Sensory for the SLP

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Speaker Disclosure

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Why We Are Here

• To gain an understanding of the external and internal sensory systems because...

• The way children receive, process and interpret sensory information affects the way they develop, learn and behave.

Sensory Preferences

• There are variations of what is considered “normal.”

• You and I can make adjustments to accommodate our sensory preferences (e.g. we don’t wear clothes that make us feel uncomfortable, put on perfume we find too strong, eat food we dislike, let food touch on the plate).

• Sometimes young children have difficulty communicating their sensory preferences and this may result in challenging or unexpected behaviors.

Sensory Processing
• The way we process and respond to sensory input is what makes each of us unique.
• “Sensory processing refers to the way the nervous system receives messages from the senses and turns them into appropriate motor and behavioral responses.” - SPD Foundation
• Our bodies must process and integrate constant sensory information coming from the environment and also from inside our own bodies.
• To be in a ready state for learning, all the sensory systems must work together to provide us with the optimal level of arousal.

How Young Children Learn
P.I.E.
• Young children learn by participating in daily routines and activities (such as meal time, bath time, dressing time and playtime).
• Young children gain independence by practicing newly learned skills at different times and with different people.
• Young children learn through social interactions while engaging with the important people in their lives.

The way young children take in and respond to sensory information can significantly impact their participation, independence and engagement (P.I.E.) in daily activities.

As the neurotypical child develops and matures, his participation, independence and engagement in activities naturally increase

As the child with special needs increases his participation, independence and engagement in activities, his degree of disability decreases

Sensory Processing Disorder
Sensory Processing Disorder (SPD)

• “Sensory Processing Disorder exists when sensory signals don’t get organized into appropriate responses and a child’s daily routines and activities are disrupted as a result.”
  -Lucy Jane Miller, 2006

• Children with sensory differences have atypical reactions to typical experiences.

Why We (all) Must Address SPD

A child who has difficulty receiving and interpreting sensory input can have difficulties with:

• social interactions with adults and peers
• communication
• making and keeping friends
• daily routines and activities
• behaviors
• self-regulation
• self-esteem
• academics
• the occupation of childhood (learning & developing)

Pioneering occupational therapist, Jean Ayres, likened sensory processing disorder (also called sensory integration disorder) to a neurological traffic jam that prevents the brain from correctly interpreting sensory input.

SPD = Input/Output Problems

Take in Multi-Sensory Info (input)  Integrate & Process Sensory Info  Child’s Response (output)

Displeasure vs. Disorder

• There are certain kinds of sensory input that cause you and I displeasure.

• While most people have occasional difficulty with sensory processing (displeasure), to get diagnosed with Sensory Processing Disorder (SPD) these difficulties must be chronic and disrupt the person’s life on a daily basis (cause total discombobulation).
Etiologies of SPD

• The exact cause of SPD—like other complex neurobehavioral disorders such as autism spectrum disorder (ASD) and ADHD—is unknown.

• According to Lucy Jane Miller, PhD, OTR, there are three likely contributors to SPD:
  1. Heredity/genetics
  2. Adverse prenatal and delivery complications (drug/alcohol exposure, prematurity, birth trauma)
  3. Environmental factors

Prevalence of SPD

• One study indicates that 1 in 20 children are affected by SPD = Prevalence of 5%. Ahn et al., 2004

• Another study suggests that 1 in 6 children experiences sensory symptoms significant enough to affect aspects of everyday life = Prevalence of 16%. Ben-Sasson, et al., 2009

• In children with ADHD, autism and Fragile X syndrome, the prevalence of SPD is much higher. Lucy Jane Miller, 2006

Self-Regulation and Dysregulation

• Today, we are talking about children with sensory differences, who may not have a formal diagnosis of SPD.

• Most of the children we work with do not have a diagnosis of SPD...which is not surprising because SPD is not recognized in the medical community as a formal diagnosis.

