

Running Heading: WHAT IS SENSORY PROCESSING DISORDER?

What is Sensory Processing Disorder?

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Taylor is a little girl who does not like to wear shoes that lace because the laces feel too tight across her foot and it just does not feel right. In order for her to participate in Physical Educational (P.E.) classes at her school the rules state that she must wear tennis shoes that lace. What is a parent to do with a child who refuses to wear this type of shoe due to sensory issues? Are the parents giving in to their child, should they force their child to comply with the rules even though the emotional outburst is intolerable? Let's say that the child does wear the shoes for the P.E. class, but after that she is so bothered by the feelings that are going on in her body, that she can't function or pay attention for the rest of the day in school because she is still thinking about how those shoes made her feel. What is she going to get out of the educational environment the rest of the day?

Take Bobby for instance, he is constantly moving around the classroom and almost never stays in his seat. His teachers report that he is not paying attention in class and he is unable to get his work done on most days. Bobby's constant movement is not only a distraction to the teacher, but to the rest of the class as well. This is obviously affecting his education, how should the teacher handle this situation? What is going on, is this all in their head or is what they are feeling a real disorder?

Sensory Processing Disorder (SPD) is a term in the literature that is used to describe children like Taylor and Bobby who have difficulty processing sensory stimulation. However SPD is not widely recognized or accepted within the field of education due to the limited research in this area. Whether this disorder is accepted in the field of education, teachers are apt to come in contact with these students in their classrooms. What should teachers do in order to facilitate the education of children who

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Comment: Sounds like ADHD

have been labeled as having a SPD? In order to answer this question, educators need to understand SPD.

What is Sensory Processing Disorder?

Definition and Prevalence

A. Jean Ayres, an occupational therapist with training in neuroscience and educational psychology coined the term Dysfunctions of Sensory Integration (DSI) in 1972. She described DSI as a neurological disorder that resulted in a person's inability to organize sensations that ones body receives through the nervous system from the environment in an effective manner (DiMatties & Sammons, 2003). While SPD has been referred to by many names over the years, such as DSI, sensory integration (SI), sensory integration dysfunction (SID) or sensory motor integration. In 2004 Miller, Cermak, Lane, Anzalone, and Koomar proposed the term [sensory processing disorder \(SPD\)](#) to differentiate the disorder from the theory and the intervention, thus SPD will be used in this paper to discuss this disorder. Kranowitz has estimated that it is likely that 12-30% of all children have some sort of sensory integration disorder (Eide & Eide, 2004). Brock and Fernette Eide (2004) reported that out of fifty consecutive patients that they saw, 52% had sensory integration problems that were severe enough to affect the child's learning. They determined that there were more children under the age of ten who were experiencing significant problems as opposed to those over ten years of age. A possible reason for this disparity is that the disorder may tend to lessen or resolve with age, or children's brains may develop compensatory strategies.

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Characteristics

Children with SPD are just as intelligent and normal as other children, except that

their brain reacts differently to sensory stimuli (Miller, L., Cermak, S., Anzaone, M. & Koomar, J. 2004.). SPD affects the seven sense areas, which include the five senses people typically identify – touch, sight, smell, taste and hearing as well as the vestibular sense, which is based in the inner ear, and the proprioceptive sense located in muscles and joints. The vestibular sense is responsible for a person's sense of balance. It helps provide information about where your body is in relation to the surrounding environment, as well as the direction, and speed of movement. The proprioceptive sense is activated when a child moves in a way that causes muscles to contract or joints to move, and sensors provide information about the position of the body part and how it is performing (Kranowitz, 2005).

SPD is further broken down into the following three subtypes; Sensory Modulation Disorder (SMD), Sensory Discrimination Disorder (SDD), and Sensory-Based Motor Disorders (SBMD) (Miller et al., 2004). A list of the diagnostic codes in Diagnostic Manual of the Interdisciplinary Council on Developmental and Learning Disorders (ICDL) for SPD is listed in Appendix B. Children classified under the subtype SMD, may be over-responsive to sensory input (SOR), under-responsive to sensory input (SUR) or sensory seeking/craving (SS).

