too much sensory information)
   - Sensory over-responsiveness
   - Sensory under-responsiveness
   - Over-sensitivities
   - Over-sensitivity
   - Over-sensitivity
   - Over-sensitivity
   - Over-sensitivity
   - Over-sensitivity

2) Sensory Underload Disorder (feeling overwhelmed when faced with too little sensory information)
   - Sensory under-responsiveness
   - Sensory over-responsiveness
   - Under-sensitivities
   - Under-sensitivity
   - Under-sensitivity
   - Under-sensitivity
   - Under-sensitivity
   - Under-sensitivity

3) Sensory Discrimination Disorder (difficulty distinguishing between sensations)
   - Vision
   - Hearing
   - Touch
   - Smell
   - Taste
   - Movement

(Miller, 2006)
Sensory Modulation Disorder (SMD)
Definition: SMD is a problem turning sensory messages into controlled behaviors that match the intensity of the sensory information we receive through our senses.

There can be three types of SMD:
- Sensory Under-Responsivity
- Sensory Seeking/Craving
- Sensory Over-Responsivity

(Sensor, 2006)

Sensory Over-Responsivity (SOR)
- These children respond to sensory messages more intensely, more quickly, and for a longer time than children with normal sensory responsivity.
- Low neurological thresholds are associated with SOR.

(Miller, 2006)

Behaviors Often Indicative of Over-Responsivity
- Picky eater
- Reacts negatively to smells which do not usually bother other people
- Easily distracted by other visual stimuli in the room
- Distracted by sounds not normally noticed by others
- Avoids playground equipment
- Becomes anxious with light or unexpected touch
Sensory Under-Responsivity (SUR)

- These children have less of a response to sensory information, taking longer to react and requiring intense messages before they act.
- High neurological thresholds are associated with SUR.
  (Miller, 2006)

Behaviors Indicative of Sensory Under-Responsivity

- Prefers foods with intense flavor
- Difficulty finding items among other items
- Unaware of what is going on around them
- Does not respond when calling their name
- Needs to touch everything and everyone
- Prefers stationary activities to more physical activities
- Slow to respond to directions or to complete assignments
- Does not cry when seriously hurt

Sensory Seeking (SS)

- These children have a nearly insatiable craving for sensory experience and actively seek sensation often in ways that are socially unacceptable.
- Associated with high neurological thresholds
  (Miller, 2006)
Behaviors Often Indicative of Sensory Seeking

- Seeks out jumping, bumping, and crashing activities
- Excessive hanging on object
- Loves "roughhousing"
- Loves jumping off furniture
- Frequently hits, bumps or pushes other children
- Chews on pens, straws, shirt sleeves, etc.

Sensory-Based Motor Disorder (SBMD)

- This disorder occurs when the "hidden" proprioceptive and vestibular senses that allow our bodies to move and sense our position in space are impaired.
- Children with SBMD have trouble with stabilizing, moving, or performing movement sequences.

The two types of SBMD:
- Dyspraxia
- Postural Disorder (Miller, 2006)

Dyspraxia

- Difficulty translating sensory information into physical movement, unfamiliar movements, or movements with multiple steps.

(Miller, 2006)
Behaviors Often Indicative of Dyspraxia

- Slow to sit up, roll, crawl, run, or walk
- Difficulty learning new motor activities, such as riding bike
- Clumsy, awkward, and accident prone
- Often trips or bumps into things
- Difficulty keeping personal spaces organized
- Poor ball skills and other sporting games

Behaviors Often Indicative of Postural Disorder

- These children have difficulty maintaining enough control of their bodies to meet the demands of a given motor activity.

Postural Disorder

- Children seem weak or tire easily, poor endurance
- Poor balance and falls easily
- Slumped posture over desk or table
- Illegible handwriting
- Do not consistently use dominant hand
- Difficulty climbing a jungle gym or hanging from bars
Sensory Discrimination Disorder (SDD)

- The impaired ability to interpret and distinguish between similar sensations in one or more of the sensory systems.
- Impairment is in one or more of several systems: touch, vision, hearing, taste, smell, vestibular, and/or proprioceptive.