• Despite 40 years of research and discussion, the SPD researchers have yet to identify and agree upon a standardized diagnostic tool. SPD was therefore excluded as a medical diagnosis in the revised DSM-V in 2013.

Regulation

The child's brain has an important job: to regulate reactions to sensory input so his/her nervous system obtains the appropriate level of alertness needed for learning and development.

➢ Self-regulation is the person's ability control and manage his or her actions and behaviors (motor output) depending on the demands of the situation.

➢ Co-regulation refers to how a person responds to and feeds off of other people (child's reaction mirrors the adult's reaction).

➢ Dysregulation describes inappropriate actions and behaviors (motor output) to input from the senses.

“Ready State for Learning”

• Parasympathetic nervous system: this part of the nervous system helps to produce a state of equilibrium in the body—necessary for a “ready state” for learning and interacting.

• Sympathetic nervous system: this part of the nervous system is intended for safety and the ability to react when danger arises—this is the “fight, flight or freeze” state of arousal.
The Dysregulated Child

- Describes a child who has difficulty turning sensory messages into behaviors that match the situation.
- Children who have difficulty with self-regulation may not be in a “ready state” for learning (they are dysregulated).
- There are three ways a child can be dysregulated:
  1. Over-responsive to sensory input
  2. Passively under-responsive to sensory input
  3. Actively under-responsive and craving/seeking sensory input

Dysregulation
H₂O Analogy

Neurotypical person = filling an 8 ounce glass with tap water (controlled and efficient)
Sensory over-responsive = filling a shot glass with a firehose (getting too much input too fast)
Sensory under-responsive = filling a large pitcher with an eye dropper (takes an extended amount of time to get enough input)
Sensory craving = filling a Styrofoam cup that has holes in the bottom (can’t ever get enough input, no matter how long you try)

Over-Responsive to Sensory Input

- Oh no! response
- Nervous system over-responds to sensory input
- Low threshold to sensory input (responds too quickly)
- Sensory information rushes in like a runaway train
- Sensory avoider; is sensory defensive
- Overwhelmed, anxious, and emotionally laden
- Overly cautious and resistive to change
- Difficulty with transitions
- Has a fight or flight response to sensory input

Under-Responsive to Sensory Input

- Huh? response
- Nervous system under-registers sensory input
- These kids require more input for longer periods of time with greater intensity in order to perceive information coming in through the senses
- Inattentive, withdrawn, difficult to engage, poor self-motivation, slow to respond, unaware of what’s going on in the environment, less socially active
- Low activity levels; prefer sedentary activities such as screen time

Craving Sensory Input

- More, more, more! response
- Nervous system never seems to get enough or the right kind of sensory input – therefore the sensory input never seems to regulate the child
- Seeks unusual amounts of sensory input
- Lacks safety awareness, takes bold risks, is impulsive
- Constantly moving, touching, chewing, licking
- Highly active, but extremely disorganized
- Knows no fear, is a risk-taker and is often described as “naughty”
A child can be dysregulated in more than one way...

**Example 1:** A child can be over-responsive to certain kinds of sensory input and under-responsive to others.

*Child is over-responsive to certain food textures and under-responsive to pain*

**Example 2:** A child can be under-responsive to certain kinds of sensory input and constantly seeking other types of input.

*Child is under-responsive to loud noises and seeking oral-sensory input*

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**The Sensory Systems**

**The 8 Sensory Systems**

<table>
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<th><strong>External Senses</strong></th>
<th><strong>Internal Senses</strong></th>
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<td>Proprioception (body position and awareness sense)</td>
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<td>Auditory (hearing)</td>
<td>Vestibular (balance and movement sense)</td>
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<td>Gustatory (taste)</td>
<td>Interoception (internal physiological body condition sense)</td>
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<tr>
<td>Olfactory (smell)</td>
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<td>Tactile (touch)</td>
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*These are considered the 5 basic sensory systems.*

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**Visual Sense**

- Sensory acuity is different from sensory processing.
  - **Visual acuity** is the actual physical ability of the sensory organs (eyes) to receive input (to see).
  - Visual acuity needs are addressed with glasses.
  - **Visual processing** is the brain's ability to process the information the eyes take in. Visual processing needs are addressed with changes to the environment/activity and vision therapy.
  - Many children with visual processing deficits actually have intact acuity (20/20 vision).