The Spiral Foundation defines SMD as a problem regulating responses to sensory inputs, which results in withdrawal or strong negative responses to sensations that do not usually bother others. Problems can vary based on situation and be made worse by stress (Koomar & May-Benson, 2006). All five of the senses may be affected under this category. An example of a child who has olfactory problems may be his intolerance to odor, which may cause him to or be distracted by smells others do not notice. Those who

are under-responsive to the olfactory sense may not recognize smells that are warnings of potential danger like a gas leak, or smoke indicating a fire. A person who is over-responsive to touch may have difficulty tolerating the tags on their clothing or the texture of certain fabric. Children who are under-responsive may not cry when they are seriously hurt. The latter may seek out sensory experiences that could be dangerous.

The Spiral Foundation defines SDD as a problem recognizing or interpreting differences or similarities in qualities of stimuli. SDD commonly involves processing sensations from touch, muscles and joints (proprioception) and head movements (vestibular-inner ear sensations) (Koomar & May-Benson, 2006). The under-responsive child may bump or push others, grasp items too tightly, mouth or chew on non-food items, crave movement, and have poor balance. These children seek excessive amounts of vigorous sensory input such as swinging, jumping, and spinning. The over-responsive child may be intolerant to movement or unstable on various surfaces. They also may get motion sickness and can be fearful of escalators.

The category of SBMD is broken further into two subcategories, Postural-Ocular Disorder and Dyspraxia. The Spiral Foundation defines Postural Disorders as a “problem with control of posture or quality of movements seen in low muscle tone or joint instability and/or poor functional use of vision. It is often seen with vestibular and proprioceptive problems” (Koomar & May-Benson, 2006). Dyspraxia involves problems sequencing, planning and executing unfamiliar actions resulting in awkward and poorly coordinated motor skills (Koomar & May-Benson, 2006). Common signs under this subtype would be displayed by children seeming weaker than other children, difficulty with eye contact or tracking while reading, fatiguing easily or slumping in their chair while sitting. Some signs

under this subtype may be problems with daily life tasks (i.e. dressing or using utensils), difficulty following multi-step directions, an awkward pencil grasp and poor handwriting. These children may also dislike sports or be reluctant to participate in sports.

Assessment

Provided on the SPD Foundations website is a checklist (Appendix A) for parents to use if they have concerns about a child. Parents who are concerned about the possibility of SPD should take their child to an OT who specializes in SPD. Since many schools do not provide services for SPD, parents must find a private OT. Parents who are concerned about their child should keep detailed notes of atypical behaviors. They should include the frequency, duration, and intensity of the child's reaction to stimuli, as well as when, why, and where the behavior occurred. It is also important to note any secondary problems, such as anxiety, low self-esteem, or social difficulties.

An OT will gather information about the child's daily performance in school related tasks. She may set up a play environment and observe the child's response to different types of sensory stimuli as well as their motor planning ability. There are some standardized checklists or sensory questionnaires such as the Sensory Profile that the OT may have the parent/caregiver fill out. The standardized Sensory Integration and Praxis Test Battery (SPIT) developed by Jane Ayers (DiMaties & Sammons, 2003) may also be utilized. There are several new sensory history assessments that rely on parent/caregiver report, such as, the Infant/Toddler Sensory Profile and the Sensory Profile (for Children). These rating scales assess the frequency of behaviors associated with responses to everyday sensory events. Norms for these profiles have been developed using several thousand children.

Treatment

The premise of treatment for SPD is the concept of neural plasticity, which suggests that the architecture of the brain is dynamic, and constantly being modified by experience. Treatment is focused on helping kids discover ways to adapt the way they process stimuli, as well as getting them to participate in normal everyday activities. Again it is important to note that occupational therapy should be provided by an OT with experience in SPD and the treatment should be tailored to the individual needs of the child (DiMatties & Sammons, 2003). Treatment should be based on the information gathered from the parent, teacher and standardized tests.

A sensory diet “a strategy that consists of a carefully planned, practical program of specific sensory activities that is scheduled according to each child’s need” should be created after all the assessments have been completed (DiMatties & Sammons, 2003). Therapy happens one on one in a sensory rich environment and can include swinging, spinning, tactile, visual, auditory, and taste opportunities. If a child does not like to finger paint, having a child lay suspended on a platform swing, swinging back and forth, the therapist can begin to have them run their finger through shaving cream and a variety of other substances. Because the vestibular system is engaged in the swinging, the activity of touching the shaving cream becomes less offensive, and hopefully the child would eventually become accepting of finger painting. Another common treatment to desensitize or fine-tune a patient’s nervous system is brushing or wearing a weighted vest (Heilbroner, 2005). It is important for families to get involved in the treatment of SPD, this way therapy can continue within the home and parents can advocate for support for their child within the school. Treatment should also focus on environmental modifications, adaptations to

daily routines, as well as teaching others how to interact appropriately with the child.

At this time there are no SPD specific treatment protocols or treatment plans, which is one of the reasons there is controversy with the therapy of SPD. There are a number of sensory areas that can be affected, therefore it is difficult to identify a single treatment method. Within each of the identified sensory areas, there are activities to help adapt a child's ability to process information, increase their tolerance to various stimuli, decrease their negative behaviors and increase their ability to function in day-to-day environments. As mentioned earlier treatment within the OT model is child directed with the therapist introducing and modifying activities to provide an appropriate amount of sensory stimulation to increase the child's tolerance level.

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Comment: I think you also have to state that the main reason there are not specific treatments/plans is because it is not a recognized disorder in the DSMIV. Thus, you can't really have any treatments for something that is not yet considered legitimate.

Many parents want to know the duration of the treatment especially since treatment is costly and usually not covered by insurance. As with most treatments, therapy should be individualized and the duration should be based on how the child is progressing. Once the child is making gains in their daily function, it is thought that treatment has been effective. If a child had been experiencing sensory defensiveness parents, therapists and teachers should look for an increased tolerance to a variety of clothing textures, playing with a variety of different art or play materials, as well as the ability to tolerate physical contact such as hugs, to indicate progress. On the other hand, if the child has been unresponsive to sensory stimuli, parents and therapists should look for an increased tolerance to sensory stimuli.

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SPD and Education

No one knows what causes SPD, it could be due to a birth defect, early life related traumas or a problem within the CNS. Educators will undoubtedly come in contact with

more and more children who are receiving private OT therapy for SPD. What can we do to help these kids currently if SPD is not recognized within the educational framework of the school system? An educator could make some non-invasive changes if it were to benefit the student. An easy accommodation is to have the child sit on a squishy disk or a therapy ball when doing seatwork. What about the child in the introduction, Taylor? If she cannot tolerate wearing lace-up shoes on her feet, what types of accommodations within the school setting should be made? Are there other types of shoes that the parents and teachers can agree on to try to get Taylor to wear? Should she have to sit out for P.E.? This would certainly contribute to some additional social problems and stigmatism for the child and the child would not participate in some very beneficial sensory stimulating activities. One of the factors educators need to take into consideration when writing an Individualized Education Programs (IEPs) for children is that any potential harmful effects on the child have been removed. Is this something that should be considered best practice for all students, not just students on IEPs? Therefore, how is forcing Taylor to put on lace-up shoes, knowing she will “shut down” or become unresponsive for the rest of the day be of any educational benefit? As educators we are setting her up to fail throughout the remainder of the school day. If a parent is seeking outside therapy for a child with a disorder that the school system does not treat or recognize, should educators, make accommodations within reason, as recommended by the outside therapists that would help to better facilitate the child’s success within the general education curriculum and improve his/her daily learning?

When we think about education in general and sensory issues with adults, we can realize that all people have ways to stimulate their sensory system during difficult tasks. If

an adult is sitting in a long meeting, he or she may chew on the end of a pen, or tap the pen on his or her leg or tap his or her foot. Why do adults display these behaviors? Do they have SPD, or are these strategies that have become accepted by society as ways to calm ourselves or help us focus better in difficult situations? Have adults just learned acceptable strategies and the reason that SPD is so difficult to tolerate in children is that their outbursts are unacceptable or intolerable (Kranowitz, 2005)?

Research has shown that proprioceptive and vestibular activities are beneficial to all children, why do we not incorporate these types of activities into our school day (Kranowitz, 2005)? Teachers could have the children all dance to a funny song, toss a balloon around the room to each other, run in place, or push their palms together, stretch up to the sky and touch their toes prior to performing tasks that require a lot of concentration, such as writing, reading or taking a test. As schools have become more standard based, we have taken away more and more of the recess time that children used to have. Could this be a reason that we are seeing more children with SPD? Do we as humans require more physical work of our bodies? There are many questions needing to be researched within the realm of SPD in order for educators to help these children function to the best of their ability.

Current Research

In 2001, Mangeot [et al.](#) investigated 56 students (26 with ADHD, 30 typical; ages 5-13 years) to determine the presence of [SMD](#) in children with ADHD versus typically developing peers. They used electordermal reactivity (EDR) to record sensory responses and parental responses to three measures (Short Sensory Profile, Leiter International Performance Scale & Child Behavior Checklist). They looked at the olfactory, auditory,

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visual, tactile and vestibular senses. The experimenters who administered the stimuli were blind to the participant groups. Results indicated that children with ADHD had greater abnormalities in SMD on both the EDR and parental report compared to typically peers. The authors stated that these results indicate that SPD should be considered as a subgroup of ADHD.

Another study conducted by Smith, Press, Koeing and Kinnealey (2005) investigated the effects of OT therapy of seven children (4 boys, 3 girls) with PDD and/or MR and their self-stimulating and self-injurious behaviors. The children ranged in age from 8-19 years old. The student's teacher completed the Sensory Integration Inventory Revised – for Individuals with Developmental Disabilities. Interventions were designed for each individual to address their needs and was varied depending on the student's responses. A multiple baseline design was used. During weeks 1 and 3 students engaged in 30 minutes of tabletop activities and during weeks 2 and 4 the students received 30 minutes of therapy to address their sensory needs. Students were video taped in their classrooms for 15 minutes prior to receiving therapy, 15 minutes after receiving therapy and then 1 hour after returning to the classroom. Videos were analyzed for Self-stimulating or self-injurious behaviors, such as biting, self-hitting, poking, hand flapping, chewing objects, head banging or repetitious vocal sounds. Researchers analyzed the videos and discovered that students performed less self-stimulating or self-injurious behavior 1 hour after OT therapy as compared to the control weeks. Teachers were also asked to rate their perceptions of these behaviors after treatment or control using a 5-point scale and their reports correlated with the researchers observations. The researchers concluded that

providing sensory stimulation to these students reduces self-injurious and self-stimulating behaviors, which enables the students to participate more in functional activities.

A recent study assessed the fidelity of treatment in SPD research (Parham, L., Cohn, E., Spitzer, S., Koomar, J., Miller, L. et al., 2007) found there were more than 80 articles that addressed SPD outcomes over the last 30 years. They stated that even though there was this number of articles, the effectiveness of the intervention was still inconclusive. Conducting a meta-analysis to investigate the fidelity of treatment, only 34 studies met their selection criteria. Out of these only 4 studies mentioned the use of an intervention manual, criteria or protocol to guide their treatment. Only addressed fidelity of treatment. The authors went on to state that the lack of fidelity measures compromises the conclusions that can be drawn about the effectiveness of treatment (Parham, L., Cohn, E., Spitzer, S., Koomar, J., Miller, L. et al., 2007).

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Another issue with the research on SPD is the lack of high quality empirical data evaluating the effectiveness of treatment. Miller, Coll and Schoen (2007) addressed this issue by conducting a randomized controlled pilot study to look at the effectiveness of OT therapy for children with SPD. When Miller, Coll and Schoen (2007) looked at 10 years of previous studies to see if there were any rigorous evidence supporting or denying the effectiveness of SPD treatment, they concluded none of the studies met their four criteria. Therefore they conducted a randomized controlled pilot study. They looked at a relatively small sample of 24 students who were randomized into three groups. One group received therapy, one group received an activity protocol and the final group received no treatment. The groups were counterbalanced so that all groups received therapy at the end of the study. The children who received SPD therapy made gains that were statistically greater

than the other two groups. Fidelity of treatment was conducted in this study

Summary

There are many problems with the research [or lack of research](#) that is currently available on SPD, which adds to the controversy about the disorder and treatment. The majority of the research is qualitative case studies. Typically articles will either present conceptual models about SPD and ideas for types of activities that can be conducted to address these needs or they will present a case study on a student with SPD and the therapy that was administered and the results. Because the intervention is child specific it is difficult to have a standard treatment protocol. This also makes it hard to replicate studies to determine if the results are generalizable to other children. Researchers in the OT field are beginning to see the importance of having high quality research and in the last few years, higher quality research studies have been conducted.

Until there is more high quality research in the field of SPD and recognition in [the DSM](#), it is unlikely that many school systems will recognize SPD. Even within the field of OT, SPD remains controversial, which having higher quality research should address. It was not clear as to where SPD would fit into the educational framework. Could SPD be a distinct category or could it fit under Other Health Impaired category like ADHD? Is SPD a co-morbid disorder? It has been noted in research that children who have Behavioral Disorders, Attention Deficit Hyperactivity Disorder (ADHD), as well as Autism and Asperger may also have sensory issues (Heilbroner, 2005). Therefore SPD may be a co-morbid disorder instead of a stand-alone disorder. These children could possibly have Emotional Disorders as a result of their sensory issues. Children may be made fun of because of their peculiarities and thus may become more introverted or have significant

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outbursts. There are some similarities within SPD, ADHD and Autism, which may account for the increased numbers of children being served in those categories (Kranowitz, 2005). Continued research needs to be conducted in order to determine which children are being treated for ADHD, Autism and Asperger's may have been misdiagnosed and in reality have SPD. Until more research is conducted within SPD and it is recognized as a disorder, it will be difficult to answer these questions. There are lots of questions left to be answered in regards to SPD, and more research needs to be conducted. However educators need to ask themselves what they can do for all the kids in their classroom to make them as successful during their school day as possible in order for them to have full access to the academic curriculum.

Dani – I think you did a good job showing the level of controversy that exists with the concept of sensory processing disorder. Good work !!

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APPENDIX A**Sensory Processing Disorder Checklist**

Many of the symptoms listed in the following categories are common to that particular age group. Where more than a few symptoms are found in a child, we recommend you talk to your doctor or check the SPD Foundation's Treatment Directory for a professional experienced with treating Sensory Processing Disorder.

Infant/ Toddler Checklist:

- My infant/toddler has problems eating.
- My infant/toddler refused to go to anyone but me.
- My infant/toddler has trouble falling asleep or staying asleep.
- My infant/toddler is extremely irritable when I dress him/her; seems to be uncomfortable in clothes.
- My infant/toddler rarely plays with toys, especially those requiring dexterity.
- My infant/toddler has difficulty shifting focus from one object/activity to another.
- My infant/toddler does not notice pain or is slow to respond when hurt.
- My infant/toddler resists cuddling, arches back away from the person holding him.
- My infant/toddler cannot calm self by sucking on a pacifier, looking at toys, or listening to my voice.
- My infant/toddler has a "floppy" body, bumps into things and has poor balance.
- My infant/toddler does little or no babbling, vocalizing.
- My infant/toddler is easily startled.
- My infant/toddler is extremely active and is constantly moving body/limbs or runs endlessly.
- My infant/toddler seems to be delayed in crawling, standing, walking or running.

Pre-School Checklist:

- My child has difficulty being toilet trained.
- My child is overly sensitive to stimulation, overreacts to or does not like touch, noise, smells, etc.
- My child is unaware of being touched/bumped unless done with extreme force/intensity.
- My child has difficulty learning and/or avoids performing fine motor tasks such as using crayons and fasteners on clothing.
- My child seems unsure how to move his/her body in space, is clumsy and awkward.
- My child has difficulty learning new motor tasks.
- My child is in constant motion.
- My child gets in everyone else's space and/or touches everything around him.
- My child has difficulty making friends (overly aggressive or passive/ withdrawn).
- My child is intense, demanding or hard to calm and has difficulty with transitions.
- My child has sudden mood changes and temper tantrums that are unexpected.
- My child seems weak, slumps when sitting/standing; prefers sedentary activities.
- It is hard to understand my child's speech.
- My child does not seem to understand verbal instructions.

School Age:

- My child is overly sensitive to stimulation, overreacts to or does not like touch, noise, smells, etc.
- My child is easily distracted in the classroom, often out of his/her seat, fidgety.
- My child is easily overwhelmed at the playground, during recess and in class.
- My child is slow to perform tasks.
- My child has difficulty performing or avoids fine motor tasks such as handwriting.
- My child appears clumsy and stumbles often, slouches in chair.
- My child craves rough housing, tackling/wrestling games.
- My child is slow to learn new activities.
- My child is in constant motion.
- My child has difficulty learning new motor tasks and prefers sedentary activities.
- My child has difficulty making friends (overly aggressive or passive/ withdrawn).
- My child 'gets stuck' on tasks and has difficulty changing to another task.
- My child confuses similar sounding words, misinterprets questions or requests.
- My child has difficulty reading, especially aloud.
- My child stumbles over words; speech lacks fluency, and rhythm is hesitant.

Adolescent/Adult:

- I am over-sensitive to environmental stimulation: I do not like being touched.
- I avoid visually stimulating environments and/or I am sensitive to sounds.
- I often feel lethargic and slow in starting my day.
- I often begin new tasks simultaneously and leave many of them uncompleted.
- I use an inappropriate amount of force when handling objects.
- I often bump into things or develop bruises that I cannot recall.
- I have difficulty learning new motor tasks, or sequencing steps of a task.
- I need physical activities to help me maintain my focus throughout the day.
- I have difficulty staying focused at work and in meetings.
- I misinterpret questions and requests, requiring more clarification than usual.
- I have difficulty reading, especially aloud.
- My speech lacks fluency, I stumble over words.
- I must read material several times to absorb the content.
- I have trouble forming thoughts and ideas in oral presentations.

**While this checklist can't diagnose a child with SPD, it can be a helpful guide to see if additional testing should be done. When filling out this checklist, think about the child's behavior during the past six months.*

Retrieved from www.spdfoundation.net March 28, 2009

Appendix B

Axis I: Regulatory-Sensory Processing Disorders¹

200. Regulatory-Sensory Processing Disorder
Sensory Modulation Challenges (Type I)

- 201. Over-Responsive, Fearful, Anxious Pattern
- 202. Over-Responsive, Negative, and Stubborn Pattern
- 203. Under-Responsive, Self-Absorbed Pattern
- 203.1 Self-Absorbed and Difficult to Engage Type
- 203.2 Self-Absorbed and Creative Type
- 204. Active, Sensory Seeking Pattern

Sensory Discrimination Challenges (Type II) and

Sensory-Based Motor Challenges (Type III)

- 205. Inattentive, Disorganized Pattern
- 205.1 With Sensory Discrimination Challenges
- 205.2 With Postural Control Challenges
- 205.3 With Dyspraxia
- 205.4 With Combinations of 205.1-205.3
- 206. Compromised School and/or Academic Performance Pattern
- 206.1 With Sensory Discrimination Challenges
- 206.2 With Postural Control Challenges
- 206.3 With Dyspraxia
- 206.4 With Combinations of 206.1-206.3

Contributing Sensory Discrimination and Sensory-Based Motor Challenges

- 207. Mixed Regulatory-Sensory Processing Patterns
- 207.1 Attentional Problems
- 207.2 Disruptive Behavioral Problems
- 207.3 Sleep Problems
- 207.4 Eating Problems
- 207.5 Elimination Problems
- 207.6 Elective Mutism
- 207.7 Mood Dysregulation, including Bipolar Patterns
- 207.8 Other Emotional and Behavioral Problems Related to Mixed Regulatory-Sensory Processing Difficulties
- 207.9 Mixed Regulatory-Sensory Processing Difficulties where Behavioral or Emotional Problems Are Not Yet in Evidence

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