

Understanding Sensory Processing: Looking at Children's Behavior Through the Lens of Sensory Processing

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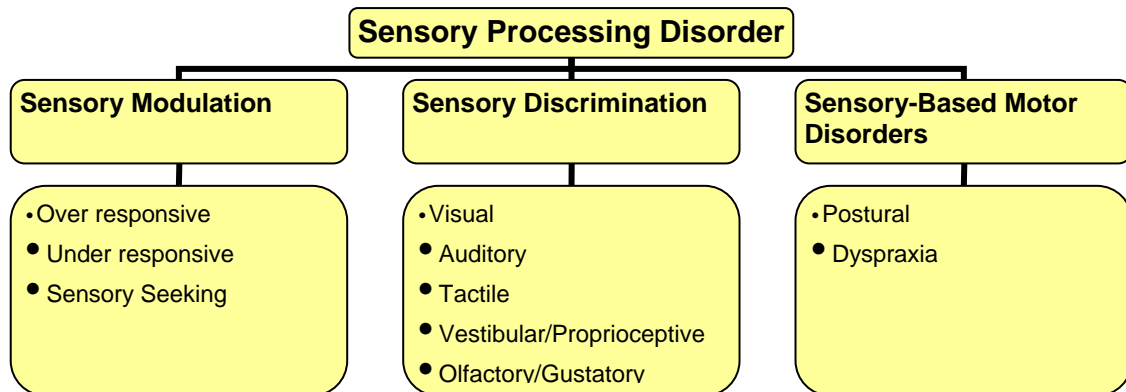
Do you know a child like this? Travis is constantly moving, pushing, or chewing on things. The collar of his shirt and coat are always wet from chewing. When talking to people, he tends to push up against you. Or do you know another child? Sierra does not like to be hugged or kissed by anyone. She gets upset with other children bump up against her. She doesn't like socks with a heel or toe seam or any tags on clothes. Why is Travis always chewing? Why doesn't Sierra like to be touched? Why do children react differently to things around them? These children have different ways of reacting to the things around them, to sensations.

Over the years, different terms (such as sensory integration) have been used to describe how children deal with the information they receive through their senses. Currently, the term being used to describe children who have difficulty dealing with input from their senses is sensory processing disorder.

Sensory Processing Disorder (SPD)

(Miller, Cermak, Lane, Anzalone, & Koomar, 2005)

<http://www.sinetwork.org/aboutspd/defining.html>



Functions of the Sensory Systems

Each of us has many senses. Most of us are familiar with the five senses of hearing, seeing, tasting, smelling, and touching. We are aware of these senses and have some control over them, for example, you can shut your eyes to avoid looking at something.

Visual: Your visual system deals with what you see with your eyes. Do you know a child who sees every detail, or who can pick out a tiny piece of dirt or food from the middle of a crowded floor? What about those children who do not appear to notice details? These children might have difficulty finding a small toy in a large box of toys or on a crowded bookshelf.

Auditory: Your auditory system deals with what you hear. Have you ever noticed that some people have trouble hearing one person talk in a crowded room with lots of talking? What about those other people who complain that they can hear every little noise in the house, such as the water dripping in the bathroom or the light bulb buzzing?

Olfactory: The olfactory system deals with what you smell. The sense of smell is centered in the section of the brain which also deals with emotions. Hence, there is an emotional component to the sense of smell. What favorite food did your mother bake when you were little? What do you think of when you smell that food baking today?

Gustatory: The gustatory system deals with how foods taste. You are born with taste buds on different areas of your tongue which interpret food as sweet, salty, bitter, and sour. The sensitivity of these taste buds diminishes with age. Babies are very sensitive to taste (which is why baby foods taste bland to adults). Elderly folks complain that food doesn't taste like it did when they were younger.

Tactile: The tactile system deals with touching things. You have touch receptors in your skin which react to pressure, such as a light tickle or a deep touch. A spider crawling up your leg is a light touch. A heavy comforter on the bed provides a deep (heavy) touch to your skin. Touch is also related to temperature and pain.

In addition to these five senses, you also have senses which can not be observed directly:

Proprioceptive: Your proprioceptive system relates to how a joint feels when it moves. For example, when you lift something, you know if something is heavy or light.

Vestibular: The vestibular system receives information through the inner ear, and processes information about movement, gravity, and balance. Some children may spin and spin without getting dizzy while other children cannot tolerate spinning or are very sensitive to movements that many of us do not think about, like riding in a car.

Information from the things around us is collected by your different systems through receptors throughout the body. For example, the receptors in the tips of your fingers register the feeling of touch in your fingers. These receptors are found in the skin, muscles, joints, and sense organs. This information is collected through the senses and brought to the central nervous system or the CNS (for example, signals travel from your finger tips to your brain).

The Feedback Loop

There is a LOOP. You touch a hot stove. The receptors in your hand send that information to your brain. The brain interprets the information to help you decide whether this feeling is pleasant or unpleasant; for example, are you touching a warm stove which might feel good or a hot stove which might feel bad? If the stove is too hot, your brain will tell your hand to move QUICK.

Each person responds to his/her own level of stimulus (threshold). Some people react when just a little stimulus is given and some people need a lot of stimuli to react.

Self-Regulation Behavior Response Continuum (W. Dunn)

Winnie Dunn is an occupational therapist who has studied how different children react to sensory stimulation. Dr. Dunn has discovered that children have different thresholds to sensory stimulation. Threshold refers to the point at which a child will respond to sensory information (Dunn, 1999). For example, each child may have a different threshold for sound. At what point does the noise become too loud for the children you know? Children with a high threshold tend to be hypo-sensitive or under-responsive, which means it takes more sound or noise for the child to react. This child might need for the music to be louder to react. Children with a low threshold tend to be hyper-sensitive or overly responsive, which means they react to just a little sound or are distracted by every noise. This child might need for the music to be softer. Dr. Dunn says that children with difficulty processing sensory information might have one of the following four types of responses to senses from the environment:

High Threshold

- Poor Registration

Children with poor registration have difficulty reacting to stimuli because of a high threshold. This means these children need more stimuli to react. These children might not react to a whisper, but rather need to loud call to come.

- Sensation Seeking

Children who are sensation seeking will look for many sensory experiences.

They have be constantly moving, or touching or chewing on everything because they need a lot of stimulation to have a reaction (this is not worded very well but it seems to need a “because....”)

Low Threshold

- Sensitivity to Stimuli

Children who are sensitive to stimuli might not be able to block out stimuli and so may get overwhelmed by lots of stimuli or even by stimuli which others may think is not too much. These children may have trouble in a crowded room with lots of people talking.

- Sensation Avoiding

Children who are avoiding sensations might be unwilling to try new things or to participate in unpredictable situations.

Sensory Defensiveness (P. Wilbarger)

Pat Wilbarger developed the “brushing program” and first coined the phrase “sensory diet.” She defines sensory defensiveness as the over activation of our protective sense (flight, fright, or fight reaction). Imagine you are walking to your car late at night and someone touched your shoulder. The brain would send a message to your autonomic nervous system preparing the body to protect itself. . . you would either run, freeze, or turn around kicking. However, for the child with severe sensory defensiveness, standing in line and being touched from behind might have the same response.

She emphasizes that children with severe sensory defensiveness view stimulation not as unpleasant but as DANGEROUS! This might be why children with sensory defensiveness are not willing to try anything new (and are actually afraid of anything new).

Arousal Modulation (L. Miller)

Dr. Lucy Miller is an occupational therapist and researcher who is currently conducting a considerable body of research on sensory processing orders. Dr. Miller has discovered that children with sensory processing disorders, when faced with novel events, might exhibit both physiological over arousal and slower habituation rates. Habituation refers to how long it takes your body to “get used to” a new sensation. For example, if you take a whiff of a new perfume, it might smell strong. However, after each whiff, the perfume appears to smell less strong. You are habituating to that smell. Children with sensory processing disorders might react very strongly (over arousal) to that smell and will take much long to “get used to” (or habituate to) the smell. This might explain why stimulation the child has been exposed to over and over again still brings a negative, and sometimes strong, reaction.

Arousal Levels Through-Out the Day

Arousal level refers to how alert you feel (Williams & Shellenberger, 1996). Throughout the day, you must be able to concentrate and attend to various tasks which require different levels of alertness. You must have a different level of alertness to play soccer than you do to listen to soft music. In addition to different tasks, different times of the day also affect arousal level. Have you ever turned on the car in the morning and been startled by how loud the radio is? You need the louder sound late in the day because it takes more to arouse you (because you are tired) than you do first thing in the morning when you are fresh.

Self-regulation refers to how your nervous system maintains and changes arousal levels to match each task that you do throughout the day (Williams & Shellenberger, 1996). For example, what do you do to pep yourself up or to calm yourself down? What do you do to stay awake in a training workshop after a big lunch?

How Do You Know if A Child Has Sensory Processing Difficulties?

How do you know if your child is having problems with sensory processing? Dunn’s ***Infant/Toddler Sensory Profile*** (2002) is a questionnaire used by professionals to examine a child’s processing of sensory information. Talk to the child’s occupational therapist for additional information.

An additional informal checklist is the *Sensorimotor History Questionnaire for Parents of Preschool Children* found at <http://www.spdnetwork.org/aboutspd/questionnaire.html>.

Think about where children spend their time: at home, at a sitter's and/or at a child care center or family day care.

The Environment

Look closely at where children spend most of their time. What do the rooms look like? How crowded are the rooms? Does the space feel cluttered or open? What sounds do you hear? What outside noises do you hear? What can you smell?

The child with typical sensory processing is able to look around her environment and concentrate on one activity. She may be able to go to a crowded shelf or full-to-the-brim toy chest and find a specific toy. This child is able to concentrate on what her parent or teacher is saying, and to tune out outside noises.

- The child with difficulties processing visual information may be distracted by a cluttered, busy room. This child may not be able to locate her favorite blanket or find a specific toy on a crowded shelf. This child might look like she cannot follow directions.
- The child with difficulties processing auditory information may be distracted by noises, such as the TV, radio, dishwasher or washing machine, others talking, a dog barking, and noises from other rooms or outside. This child may not be able to distinguish what his parent is saying from the other noises in the room. This child might appear to be not listening.
- Think about all the smells, such as food cooking, smells from pets, cleaning items, the perfume of adults, etc. How might the child who is sensitive to olfactory information deal with all these smells? This child might appear to be irritable or fussy.

Play Time

Where do children play? If outside, what is available? Swings, slides, climbing gyms? Do they go to a community playground or play on a playground at preschool? What is the surface of the playground? How many children are usually on the playground at one time? If inside, what equipment is available? What is the noise level?

The child with typical sensory processing will be able to play on a variety of pieces of equipment, choosing the most comfortable ones. This child may be able to walk on or sit on playground surfaces without problem. He might be able to play for the entire play time.

- A child with a high threshold for vestibular activities may crave activities which

involve spinning, climbing, or swinging, and may not want to stop and do something else. They may be scared, or it may just make them feel ill. This sentence I am not sure about – it makes it sound like maybe the spinning, etc makes them scared or ill but I think you mean the other activities make them ill.

- A child with a low threshold for vestibular activities may avoid climbing off the ground at all costs. This child may be scared to death of any activities involving spinning or swinging as well.
- The child with a low threshold for auditory stimulation may have difficulty playing in a crowded gym or playroom where the sound echoes.

Meal and Snack Time

Watch children during meals and snack time. What smells are present during meals and snack? What types of foods are served? Are alternate items available? Does your children pour or pass items? How long does the meal or snack last?

The child with typical sensory processing will be able to sit for the entire meal or snack time and will eat (or try) a variety of foods. This child may be able to pour liquids without spilling and wipe her mouth when finished. She might be able to sit still for the entire snack or meal.

- The child with tactile difficulties might be a picky eater. She might only eat puffed cheetos and will not try new foods. If the cheetos are not available, she will not eat.
- The child with a high threshold might be a messy eater and have food all over her face. She might stuff food until her mouth is full (because she needs a full mouth to be able to feel the food in her mouth).
- The child who is sensitive to smell might not try new foods because of the overwhelming smell.

Nap and Bedtime

Observe children during nap time and when asleep for the night. What is the sleeping surface (e.g., the sofa, a crib, your bed)? Is music playing in the background? Are sudden sounds present, such as the phone ringing or someone knocking at the door? Is your child covered? How long is nap time? How long does he sleep at night?

The child with typical sensory processing will be able to sleep on a different textures and may be able to sleep with a background noise and not startle with sudden sounds.

- The child with vestibular difficulties who is a preschool might feel afraid sleeping in a cot off the ground; she might be afraid she is going to fall.
- The child with tactile difficulties might be bothered by a rough blanket at home or the plastic mat at preschool which feels cold.
- The child with auditory difficulties might hear every noise in the house. She might awaken with a sudden noise and not be able to go back to sleep.