(Miller, 2006)

Behaviors Often Indicative of SDD

- Difficulty feeling what is in hands
- Not sure how much pressure to use when grasping items
- Difficulty hearing what is said if there is background noise
- Difficulty differentiating smells, tastes
- Gets lost easily, difficulty following directions
- Aversion to puzzles or other visual games

Behaviors Often Indicative of SDD Continued

- Difficulty telling difference between similar words
- Difficulty identifying shapes and letters
- Difficulty following multi-step or complex directions
- Difficulty organizing writing on a page, such as spacing between letters or words
- Difficulty distinguishing what is touching him or where on his body he is being touched

(Miller, 2006)
Impact of SPD

Sensory processing disorders can negatively affect development and function in the following areas:

- Social/emotional
- Play
- Motor
- Cognitive/academic

Prevalence of SPD with Other Disabilities

- 40% - 48% of children who have other disabilities also have sensory processing problems.

(Miller, 2006)

Coexisting Conditions

- Attention Deficit Hyperactivity Disorder (ADHD)
- Attention Deficit Disorder (ADD)
- Autism Spectrum Disorders
- Bipolar Disorder
- Depression and Anxiety
- Fragile X Syndrome
- Fetal Alcohol Syndrome
- Obsessive Compulsive Disorder (OCD)
- Cerebral Palsy
Prevalence of SPD in Children Without Disabilities

- One recent study of surveyed parents of kindergartners found that 14% of the 703 surveys returned had symptoms. (Ahm, Miller, Milkerger, & McIntosh, 2004)
- Another recent survey of kindergartners used a conservative estimate of 5% or 1 in 20 of incoming kindergartners have symptoms, based on screening results. (Miller, 2006)

What is Occupational Therapy?

- Specialize in assisting people with the everyday activities that make life meaningful and productive.
- Occupational therapy with infants and young children: Assist children with daily life tasks such as playing, sleeping, eating, learning, relating, and developing.

Benefits of Occupational Therapy in Relationship to Treating SPDs

- Can help identify the difficulties a child is having in response to inefficient sensory processing
- Helps children with self-regulation
- Helps families and teachers modify the environment to improve functional activities
- Helps children improve functional skills at home and at school
Occupational Therapist Roles

Assessment
- Clinical observation
- Interviews with parents/caregivers and teachers
- Evaluation tools/tests

Occupational Therapist/Occupational Therapy Assistant Roles

Treatment
- Sensory integration therapy
- Collaboration
- Consultation
- Environmental modifications

Classic Sensory Integration Therapy

Key Principles of Sensory Integration Therapy:
- Just right challenge
- The adaptive response
- Active engagement
- Child directed

(Schaaf & Miller, 2005)
Controversies of SI Therapy

- Lack of valid research
- Validation of diagnosis
- Consistency within treatment sessions among therapists
- Effectiveness of other therapies

Parent and Teacher Considerations

- Mindfulness of different sensory needs of each child
- Different learning styles
- Mindfulness of the environment
- Culture influences/philosophies

What Can Parents and Teachers Do To Help Children with SPD?

- Sensory diets
- Environmental modifications
What is a Sensory Diet?

