



EIT I Newsletter

Early Intervention Training Institute

Spring 2008

Rose F. Kennedy Center, University Center for Excellence in Developmental Disabilities

SENSORY PROCESSING DISORDERS

Elizabeth Ridgway, OTR and Sarah Schoen, Ph.D., OTR

The purpose of this article is to discuss characteristics of developmental problems called Sensory Processing Disorders (SPD). Our aim is to describe current conceptualizations of SPD from an occupational therapy (OT) perspective, to clarify patterns of SPD and to identify sensory issues that may contribute to the difficulties that many children experience in daily life. Although there are differences of opinion about SPD, it has become more widely accepted that some individuals have abnormal responses to sensory stimulation.

SENSORY PROCESSING

We take many aspects of infant development for granted. In a very short time, babies learn to reach, explore toys, play on their stomachs, roll over, or even crawl to explore their environment. They interact and respond to caregivers, establishing an emotional bond. They use their mouth, lips and tongue for drinking from a bottle or taking food from a spoon. In the absence of a known neurological deficit, these skills and abilities sometimes do not develop automatically. Infants whose sensory systems do not perceive, interpret or respond to the sensory information appropriately or do not automatically develop these skills maybe identified as having a Sensory Processing Disorder (SPD). Many people refer to this as a "hidden" disorder because the children look like typically developing children but have inexplicable gaps in their development. Even though the skills of an occupational therapist may be required to identify features of Sensory Processing Disorder, other professionals and parents can become familiar with its characteristics. Evidence to support the existence of SPD is emerging (Reynolds & Lane, 2007).

SUGGESTED CHARACTERISTICS OF SENSORY PROCESSING DISORDERS

The primary problem for children with SPD is that they misinterpret everyday sensory information, such as touch, sound, and movement. They may feel bombarded by information, they may seek out intense sensory experiences, or they may be unaware of sensations that others feel. They may also have symptoms such as poor postural control, clumsiness or delayed motor skills. Characteristics listed in the accompanying table are adapted from "Signs and Symptoms of SPD", published by the STAR Center and KID Foundation in 2006.

EXCLUSIONARY CRITERIA

SPD is a diagnosis of exclusion: in order to make a diagnosis of SPD, other causes of these behavioral abnormalities must be ruled out. In the case of SPD, the

general conditions that must be excluded are chronic medical conditions, neurological disease, specific genetic conditions, and psychiatric disorders. For example, hearing loss must be ruled out before auditory inattention is considered as a condition requiring intervention. Weakness and poor postural control from neurological disease or an underlying medical condition must be ruled out. Sensory processing issues can exist in isolation or co-exist with other conditions as secondary problems impeding function.

SUBTYPES OF SENSORY PROCESSING DISORDERS DESCRIBED IN OT NOSOLOGY

The first subtype of SPD is called Sensory Modulation Disorder (SMD). Children with SMD have a problem "responding to sensory input with behavior that is graded relative to the degree, nature or intensity of the sensory information. Their responses do not match the demands of the activity and instead are often met with inflexibility and difficulty obtaining and sustaining developmentally appropriate attention and emotional responses" (Miller, Anzalone, Lane, Cermak, & Osten, 2007, pg. 136). There are three subtypes of SMD: Sensory Over-Responsivity, Sensory Under-Responsivity and Sensory Seekers/ Cravers.

SMD can occur in any of the sensory systems. Infants who have sensory over-responsivity may become so easily overwhelmed or distracted by environmental stimuli such as sounds or visual images around them that they are unable to reach, grasp or play with toys that are presented. They may not like the way certain textured toys feel. Some are over-reponsive to movement and do not like to play on their stomachs or move against gravity and therefore never learn to explore their environment. These infants are skilled at maintaining one position, usually static sitting. Other infants are so overwhelmed by visual stimuli that just looking face to face or trying to interact through different facial expressions can make them cry or look away from their caregiver. This behavior often interferes with the establishment of strong, positive emotional bonds between infants and their caregivers. The most challenging of all is the infant who doesn't eat, or who is so sensitive to touch, smell and taste that he or she does not want to eat table foods, experience textures or engage in self feeding. The emotional toll on caregivers is tremendous if they are unable to fulfill the most basic parental function of providing adequate nutrition.