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**Visual Input:**

**Symptoms of Sensory Over-Responsivity**

- Sensitive to bright sunlight (insists on wearing hat or sunglasses; only plays outside after dusk)
- Dislikes flashing lights
- Difficulty keeping eyes focused on activity
- Easily distracted or overwhelmed by visual stimuli
- Difficulty focusing in bright rooms
- Rubs eyes or squints frequently
- Avoids eye contact
- Likes to play in the dark

**Symptoms of Sensory Under-Responsivity**

- Has difficulty following a moving object
- Difficulty locating items that are often in plain sight
- Loses place when copying from book, while reading or when doing math problems
- Struggles identifying differences in pictures
- Difficulty with consistent spacing and size of letters
Visual Input: Symptoms of Sensory Craving
- Is attracted to bright or spinning lights
- Likes to stare at spinning objects
- Blinks eyes repetitively
- Moves fingers in front of eyes or pokes eyes
- Peers out of corner of eyes (peripheral vision)
- Lines up objects and then scans them repeatedly
- Turns light switches on and off repeatedly
- Is fascinated by electronic screens (TV, iPad)

Auditory Sense
- Sensory acuity is different from sensory processing.
  ➢ Auditory acuity is the physical ability of the sensory organs (the ears) to receive input (to hear). Acuity needs are addressed with hearing aids.
  ➢ Auditory processing is the ability of the brain to process the information the ears take in. Auditory processing needs are addressed with changes to the environment/activity and speech therapy.

Auditory Input
Symptoms of Sensory Over-Responsivity
- Bothered by sounds not noticed by others
- Fearful of loud or unexpected sounds (vacuum, sirens, hairdryer, flushing toilet, sneezes)
- Covers ears to block out sounds
- Dislikes loud places (movie theater, parades, school assemblies, Chuck E. Cheese, Wal-Mart)
- May dislike certain people because of their voice
- Tells people to “be quiet” or “stop singing”
- Strong aversion to the Happy Birthday song

Auditory Input
Symptoms of Sensory Under-Responsivity
- Doesn’t consistently respond to name being called
- Appears deaf at times (yet hearing is WNL)
- Has difficulty remembering what was said
- Appears oblivious to certain sounds/doesn’t startle
- Overly tolerant of loud noises
- Unsure of where sounds are coming from
- Limited vocalizing or babbling as a baby
- Says “What?” or “Huh?” frequently
- May get diagnosed with auditory processing disorder

Auditory Input
Symptoms of Sensory Craving
- Enjoys noisy environments (mall, gymnasium)
- Talks loudly/often the loudest kid in the classroom
- Prefers TV and music be played at a loud volume
- Frequently makes odd noises just to hear them
- Produces frequent vocalizations such as humming, grunting or shrieking
- Repeats portions of videos or books (scripting)
- Covers and uncovers ears
- Snaps fingers or taps objects repeatedly

Gustatory Sense
- The taste buds can detect 5 flavors: sweet, salty, sour, bitter and savory (umami).
- The gustatory sense allows us to know what we are eating, even if we don’t see it first.
- People with a well regulated gustatory sense will tolerate and welcome the introduction of new foods.
Gustatory/Oral Input
Symptoms of Sensory Over-Responsivity
• Eats the same foods every day
• Gags with textured foods/prefers pureed foods
• Prefers bland flavors
• Dislikes mixing foods and textures
• Strong aversion to having teeth brushed
• Dislikes toothpaste and mouthwash because of their strong flavors
• Extremely fearful of going to the dentist
• Dislikes chewing gum or sucking on mints

Gustatory/Oral Input
Symptoms of Sensory Under-Responsivity
• May act as though all foods taste the same
• Excessive drooling past the teething stage due to lack of oral awareness
• Unable to feel food that is in or around mouth
• Overstuffs mouth when eating
• Has difficulty learning to use a straw
• Unable to notice tastes and textures that others do, even if they are offensive
• Has an underactive gag reflex

Gustatory/Oral Input
Symptoms of Sensory Craving
• Licks toys, walls or other non-edible surfaces
• Eats play-dough or other non-edible items
• Craves flavor extremes
• Chews on shirt, fingers, pencils, straws or hair
• Bites finger nails
• Constantly puts toys in mouth after age two
• Wants to chew gum all the time
• Loves condiments/can’t get enough ketchup, ranch dressing, salsa, etc.

Olfactory Sense
• Smell travels to the limbic system (emotional part of the brain—this is why the smell of apple pie reminds us of grandma’s house).
• Taste and smell are closely tied together.
• There are 5 tastes we can detect (salty, sweet, bitter, sour, savory)—any other flavor we detect is actually provided by the olfactory sense.
• If you can’t smell, you can’t taste, which is why having a cold decreases your appetite.
• If something smells bad, you can almost taste it.

Olfactory Input
Symptoms of Sensory Over-Responsivity
• Unable to tolerate certain smells
• May have strong aversions to certain foods because of how they smell
• Extreme reactions to certain smells—may get physically ill/nauseated
• Often notices odors that other people don’t
• Is offended by cologne/perfume and scented lotion, soap, shaving cream
• May avoid certain people or places based on how they smell/may talk about it excessively

Olfactory Input
Symptoms of Sensory Under-Responsivity
• Does not notice smells that others do, even if they are offensive
• Does not respond to unpleasant odors
• May eat or drink harmful or poisonous things due to inability to notice the noxious smell
• Unable to identify smells from spices or scratch ‘n sniff stickers
Olfactory Input
Symptoms of Sensory Craving

• Craves certain smells
• Needs to smell new people, food and objects
• Smells food before eating it
• Smells toys during playtime

Tactile Sense

• The tactile sense interprets information we get from receptors on our skin.
• The tactile sense is the largest sensory system because the skin is the largest organ in the body.
• When we touch an object in the environment, our tactile sense helps us understand its textural qualities (smooth, bumpy, rough or sharp), and allows us to interpret vibration, temperature, and pressure.
• There are two types of touch receptors:
  1. deep pressure touch receptors (calming/inhibitory)
  2. light touch receptors (alerting/excitatory)

Tactile Input
Symptoms of Sensory Over-Responsivity

• An intact tactile sense allows children to participate in daily activities such as dressing, handwashing, playing with toys, and tolerating different textures.

• “Every one of us, from infancy onward, needs steady tactile stimulation to keep us organized, functioning and healthy.” Carol Kranowitz, 2003

• “…children who don’t play much or are rarely touched develop brains 20 – 30% smaller than normal for their age.” Baylor College of Medicine

• Has difficulty transitioning from winter clothes to summer clothes
• Wipes off place where kissed
• Avoids group activities for fear of being touched or bumped into
• Avoids standing close to other people
• Is excessively ticklish
• Bothered by the wind
• Distressed by diaper changes
• Resists affection/doesn’t like to be held or cuddled
• Dislikes being hugged, but may be willing to give hugs (does not want touch to be imposed on him)

• Over-reacts to minor cuts, scrapes and bug bites
• Refuses to walk barefoot in the grass or sand
• May toe walk to avoid having feet touch the surface
• Won’t leave bandages on skin
• Dislikes messy play such as finger painting
• Bothered by dirty hands—wants to wash them frequently
• Avoids using hands during play
• Hates being buckled into the car seat
• Averse to taking a shower (prefers a calm bath)
• Bothered by having face washed, nails clipped, hair brushed or washed, getting a haircut
**Tactile Input**  
**Symptoms of Sensory Under-Responsivity**  
- Lacks awareness of being touched or bumped  
- Doesn’t seem to recognize when being handled aggressively  
- Dresses inappropriately for the weather due to not noticing extremes in temperature  
- Doesn’t notice if bath water is too hot or too cold  
- Oblivious to hands or face being dirty or wet  
- Not aware that nose is running  
- High pain tolerance

- Isn’t bothered by wet or dirty diapers  
- Doesn’t notice scrapes and cuts  
- Doesn’t notice when clothes (or chin) are wet  
- Lacks awareness of whether clothes are on straight (looks disheveled most of the time)  
- Has difficulty successfully using tools such as pencils, scissors, eating utensils

**Tactile Input**  
**Symptoms of Sensory Craving**  
- Intrusively touches other people (“space invader”)  
- Explores surfaces or textures repeatedly by touching, rubbing, licking, squeezing, etc.  
- Excessively mouths objects (past age 2)  
- Scratches or rub own skin excessively  
- Engages in self-injurious behaviors (pinching, biting, banging head)  
- Seeks out messy play  
- Sleeps with excessive number of stuffed animals and blankets on the bed

- Likes clothes and shoelaces to be as tight as possible  
- Enjoys being in tight spaces  
- Likes heavy or weighted blankets  
- Enjoys lying under something heavy  
- Likes being wrapped up tightly in a blanket (baby burrito/swaddling)  
- Loves to be squished

*Weight provides deep pressure touch; if the child tries to climb out from under the weight, he is working against gravity and will also receive proprioceptive input

**Proprioceptive Sense**  
- Sensory information comes through receptors in the muscles, joints, ligaments and tendons.  
- Through movement, muscles stretch and contract (this is why play-based movement is so important!).  
- This sense allows children to play and move without having to look at what they are doing (referred to as body awareness).  
- Vision is not necessary to understand body ownership.  
- Have you ever felt disconnected from your own body? How about when your leg falls asleep or after you get Novocain at the dentist?

- Proprioceptive input involves heavy resistance to the muscles and joints and helps our bodies assimilate and process movement (vestibular) and touch (tactile) information.  
- Body awareness (“internal eyes”) aids in accurate motor planning.  
- Poor awareness of the articulators can contribute to speech challenges (many young children we work with don’t even know they have lips and a tongue).
**Proprioceptive Input**  
**Symptoms of Sensory Over-Responsivity**

- Proprioceptive input is helpful to the nervous system, so we do not typically see over-responsivity in this sensory system.

**Symptoms of Sensory Under-Responsivity**

- Has poor body awareness
- Doesn’t know where body is in space
- Has difficulty maintaining posture; slumps when sitting in a chair or when seated on the floor; leans head on hands when working at a desk

**Symptoms of Sensory Craving**

- Seeks out constant input to muscles and joints
- Craves high-impact jumping (gives the joints in the hips, knees and ankles a jolt)
- Flaps hands or arms excessively (gives the joints in the shoulders, elbows and wrists a jolt)
- Loves heavy work (pushing, pulling, or dragging weighted or bulky items; working against gravity)
- Frequently cracks knuckles or neck
- Kicks floor or chair while seated
- Walks on toes for increased input

**Vestibular Sense**

- This is the most powerful sensory system and its main job is to regulate our sense of balance.
- This is our internal GPS system and it tells us where we are in relation to the ground.
- Vestibular input is processed in the inner ear (the “vestibule” consists of the semicircular canals, the utricle, and the saccule).
- The vestibular system is like a carpenter’s level.

- When fluid in the inner ear shifts, the vestibular sense works with our eyes to detect movement changes related to gravity: tells you whether you are sitting or standing, in motion or standing still, balanced or off-balance, upright or horizontal, moving forward or backward, walking or running, right side up or upside down; also detects if we are in a safe, relaxing place or in danger.
- This sense is important for the development of balance, orientation, coordination, eye control, attention, security in movement, and some aspects of speech and language.
The semicircular canals process movement/primarily starting and stopping: on an airplane the only time you experience the sensation of movement is at take off, landing and when there is turbulence.

The utricle and saccule process smaller sustained movements. This helps with balance, extensor tone, linear movements and feeling grounded (the person’s relationship to gravity).

Vestibular input has to be processed bilaterally (we have 2 ears!).

Vestibular Input
Symptoms of Sensory Over-Responsivity
- Has a general fear of movement/fearful of feet leaving the ground/gravitational insecurity (gravitational security: the confidence that we can maintain a position without falling)
- Dislikes playground equipment that involves movement (slides, swings, teeter totters)
- Is uncomfortable in elevators and on escalators (may try to sit down)
- Over-responds to ordinary movements (appears terrified); physically clings to caregiver
- Fearful of going up and down stairs/ladders

Vestibular Input
Symptoms of Sensory Under-Responsivity
- Moves in a clumsy manner, bumps into things, falls frequently, slouches when sitting, leans when standing
- Unaware of being off-balance/sensation of falling; doesn’t protect self well during a fall
- Has poor muscle tone and/or coordination resulting in:
  - A weak/floppy body
  - Skipping of the crawling stage
  - Weak gross and fine motor skills
  - “W” sitting

“W” Sitting

The vestibular system coordinates body movements, maintains balance and equilibrium, and helps children develop normal muscle tone

A deprived vestibular system can contribute to weak core

W-sitting can contribute to or exacerbate already existing orthopedic issues

W-sitting is often used to compensate for poor trunk or pelvic stability and/or poor static balance

W-sitting limits trunk rotation

Encourage Other Ways to Sit

- Long sitting
- Side sitting
- Heal sitting
- Circle sitting
- Pretzel sitting
- Prone
- Sitting on a small stool
- Difficulty coordinating and motor planning tasks such as skipping or doing jumping jacks
- Difficulty developing hand dominance due to struggles with bilateral integration
- Has problems crossing midline
- Struggles with tasks involving both sides of the body (zipping a jacket, riding a bike)
- Difficulty coordinating movements of the mouth (resulting in struggles with speech production)

Vestibular Input
Symptoms of Sensory Craving
- Seeks intense movement (the faster the better)
- Loves to jump, spin, skip and roll excessively
- Delights in being upside down
- Is a thrill seeker; loves roller coasters & spinning rides
- Has spurts of impulsive running
- Likes to jump from high heights
- Loves being thrown in the air
- Gets little to no information about how high or how fast he is going; has “no fear”
- Seeks out balancing activities

Interoceptive Sense
• This is the “How do you feel?” sense.
• The interoceptors are internal sensors that tell you about the physiological condition of your body related to:
  • Pain/Sickness
  • Itch
  • Thirst and hunger
  • Need to use the bathroom
  • Fatigue
  • Breathlessness
  • Heartrate
  • Subjective feelings of ones’ emotions

The Hidden Sense

Interoceptive Input
Symptoms of Sensory Over-Responsivity
• Bodily sensations may cause over-reactions such as fear or pain (e.g. hunger interpreted as a stomach ache, stretching interpreted as pain)
• Frequently complains of non-specific discomfort
• Avoids using the restroom due to anticipation of pain associated with bowel movements or uses the restroom excessively
• Has meltdowns for no apparent reason (reacting to intense internal sensations)

Interoceptive Input
Symptoms of Sensory Under-Responsivity
• Child may not feel or respond to the body’s signals appropriately or in a timely manner
• High internal pain tolerance
• May not experience nausea, hunger, thirst, fullness, fatigue
• Slow to potty train
• Difficulty sensing need to use the restroom—may have frequent “accidents” (incontinence, enuresis)
• Doesn’t notice a pounding heartbeat or sweaty palms

Interoceptive Input
Symptoms of Sensory Seeking
• