

Sensory frame work of reference for the development of communication skills in children with autism spectrum disorders an occupational therapy perspective

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Abbreviations

SPD, sensory processing disorder; SMD, sensory modulation disorder; SDD, sensory discrimination disorder; ASD, autism spectrum disorder; SIPT, sensory integrative praxis test; OT, occupational therapy

Introduction

Sensory integration refers to how people use the information provided by all the sensations coming from within the body and from the external environment. We usually think of the senses as separate channels of information, but they actually work together to give us a reliable picture of the world and our place in it. Your senses integrate to form a complete understanding of who you are, where you are, and what is happening around you. Because your brain uses information about sights, sounds, textures, smells, tastes, and movement in an organized way, you assign meaning to your sensory experiences, and you know how to respond and behave accordingly.¹ The neurological process that organizes sensation from one's own body and from the environment and makes it possible to use the body effectively within the environment.²

Sensory processing disorder (SPD)

Sensory Processing Disorder (SPD) describes the difficulty that some people's nervous systems have in making use of and integrating sensory information. SPD can exist when there are no other underlying conditions or can be present in conjunction with other neurological or psychological diagnoses.

Causes of SPD

Sensory Processing Disorder is a result of neurological disorganization that affects nervous system processing in a few different ways, so the brain is not receiving messages, or the messages that are received are inconsistent, or the sensory information is consistent but does not integrate properly with other sensory information from the other related sensory systems.

Three categories of sensory processing disorder³

Sensory Modulation Disorder (SMD): Sometimes the nervous system's reactions to everyday stimuli are either "too much" or "too little" relative to the stimuli. Sensory Modulation Disorder describes this set of conditions. There are three subtypes of SMD:

- A. Sensory Over-Responsively Disorder (SOR)
- B. Sensory Under-Responsively Disorder (SUR).
- C. Sensory Seeking/Craving.

A. Sensory Over-Responsively Disorder (SOR): This is where children respond more intensely & faster for longer durations e.g. becoming really upset when touched by another child standing in line (Miller, 2006). **Sensory Under-Responsively Disorder (SUR)** – These children show less of a response to sensory input than would be expected for the situation, they take longer to respond and require more intense input before they even respond e.g. having a high pain threshold (Miller, 2006). **Sensory Seeking/ Craving** - These children have a intense craving for sensory experiences and will actively seek this out, often in ways that aren't matched or appropriate to the environment e.g. running around during group time (Miller, 2006).

B. Sensory Discrimination Disorder (SDD): One of the key things the sensory nervous system does is given us vital information about our own bodies as well as our environment. Sensory Discrimination Disorder is the inability to distinguish one type of input from another. Persons with SDD have difficulty distinguishing and categorizing various attributes about the physical environment. A child may not process hot and cold in the same way we do or may not process the difference when lifting a full cold drinks can versus an empty one.

C. Sensory-based motor disorders: These disorders result when a child's nervous system is not processing or integrating movement and body information, leading to interference with a child's motor skills. Sensory Based Motor. Disorders have two subtypes:

- a. **Postural Disorder:** These children have difficulty maintaining enough control of their bodies to meet the demands of a given motor task e.g. difficulty remaining in an upright sitting position for writing tasks (Miller, 2006).
- b. **Dyspraxia:** These children have difficult processing sensory information to create physical, unfamiliar or sequenced movements e.g. difficulty riding a bike (Miller, 2006).

SPD and children with Autism: It is very common for a child with autism to also have SPD. It is reported that more than ninety percent

of children with Autism Spectrum Disorder have sensory processing difficulties. The level of SPD severity varies in children with autism, as it does in all children with sensory processing difficulties. However, children with autism may have additional difficulties communicating to others what sensations are uncomfortable and scary, versus satisfying and calming. When individuals do not have the ability to communicate, they often use behavior to let others know what they think about something. Many children with autism use behavior to communicate fears, which people may misinterpret. Communication difficulties can easily exacerbate the severity of behavioral reactions to sensory input (Figure 1).

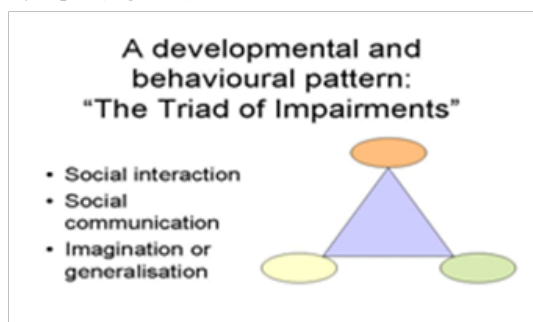


Figure 1 Impairments triad in autism.

Communication and its related dysfunction in children with SPD in ASD⁴

- Delay Speech:** A speech delay may be the result of underlying sensory processing difficulties. Many aspects of neurological functioning impact our ability to communicate effectively. For instance, if a child is having auditory processing difficulties, he may have difficulty locating where sounds are coming from or discriminating between similar yet different sounds. This will impact his understanding of language as well as his expressive speech. If a child has tactile/proprioceptive processing difficulties, this could affect oral-motor skills. Using your lips, tongue, and other articulators correctly to form words is a very complicated oral-motor skill. In addition, many children with sensory processing difficulties have poor muscle tone, which may result in weak muscles around the jaw, cheeks, lips, and tongue. Tactile defensiveness can also interfere with a child's ability to use his mouth correctly, affecting speech production.
- Verbal dyspraxia:** Verbal dyspraxia is a motor programming disorder that makes it difficult to execute and sequence voluntary motor movements of the small muscles of the mouth. These movements are required to produce speech as well as combine speech sounds to form syllables, words, phrases, and sentences in a controlled manner. Children with verbal dyspraxia hear and understand words, but cannot get all the small muscles of the mouth and tongue to move in a coordinated way. Sometimes they may be able to produce words or sounds when they are not thinking about it, but when asked to replicate the same word or sound again, they are unable to reproduce the sequence of oral-motor actions necessary to say the word.
- Early signs of verbal dyspraxia:** The some common early signs of verbal dyspraxia are:
 - Have difficulties with other fine motor skills.
 - Uses limited or little babbling as an infant (void of many consonants)-first words may appear late or not at all; pointing and "grunting" may be all that is heard.

- Able to open and close mouth, lick lips, and protrude, retract, and lateralize tongue while eating, but not when directed to do so.
- Has difficulty speaking on demand, even though speaking spontaneously is not a problem.
- Displays continuous grunting and pointing beyond age two.
- Shows limited use of consonants-child may only use b, m, p, t, d, and h.
- Has difficulty combining consonants and vowels into words.
- Is able to articulate simple words but will not use them purposefully in a sentence.
- Appears to understand much more language than she/he can express.
- One syllable or word is favored and used to convey all or many words beyond age two.
- Speaks mostly in vowels.
- Gets "stuck" on a previously uttered word, or brings oral-motor elements from a previous word into the next word uttered.

d. Oral-motor difficulties: A child with oral-motor difficulties may have trouble chewing, sucking, blowing, and/or making certain speech sounds. The child may have low muscle tone in the face ("long" or "droopy" face), a "flat affect" look, or open-mouth breathing.

e. Difficulties in Social Communication: Sensory processing difficulties will directly affect social communication. This is because social communication requires attending to incoming sensory stimuli from others, such as body language, auditory and visual input, as well as the greater environment.

Assessment of Sensory Integrative Function

Assessment tools employed by occupational therapists using a sensory integration perspective include interviews and questionnaires, informal and formal observations, standardized tests, and consideration of services and resource available to the family.

Interviews and Questionnaires

The potential need for an occupational therapy assessment of sensory integration usually arises with a referral from someone who knows the child and something about the problems the child is experiencing. The referral source, family members, and others who work with the child may all be valuable sources of information through interview or questionnaire.

Observations of the Child

Informal and formal as well as clinical observation of the child in natural setting, such as a classroom, playground, or home, is informative and should be done whenever feasible.

Standardized Testing⁵

- Miller assessment for pre-schooling.
- Bruininks-oseretsky test for motor proficiency.
- Developmental test of visual motor integration.
- Sensory Integration and Praxis Tests (SIPT).
- Sensory profile.

Occupational Therapy Intervention:¹

Working with children with sensory processing difficulties is primarily the domain of occupational therapists (OTs). The occupational therapy curriculum consists of core courses in the areas of neurology, gross anatomy, physiology, and courses that teach how to break down everyday tasks (such as dressing) into the sequential neuromotor steps required for that task. Occupational therapy schools offer pediatric-specific courses that teach sensory integration theory and application, as well as other theory applications, such as neuro-developmental therapy. Occupational therapists can be thought of as the ambassadors of the nervous system. An OT can evaluate the link between your child's nervous system and the function or "occupation" of being a child, such as learning and playing.

Sensory integration therapy: Early sensory integration therapy concentrated on providing a child with tactile, proprioceptive, and vestibular input to enhance and/or counter how the child's nervous system processes the information from these senses. Research and some evidenced based practice by therapists pushed sensory integration therapy to enhance auditory and visual processing. A large component of therapy is helping a child to better understand how the sensory nervous systems impact behavior and perceptions as well as how to cope with sensory processing difficulties.

Sensory diet: A sensory diet is an individualized program of sensory activities designed to help a specific child function better at home and school. This program should be set up and monitored by an occupational therapist that is familiar with your child's sensory needs. It is important to remember the program that works today may not be the same one that will work three months from now. The program will be modified to meet your child's changing needs.

Usually, a sensory diet is designed by the occupational therapist in conjunction with the family and other team members. A sensory diet will not be successful if it is carried out only during occupational therapy sessions. The sensory diet activities must be implemented by the family and everyone else on the team. Frankly, all children would probably benefit from a sensory diet. Many of today's children get bombarded with too much of one kind of sensation and too little of other kinds. A sensory diet is simply a way for your child to get a well-balanced set of activities to reach an optimal level of engagement in her surroundings. A child who has sensory processing disorder requires a sensory diet.

It helps a child with modulation difficulties to react appropriately by learning self-regulation strategies; it increases the focus of a child by helping her engage in activities that calm over arousal; and it increases the activity level of an under aroused child.

Activities such as dance can also play a positive role if they get your child active and engaged. Some of these activities may even be a part of a sensory diet, but for a child who has sensory processing difficulties, it is important to have specific sensory activities infused into her day. Each sensory diet is different in that it is tailored for the specific needs of each child. Here is a brief example of what a sensory diet may look like, keep in mind that sensory diet activities are tailored specifically to meet the needs of individual children. Here are a few common activities for home and school designed to work on specific sensory issues.

Sensory diet for home:¹ Vestibular-roll down a hill, spin in a chair, sit-n-spin, Proprioceptive-vacuum, carry laundry, jump on trampoline, pillow crashing, roll child in blanket, Tactile-play with Play-Doh, find objects in rice bins, Auditory-listen to therapeutic CDs, Visual-ball activities with varying sizes and colors of balls (Figure 2).



Figure 2 Sensory diet-Vestibular focused intervention.

Sensory diet for school: Vestibular-use playground swings, monkey bars (upside down), Proprioceptive-carry books, play hopscotch Tactile-use squeeze toys (e.g., balls with tentacles, etc.) (Figures 3 & 4). Auditory-engage in Therapeutic Listening or Metronome. Visual-place a three-folder "wall" on the desk to reduce overstimulation and visual distraction during tests.



Figure 3 Proprioceptive activities.



Figure 4 Proprioceptive activities.

Institution/Clinic Based Sensory Integration Therapy: Many therapists think that the most beneficial therapy for a child with a diagnosis of SPD is institute/clinic-based therapy. Here the equipment provides an environment that is designed to give just the right challenge for your child's nervous system. The hallmark of sensory integration therapy is suspended equipment and an environment that allows for child-directed therapy.

Use of sensory integration equipment

1. Therapy ball
2. Balance board
3. Flat swing
4. T-swing
5. Round swing
6. Bolster swing
7. Hammock
8. Tyre-tube swing
9. Tunnel
10. Tactile, visual. Auditory items

Tactile stimulating activities: (1) Use battery operated tooth brush, regular tooth brushes, different food consistencies, etc to provide

tactile input in the oral area (2) start with bland foods (cream of wheat, mashed potatoes) (3) offer food of various texture (4) Start with a shake that has everything smoothly blended, then slowly increase the thickness.

Proprioceptive stimulating activities: (1) Chewing (2) Sucking. (3) Face Tapping. (4) Skull tapping. (5) Jumping on trampoline. (6) Oral-motor toys- whistle, blowing bubbles/balloons, magic straw, edible play doh (Figures 5-7).



Figure 5 Sucking-Crazy straw.



Figure 6 Auditory focused intervention.



Figure 7 Face tapping.

Auditory stimulating activities: (1) Carry headphones with calm, rhythmic music. (2) Paraphrasing direction (3) Consistent use of visual cues for direction. (4) Sound health CD. (5) Listening Program. (6) Therapeutic Listening.

Therapeutic listening

Therapeutic Listening is a listening protocol designed by Sheila Frick, an occupational therapist that promotes the use of a sound based

intervention along with sensory integrative activities to help children with sensory difficulties. It has been documented to help children with modulation, attention, behavior, and speech and language difficulties. Headphones and modified CDs used in the protocol.

Following an evaluation, a therapist will set up a program that can be done at home, school, or in the community. The child is given headphones with particular acoustic specifications and a portable CD player that plays electronically engineered CDs. The headphones your child wears are unique because they allow him to hear everything around him while also listening to the modified music. Therapeutic Listening is very flexible because it is a portable program and a child does not have to be sitting still to access the benefits. As a matter of fact, it is better if your child is moving while participating in the program. For best results, it is not recommended that your child watch TV or work on the computer while listening to the headphones, because these activities allow the brain to “check out” and the idea is to have your child’s brain and body actively engaged while wearing the headphones.

Listening program, and how that different from therapeutic listening

Both programs require special training to administer and are based on similar research. Both listening programs use electronically engineered CDs and headphones with specific acoustic specifications that make use of portable CD players. The Listening Program has a defined progression of CDs for the child to listen to, where as the Therapeutic Listening program relies on the expertise of the therapist administering it to determine which CDs are appropriate.

Both programs encourage the child to be participating in other activities while participating in the listening protocol. The choice of programs that utilize may boil down to the program in which the therapist is trained. Both the programs will require child involvement.

Auditory integration training

Auditory Integration Training, which was developed by Guy Berard, is a more intensive program that is also more restrictive because it must be done in a clinic dedicated to Auditory Integration Training. Several occupational therapy and speech therapy clinics house these programs; visit www.aitinstitute.org for more information.

Acknowledgments

None.

Conflicts of interest

Authors declare that there is no conflict of interest.

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