Some infants present with a Sensory Based Motor Disorder which impacts their ability to organize and move in the environment. There are two subtypes of Sensory Based Motor Disorders: Postural Disorder and Dyspraxia. Infants or toddlers with a postural disorder are not necessarily delayed in the acquisition of motor milestones

but they often have difficulty achieving control of their body to meet the demands of a motor task, especially in anti-gravity positions. In fact, many are early walkers because they do not have the postural tone enabling them to crawl. Due to a lack of mature reactions for weight shifting, their sitting balance is often compromised, making it difficult for them to sit in a chair at school or at the dinner table. They are often described as weaker than other children, tend to tire easily and are often misinterpreted as being lazy.

Children with Dyspraxia have problems planning and carrying out novel movements. They may have difficulty in one or more of the following: 1) forming a goal or idea, 2) planning a sequence of actions or 3) performing new motor tasks. These individuals are clumsy, awkward, and accident prone. They may break toys, have poor skill in ball activities or other sports, or have trouble with fine motor or oral motor activities. They may prefer sedentary activities or try to hide their motor planning problem by talking about the task rather than doing it.

The last subtype of Sensory Processing Disorder is called Sensory Discrimination Disorder (SDD). Due to difficulty interpreting the differences, similarities and location of sensory stimuli, children with SDD have difficulty understanding accurately what is seen, heard, felt, tasted, or smelled, and have problems determining the characteristics of sensory stimuli. This may be localized to one modality (i.e. auditory discrimination disorder) or may affect multiple sensory modalities. The result is a poor ability to interpret or give meaning to the specific qualities of stimuli (Do I see a "p" or a "q"? Do I hear "cat" or "cap"? Do I feel a quarter or a dime in my pocket? Am I falling to the side or backwards?). Individuals with poor sensory discrimination may appear awkward in both gross and fine motor abilities and/or inattentive to people and objects in their environment. They may take extra time to process the important aspects of sensory stimuli.

PREVALENCE

A study in a Colorado school district identified 5% of the kindergarteners with significant symptoms of SPD (Ahn, Miller, Milberger, & McIntosh, 2004). Similar prevalence rates were obtained in a pilot study of a community sample of twins (Goldsmith, Van Hulle, Arneson, Schreiber, & Gernsbacher, 2006). Additionally a much higher incidence of sensory symptoms, ranging from 30 to 80%, is reported in the literature in individuals with Autism Spectrum Disorders or Developmental Disabilities.

ASSESSMENT

Two standardized measures to identify SPD are the Sensory Profile and the Sensory Processing Measure, which are caregiver or self report questionnaires. The 'gold standard' for identifying dyspraxia and sensory discrimination problems is the Sensory Integration and Praxis Tests (SIPT). Further examiner administered scales of SMD are in development to cross-validate findings from caregiver report measures. A recently developed scale measuring Sensory Over-Responsivity shows promise for future use by clinicians (Schoen, Miller & Green, in press). The Resources section provides more information about assessments.

ASSOCIATED DIAGNOSES

Sensory Processing Disorder (SPD) has many symptoms

that are similar to those associated with Attention-deficit/hyperactivity disorder (ADHD). Also, sensory processing issues may contribute to behavioral difficulties. For example, children with SPD also present with problems paying attention or appear to be in constant motion. They may fidget with their hands or feet, run or climb excessively, have difficulty engaging in quiet activities and/or be unable to sit still.