Specific Ways To Help Young Children Deal with Sensory Input

Sensory System	Common Parent/Teacher Observations	Home/Center Accommodations
Tactile	Children with a low threshold for tactile stimulation might: <ul style="list-style-type: none"> - Have a strong reaction to the unexpected touch or the light touch - Be a picker eater, eat only a few foods, or not like to mix foods - Be picky about clothes, may take clothes off, or resist being dressed 	<ul style="list-style-type: none"> - Tell child before touching - In a group situation, sit child so others don't brush against him - Before tooth brushing, apply deep pressure around mouth with washcloth - Brush teeth before meal (to relax the child's sensitivity) - Use all cotton clothing, wash new clothes several times before wearing, use seamless socks
Tactile	Children with a high threshold for tactile stimulation might: <ul style="list-style-type: none"> - Be a messy eater, have food all over face, or stuff mouth full of food - Play roughly 	<ul style="list-style-type: none"> - Brush teeth before meal (to pep up the child's oral sensitivities) - Provide more stimulation, such as squeeze balls, rubbing with towel or other textures - Provide lots of opportunities for sensory play such as finger painting
Olfactory Gustatory	Children with a low threshold for olfactory or gustatory stimulation might: <ul style="list-style-type: none"> - Strong reaction to smells, perfumes, air fresheners - Avoid certain types of food or certain textures 	<ul style="list-style-type: none"> - Try to reduce the number of conflicting smells in the environment, such as perfumes - Tell child strong tastes are coming
Olfactory Gustatory	Children with a high threshold for olfactory or gustatory stimulation might have: <ul style="list-style-type: none"> - Decreased ability to taste or recognize different smells - Difficulty with articulation 	<ul style="list-style-type: none"> - Give the child strong smells and tastes to experience - Try giving child strong tastes, such as sour, bitter, spicy - Use cold temperatures
Visual	Children with a high low	- Minimize the number of

Sensory System	Common Parent/Teacher Observations	Home/Center Accommodations
	<p>threshold for visual stimulation might:</p> <ul style="list-style-type: none"> - Close eyes or cover eyes frequently - Squint - Have difficulty with figure ground activities 	<p>distractions; decrease clutter in the environment</p> <ul style="list-style-type: none"> - Create quiet area in the home where child can go when overwhelmed - Avoid bright lights
Visual	<p>Children with a high threshold for visual stimulation might:</p> <ul style="list-style-type: none"> - Avoid coloring, puzzles, stacking blocks - May not recognize shapes or colors 	<ul style="list-style-type: none"> - Put toys on blank table top or white paper to increase contrast - Use brightly colored materials
Auditory	<p>Children with a low threshold for auditory stimulation might have:</p> <ul style="list-style-type: none"> - Strong reaction to fire sirens, planes flying low overhead, and other sudden, loud sounds - Difficulty distinguishing what adults are saying from outside noise 	<ul style="list-style-type: none"> - Warn child before loud noise - Place child in quiet area of the home when possible when he seems overwhelmed by loud noises
Auditory	<p>Children with a high threshold for auditory stimulation might:</p> <ul style="list-style-type: none"> - Frequently asks what the adult said - Appear to not hear what was said 	<ul style="list-style-type: none"> - Use short, simple directions
Vestibular	<p>Children with a high threshold for vestibular movement might:</p> <ul style="list-style-type: none"> - Swing and swing and never stop - Be moving and rocking all the time 	<ul style="list-style-type: none"> - Allow child to stand at a table while playing - Provide lots of opportunities for movement - Provide opportunities to play outside
Vestibular	<p>Children with a low threshold for vestibular activities might:</p>	<ul style="list-style-type: none"> - Avoid quick movements or sudden changes in position

Sensory System	Common Parent/Teacher Observations	Home/Center Accommodations
	<ul style="list-style-type: none"> - Fear being picked up or tipped back - Be very sedentary - Not like to climb, swim, or be off the ground - Gets carsick from movement 	<ul style="list-style-type: none"> - Open windows of car, position in middle of back seat
Proprioception	Children with a low threshold for proprioceptive activities might: <ul style="list-style-type: none"> - Look clumsy - May hang onto you, walk into you 	<ul style="list-style-type: none"> - Provide activities for pouring materials such as beans, rice, etc. - Play catch with a big ball or pillow - Give the child lots of bear hugs
Proprioception	Children with a high threshold for proprioceptive activities might: <ul style="list-style-type: none"> - Press really hard when writing or coloring - Chews on shirts 	<ul style="list-style-type: none"> - Have child carry something heavy, such as books, laundry bag- - Have child press against wall or push chair across room - Give child something to chew on

The information in this table was taken from:

Dunn, W. (1999). *The sensory profile*. Tucson, AZ: Therapy Skills Builders.

Inamura, K.N. (1998). *SI for early intervention: A team approach*. Tucson, AZ: Therapy Skills Builders.

Kranowitz, C.S. (1998). *The out-of-sync child: Recognizing and coping with sensory integration dysfunction*. New York: Berkley Publishing Co.

Miller, H., & Heaphy, T. (1998). Sensory process in preschool children. Volume 3 of *AOTA's Self-Study Series: Making a Difference in School System Practice : A Self-Paced Clinical Course*. Bethesda, MD: American Occupational Therapy Association.

Williams, M.S., & Shelenberger, S. (1996). *"How does your engine run?" A leader's guide to the alert program for self-regulation*. Albuquerque, NM: Therapy Works.

Is it Sensory or Is It Behavior?

A Functional Analysis

- **Incident**
- **Sensory Characteristics of the Environment**
- **Sensory Characteristics of the Task**
- **Child's Response**
- **Adult's Response**
- **Recovery**
- **Sensory Analysis of the Problem**
- **Sense-able Solution**

Incident: Ella begins protesting as she and mother are getting ready to leave the house. She refuses to go down the back stairs to get into the car. She drops to the floor and starts crying.

Sensory Characteristics of the Environment: Steep back stairs leading to the back alley, heat pump of the next house periodically turns on

Sensory Characteristics of the Task: Ella has to walk down stairs (balance and visual input), auditory fear of loud noise

Child's Response: Refusal

Adult's Response: Frustration, yelling

Recovery: Mother had to pick child up and carry her to the car. Once inside the safety of the car, Ella was able to calm down.

Sensory Analysis of the Problem: Ella has difficulty with balance and heights. She also has extreme auditory sensitivity

Sense-able Solution: Have Ella hold adult's hand on one side and the rail on the other. Look ahead and not down. Wear a walkman to hear one of her favorite tapes. Be patient and reassuring.

Reference:

Smith, K.A., & Gouze, K.R. (2004). *The sensory-sensitive student: Practical solutions for out-of-bounds behavior*. New York, NY: HarperCollins Publishers Inc.

Suggestions for Dealing with Unpredictable Transitions

Develop a consistent routine

Parents and other adults can help by sticking to a routine whenever possible and keeping the child's environment arranged in a predictable way. When transitions and changes need to occur, the following ideas might help prepare for or manage these transitions.

Plan transitions in advance

- notify children of impending transitions (“In 15 minutes, we are going to the take a bath”);
- prepare for changes using visual supports (a photo of the bathtub); and
- give plenty of notice when something out-of-the-ordinary, such as a trip to town, will occur.

Spin the transition in a positive light, such as you're going on an adventure, just like Dora the Explorer™ (www.nickjr.com).

Express time in terms of sequence, such as “First you finish this task, then you can do_”

Prepare transition fillers to turn empty time into fun moments. For example, sing a favorite song together.

Plan deep pressure activities (or heavy work) between activities, such as:

- stand and stretch;
- move across the room;
- march; and;
- push chairs to the kitchen table for snack or lunch.

If needed, offer the child a quiet place to help him calm down and reorganize.

Provide comfort object, such as a favorite object to hold or put in pocket.

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Other Resources

Helpful Websites:

How Does Your Engine Run? The Alert Program for Self-Regulation

<http://www.AlertProgram.com>

The Out-of-Syn Child: Recognizing and Coping with Sensory Integration Dysfunction

<http://www.out-of-sync-child.com>

The Sensory Integration Network

<http://www.sinetwork.org>

Sensory Processing in Everyday Life

http://classes.kumc.edu/sah/resources/sensory_processing/learning_opportunities/concepts/sp_concepts_main.htm

Sensory Processing Disorder Network

<http://www.spdnetwork.org>