- Sensory diets are sensory activities that are included in a child's day at regular intervals to help meet specific sensory needs.
- These activities give the child the sensory input their body needs throughout the day to help the child remain in a calm, alert state so they can function at their optimal level throughout the day. (Naeldey, 2001)

Sensory Diet Continued

- Every child has unique sensory needs, and their sensory diet must be customized for individual needs and responses.
- An occupational therapist needs to be involved in the development of an individualized sensory diet. (Naeldey, 2001)

Indications for a Sensory Diet

- Frequently zones out
- Seems sleepy when should be attentive
- Needs frequent movement
- Understands things sometimes, sometimes does not
- Often appears agitated
- Difficulty settling down after recess or movement activities
- Sucks or chews on clothing or other objects
- Clumsy and uncoordinated
- Temper tantrums for no apparent reason or in loud environments
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- Prevent sensory and emotional overload
- Prevent challenging behaviors
- Decrease anxiety
- Increase attention and ability to focus during activities
- Increase positive interactions with peers and adults
- Calming and organizing effects

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Look at child's behavior for subtle cues to strategies he or she is using
- What is the child seeing or avoiding?
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- Heavy work is the most effective and easiest strategy for self-regulation at home and school
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- Deep pressure
- Slow rocking, swinging, or swaying
- Soft music
- Dim lights
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Alerting Activities

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- Bouncing on a therapy ball or trampoline
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- Provide seating options that allow for additional movement

Modifications Continued

Leisure Activities – Allow for a more typical and natural sensory diet
- Sports
- The arts
- Dance
- Playground activities
Modifications Continued

**Interactions**
- Modify tone of voice
- Modify voice quality and rate of speech
- Use touch
- Reduce demand for eye contact

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**Learning Activities: Case Studies**
- Read the case studies and identify the type of SPD patterns the child is experiencing.
- Break out into small groups of teachers and parents and discuss case studies.
- Based on the information you have received, come up with ideas to help support each child at home and at school.
- Come back together as a large group and discuss the ideas.

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**Review of Workshop Objectives**
- Define sensory processing and sensory processing disorder (SPD).
- Identify and describe symptoms and warning signs of SPD.
- Explain the effects SPD has on the daily functions of children.
- Describe the benefits of a sensory diet and be able to incorporate sensory diet activities into a child’s daily routines.
- Adapt the environment in order to meet the sensory needs of a child.
Conclusion and Review

• The first step to helping your child is understanding sensory processing disorders and how they can affect your child.

• The next step is recognizing your child's individual needs and what can be done to help him/her.

• It is important to educate yourself and work closely with a professional that is familiar with sensory processing disorders.
References


Resources for Parents and Teachers

**General Interest Books**


Miller, L. J. (2006). *Sensational kids: Help and hope for children with sensory processing disorder.* New York: Putnam. This is a resource book for parents and teachers that describes sensory processing disorders and explains how this disorder affects children. Provides information on current research in the field, and gives ideas about treatment strategies to help your child.
Schneider, C. (2001). *Sensory secrets: How to jump-start your engine*. Siloam Springs, AR: Concerned Communications. A guide to promote successful learning and positive behavior in people of all ages is provided in this text.


**Activity Guide Books for Teachers and Parents**


**Recommended Web Sites**

http://www.alertprogram.com/ Information and resources on the “How Does Your Engine Run” program, which informs parents and teachers about self-regulation problems.

http://www.henryot.com/ Information and resources for parents and teachers on the application of sensory integration principles for home and school.
http://www.sensory-processing-disorder.com/index.html Provides information for parents and teachers on SPD. This site provides diagnostic information, treatment information, checklists for signs and symptoms, and a variety of additional resources.

http://www.skillbuildersonline.com/ Information on sensory processing disorders, dyspraxia, fine and gross motor deficits. Provides free downloadable resource to work on fine motor, gross motor, handwriting and sensory processing disorders.

http://www.spdfoundation.net/ Provides a vast array of information about SPD as well as many resources for parents, teachers and therapists. Provides information regarding current research on the diagnosis and treatment of sensory processing disorders.

**Video/CD Resources**


**Web Sites for Products**


http://www.sensorycomfort.com/ A catalog of clothes and household products for children and adults with sensory processing difficulties.


Resource list adapted from the works of Kranowitz (2003) and Miller (2006)
Case Study Handouts

Case Study #1
Tim is a 5-year-old boy who attends pre-school. The teachers at his pre-school think he is bright; however, they are concerned with some of his behaviors such as difficulty following adult directions. Tim likes to engage in rough play such as wrestling during playtime and doesn’t seem to know his own strength. He tends to be a little too rough, and typically needs to be supervised so that wrestling remains safe. Tim also likes to participate in chase games when out on the playground. When given an open environment with a lot of space, he tends to get highly active and has a difficult time calming down. Tim does not necessarily like being hugged, but he will fall or jump into a teacher’s lap unexpectedly. Tim likes participating in art/craft type activities and gets extremely focused during this time. Sometimes he gets completely focused to the point of tuning out his environment, making it difficult to transition him out of this type of activity. When his teachers call his name, it seems he is either too focused on the activity or that he is ignoring them. Although he enjoys art activities, Tim exhibits poor fine motor skills. He tends to put a lot of pressure on his marker when drawing and writing and has a difficult time coordinating both hands in order to cut with scissors. Lastly, Tim stuffs his mouth with food during snack time and his teachers have to tell him to slow down constantly. Peer interactions are impeded due to Tim being too rough and unpredictable and the other kids being somewhat fearful of him.

Case Study #2
Rosa is a sweet 4-year-old girl who is reluctant to come in to her pre-school classroom each day. She clings to her mother’s side until the teacher pulls her away crying. It typically takes her 5-10 minutes to calm down. During playtime Rosa usually chooses to play by herself and away from the rest of the children. When a peer tries to engage in conversation with her she turns away or walks away. If the room gets too noisy, Rosa will cover her ears or go sit in the “cozy” area. In addition, she has a difficult time making eye contact with people, and the teachers have to cue her by turning her head to look at them. In addition, it appears Rosa has a difficult time understanding what the instructions are when there is a lot of noise in the room. Rosa does not like sudden transitions and gets upset when the teacher tells her it’s time to clean up. Rosa avoids finger painting and asks to wash her hands right away if she gets glue or food on them. On the playground Rosa chooses sedentary play such as the sandbox. Overall, Rosa is a sweet child, but lacks the ability to adjust to changes and unpredictability in her life.
Case Study #3
Michael is a 4-year-old boy who stays at home with his mom and younger brother. He is an easy-going child with no behaviors reported by his parents. His mom states that he takes a very long time to get going in the morning despite sleeping well throughout the night. It seems like he is more active and attentive by nighttime when his parents are ready to start calming things down and getting everybody ready for bed. Mom reports she has to keep a watchful eye on Michael when she is cooking because one time he put his hand on the stove and didn’t notice right away, resulting in second degree burns. At times Michael’s parents wonder if he has a hearing problem because it seems like he doesn’t hear them when they call his name. Only when they touch him and call his name does he respond. Michael participates in a playgroup twice a week, but his parents worry because he hasn’t made any friends and just doesn’t seem to know how to play. His parents worry about Michael and would really like him to make some friends.

Case Study #4
Sandy is a 4-year-old little girl who attends pre-school. She has been described as spunky and a ball full of energy. She has a diagnosis of ADHD and her parents are not interested in giving her medication for it. When Sandy walks into the classroom she yells, “Hi everyone, I’m here!” Sandy appears to be a happy child most of the time, and when she comes to give you a hug she typically runs and jumps on you without warning. During circle time Sandy has a difficult time keeping her hands to herself, and the teachers have had to move her slightly away from her peers so that she doesn’t bother them. Sandy is constantly making noises and speaking out of turn. Her teachers report they are exhausted trying to keep up with her. Throughout the day Sandy is constantly moving. She is always actively engaged in her environment whether in the classroom or outside. For example, she chooses chase games, sliding, running, playing in the sensory table, etc. throughout her day. She never seems to take a break. Sandy has a difficult time sitting to do work and notices everything that is going on around her. Lastly, Sandy has a difficult time making friends because she can be impulsive (she will take toys without asking) and has difficulty sharing with her friends.

Case Study #5
Gabriel is a 4-year-old boy and is an only child to two parents. His mom works part time so Gabriel attends a daycare twice a week. Gabriel was a fussy baby and mom stated she had a difficult time soothing him as a baby when he cried. She stated it seemed like the only thing that worked for him was to turn the vacuum on or take him for a ride in the car. As he has gotten older, Gabriel has not grown out of his fussiness. Gabriel’s mom usually waits to go grocery shopping when her husband is home to watch him. At the store Gabriel typically cries or throws a tantrum. His mom has stated she gets angry with him and tries to discipline him, but the only thing that works is to get him out of there and to the car where he soothes himself by sucking his thumb and humming to himself. At home Gabriel has a lot of toys to play with. He has a difficult time sticking with one toy for very long. His parents think it’s strange that he still puts toys in his mouth and have to tell him to stop or take the toy away. Gabriel tends to like sameness in his day and throughout various situations. For example, one day Gabriel got upset when his parents bought new furniture and told them he wanted the old furniture back. It took a long time
for Gabriel to accept the change in his living room. In addition, Gabriel has to wear the same clothes everyday. He refuses to wear any of the new clothes that are still in his closet. His mom is getting tired of him wearing the same sweatpants and long sleeve t-shirts everyday. His parents wonder how he is going to handle kindergarten when everyday seems to be a challenge.
Sensory Diet Activities for Teachers and Parents
Heavy Work/Organizing Activities

Heavy work or organizing activities can help a child who is either over or under active. It is generally organizing and can improve attention, arousal level, body awareness, and decrease defensiveness. These activities can be whole body actions involving pushing, pulling, lifting, playing, and moving, as well as, oral actions such as chewing, sucking, and blowing. They can also involve hands in actions such as squeezing, pinching, or playing with fidget toys.

Activities for home

- Animal walks (wheelbarrow, crab, bear, snake)
- Carrying laundry/groceries
- Gardening
- Biking, jump rope, roller skating
- Washing tables/countertops
- House work/chores (vacuuming, raking, dusting)
- Wrestling and tug a war games

Activities for School

- School chores (stacking chairs, washing tables or chalkboards)
- Carrying books, backpacks, or other heavy items
- Animal walks (wheelbarrow, crab, bear, snake)
- Playground activities (monkey bars, climbing, pulling friend in wagon, digging in sandbox, biking, playing catch with a big ball, teeter totter)
- Playing with play doh, or other manipulatives
Alerting Techniques

Alerting activities can help a child who is under-reactive to sensory input, passive, or lethargic become more focused and attentive. Alerting activities should be closely monitored to prevent over stimulation.

Alerting activities for home and school

- Running, chase games, red light green light, Simon Says
- Bouncing on a large ball (therapy balls, hippity hops)
- Fast swinging or spinning
- Using contrasting colors to help increase visual attention
- Crunchy foods (dry cereal, apples, carrots)
- Jumping on a mini trampoline
- Obstacle courses
- Chewing gum
- Use light touch pressure
- Different textured items (balls, clothing)
- Drinking ice water or carbonated drinks
- Fresh, cool air
- Sitting on a ball chair, or air cushion
- Strong odors (peppermint, perfume, etc.)
- Fidget toys, play doh, manipulatives
- Climbing on playground equipment,
Calming Activities
Calming activities can help any child who is over reactive to sensory input or is anxious. These activities help to relax the nervous system and reduce exaggerated responses.

Calming activities for home and school

- Minimize environmental stimulation (dim lights, quiet area, decrease visual distractions, natural lighting)
- Deep pressure activities (wrapping inside blankets, rolling big ball over body, pillow sandwich, applying lotion with heavy pressure)
- Slow rocking or swaying (rocking chair, rocking in adults lap)
- Slow swinging or rocking
- Pushing/pulling (wall or chair pushups, pulling wagons with heavy objects)
- Snuggling in a sleeping bag or under a heavy weighted blanket or comforter
- Sucking on hard candy, frozen popsicles, thick liquid through straws, chewy foods, or gum
- Soft quiet music with a steady beat or white noise
- Aroma therapy (lavender, vanilla, banana)
- Pushing a grocery cart
- Stretching, yoga
- Tight fitting clothing such as spandex or lycra
- Weighted lap blanket or sock
- Fidget toys
- Bear hugs or self hugs, deep pressure massage
- Warm bath or shower
Appendix E

Case Study Lesson Plan
Case Study Lesson Plan

Goal of the lesson: For instructors to support caregivers and teachers in their thought processes on how to support children with signs of SPD.

Objectives of the learners:
1) The learners will be able to identify a child who is under-responsive, over-responsive or both.
2) The learners will be able to identify activities that will support a child who is under-responsive and over-responsive.
3) The learners will be able to identify environmental strategies that will support a child who is having difficulties with sensory processing.

Lesson plan activities:
1) Explain activity and go over objectives.
2) Split into small groups of parents and teachers.
3) Hand out sensory diet activities and review with the large group.
4) Hand out case studies and have each group read them.
5) Have small groups discuss case studies and identify whether the child is over-responsive, under-responsive, or both; instructor will walk around and answer questions.
6) Have small groups identify activities and environmental supports that will support their child; instructor will walk around and answer questions.
7) Return to large group.
8) Have each group present their case study to the large group.
9) Open each case study for discussion with instructor facilitating.

Teacher Notes:
Case study #1:
sensory-modulation/under and over-responsive

Case study #2:
over-responsive/sensory sensitivity

Case study #3:
under-responsive/low registration

Case study #4:
under-responsive/sensory seeker

Case study #5:
over-responsive and under-responsive
Appendix F

Program Evaluation
# SPD Workshop Evaluation

Please fill in the evaluation below: 1- Strongly disagree, 2- Disagree, 3- Neutral, 4- Agree, and 5- Strongly agree. Please provide suggestions for improvement in the comments sections.

<table>
<thead>
<tr>
<th>1. The instructors presented information in a clear and logical manner.</th>
<th>1 2 3 4 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comments:</td>
<td></td>
</tr>
<tr>
<td>2. The instructors established an open learning atmosphere.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
</tr>
<tr>
<td>3. Teaching methods were appropriate for the topic.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
</tr>
<tr>
<td>4. The amount of information in each of the areas listed below was adequate:</td>
<td></td>
</tr>
<tr>
<td>a) Information on sensory processing and sensory processing disorder (SPD).</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>b) Identification and description of symptoms and warning signs of SPD.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>c) The effects SPD has on the daily functions of children.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>d) Sensory diet activities that can be incorporated into a child’s daily routine.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>e) Adaptations of the environment in order to meet the sensory needs of a child.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Additional Comments:</td>
<td></td>
</tr>
</tbody>
</table>

177
Appendix G

Authorization for Pictures
Authorization For Pictures

I, [JINNY MORTENSEN], do hereby give Stephanie Thomas and Karla Emmerich my consent and permission for my child/children's picture(s) to be used in a PowerPoint presentation developed for a scholarly project and for training purposes.

Parent signature and date [JINNY MORTENSEN] 4/12/09
Authorization For Pictures

I, Jennifer S. Trujillo, do hereby give Stephanie Thomas and Karla Emmerich my consent and permission for my child/children’s picture(s) to be used in a PowerPoint presentation developed for a scholarly project and for training purposes.

Parent signature and date: Jennifer S. Trujillo 4/1/09
Authorization For Pictures

I, [Signature], do hereby give Stephanie Thomas and Karla Emmerich my consent and permission for my child/children's picture(s) to be used in a PowerPoint presentation developed for a scholarly project and for training purposes.

Parent signature and date [Signature and Date]

[Signature]