SPD also has many symptoms that are similar to those associated with Autism Spectrum Disorders (ASD). Over-responsivity to specific sensory stimuli such as visual, auditory or touch, contribute to decreased eye contact and poor social interaction. Articulation and communication may be impaired due to oral motor planning deficits. Sensory processing issues may also contribute to a tendency to withdraw from adults, peers or play situations. These sensory issues should be considered when planning intervention.

Lastly, SPD has many symptoms that are similar to with those associated with anxiety. For example, children with SPD may present with anxiety that interferes with their daily activities and routines. They may be fearful of the sensory experiences in new situations or easily overwhelmed by environmental stimuli.

An accurate diagnosis of SPD, ADHD, ASD or an anxiety disorder can only be made by trained clinicians after an extensive evaluation. This evaluation should include ruling out other reasons that the behavioral symptoms might exist.

Physiological evidence of the existence of SPD is currently available from multiple sources including studies of electrodermal activity, vagal tone and event related brain potentials, showing differences in the way children with SPD process and respond to sensory stimulation when compared to typically developing children, children with ASD and children with ADHD. Preliminary research from studies of multi-sensory integration is also emerging. (See Resources.)

INTERVENTION

The most commonly used intervention for Sensory Processing Disorder is occupational therapy (OT) using a sensory based approach. The goal of OT is to enable a child to participate in normal activities of daily life, such as playing with friends or having appropriate relationships, enjoying school or work, and easily achieving daily routines such as eating, dressing, and sleeping. OT is conducted in a sensory-rich environment. Children are supported to accurately detect, regulate, organize, and have appropriate motor and emotional responses to sensations.

During therapy, children are guided through activities that provide increasing challenges to their ability to respond appropriately to sensory input. The emphasis in therapy is developing automatic and appropriate responses to sensation so that activities can be accomplished. Children are not "taught" to do specific tasks (e.g. stand on one foot or cut with scissors) or drilled in to respond to specific sensory stimuli. Rather a variety of play activities are used to enhance a child's underlying abilities and help the child develop the skills necessary to independently manage his/her sensory world.

Therapy must be fun for the child. From the child's perspective, therapy is play (and it may look like the

therapist and child are “just playing” to an adult observer). The therapy room has playground-type equipment such as swings, slides, jungle gyms and climbing walls. The therapist is uniquely trained to guide the child to achieve successes that would not occur in his or her unguided play. A playful atmosphere helps to motivate the child and thus maintain his/her interest and engagement in therapy. A successful therapeutic experience will not only allow a child to be more effective in processing complex sensory information, but will also contribute to the development of skills necessary for independent functioning at home, school and the community. Self-confidence, self-esteem, motor coordination and family relationships are often the first improvements parents notice.

A collaborative research group of advanced occupational therapists across the country are currently preparing for a multi-site study of treatment effectiveness utilizing a modularized approach and a measure of fidelity to treatment. Additional evidence of effectiveness is available using single subject designs.

Dr. Schoen is affiliated with the University of Colorado Health Sciences Center.

References:

Ahn, R. R., Miller, L. J., Milberger, S. & McIntosh, D. N. (2004). Prevalence of parents’ perceptions of sensory processing disorders among kindergarten children. *American Journal of Occupational Therapy*. 58, 287-293.

Goldsmith H.H., VanHulle C.A., Arneson, C.L., Schreiber J.E., Gernsbacher M.A. (2006). A population-based twin study of parentally reported tactile and auditory defensiveness in young children. *Journal of Abnormal Child Psychology*. 34, 393-407.

Miller, L. J., Anzalone, M. E., Lane, S. J., Cermak, S. A. & Osten, E.T. (2007). Concept evolution in sensory integration: A proposed nosology for diagnosis. *American Journal of Occupational Therapy*. 61,135-140.

Reynolds, S. & Lane, S. L. (2007). Diagnostic validity of sensory over-responsivity: A review of the literature and case reports. *Journal of Autism and developmental disorder*. Epub ahead of print.

Schoen, S.A., Miller, L.J. & Green, K. (in press). The sensory over-responsivity assessment and inventory: Reliability and validity. *The American Journal of Occupational Therapy*.

Resources:

Sensational Kids: Hope and Help for Children with Sensory Processing Disorder (SPD) by Lucy J. Miller, 2006.
 Sensory Integration and Praxis Tests (SIPT) <http://portal.wpspublish.com>
 Sensory Profile <http://harcourtassessment.com>
 Sensory Processing Measure <http://www.sensoryprocessingmeasure.com>
 SPD Network <http://www.sinetwork.org/>
 Research references: eridgway@aecom.yu.edu

TABLE - BEHAVIORS OFTEN ASSOCIATED WITH SENSORY PROCESSING DISORDER

<p>Sensory Over-Responsive symptoms - bothered by:</p> <ul style="list-style-type: none"> • Textures on body, face, hands, or feet, having hair or nails cut; hair combed • Background noise, loud, unexpected sounds, fragrances • Playing on swings and slides, being upside down • Bright lights or sunshine <p>Sensory Under-Responsive symptoms</p> <ul style="list-style-type: none"> • Doesn't feel pain, doesn't notice when someone touches him • Doesn't like physical activities; prefers sedentary activities • Slow or unmotivated and unaware of what's going on around him • Unaware of body sensations such as hunger, hot or cold or need to use toilet <p>Sensory-Seeking symptoms</p> <ul style="list-style-type: none"> • Is on the move constantly, crashing, bashing, and is unable to sit still • Constantly touches objects and/or intrudes on people • Seems unable to stop talking and takes excessive risks • Often licks, sucks, chews smells or tastes objects <p>Dyspraxia/Motor Planning Problem symptoms</p> <ul style="list-style-type: none"> • Difficulty learning new motor activities or those that require more than one step 	<ul style="list-style-type: none"> • Is clumsy, awkward, and/or accident-prone, tripping or bumping into other people • Takes a long time to write things down and to do self-care activities like dressing • Has difficulty organizing personal spaces or playing with small objects <p>Postural Disorder symptoms</p> <ul style="list-style-type: none"> • Has poor muscle tone, seems weak, slumps when sitting or standing • Has difficulty crossing the middle of his body to complete a task • Has poor balance and falls over easily, sometimes even when seated • Has poor endurance and gets tired easily <p>Sensory Discrimination Disorder symptoms</p> <ul style="list-style-type: none"> • Difficulty knowing what is in his hands or telling what is touching him • Judging how much force is required for a task • Identifying and distinguishing between different sounds or letters • Organizing writing on a page, e.g., spacing between letters or words <p style="text-align: right;">Signs and Symptoms of SPD © March, 2006 STAR Center and KID Foundation</p>
----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

EITI EDITORIAL RESPONSE

The functional deficits described by advocates of the concept of Sensory Processing Disorders are real and familiar to clinicians working with children who have developmental disabilities in the motor, behavioral, and learning domains. However, medical and mental health professionals question theoretical explanations for SPD and the assumption that treatment should involve a sensory-based approach.

In thinking about children’s developmental problems, it is important to explore many different kinds of explanations for behaviors observed, and to consider a broad array of treatment options in planning intervention. As part of this process, medical and neurological diagnostic workups are often needed.

The careful observations of children’s responses to sensory stimuli provided by occupational therapists are valuable in understanding the children’s behavior and can

lead to greater understanding and useful intervention techniques. However, many professionals believe that viewing children's functional deficits solely in terms of SPD may deprive the children of other treatments already known to be useful. Some deficits (particularly those associated with ADHD and Autism) fulfill validated diagnostic criteria published by the American Psychiatric Association. There are treatments for these conditions previously shown by major empirical studies to be effective. Although research is

emerging to document the existence of SPD and the efficacy of treatment based on this formulation, implications of research findings remain controversial.

New observations and interventions, including those based on an SPD perspective, need to be placed within a context of what is already known about the diagnosis and treatment of children with motor, behavioral, and learning difficulties.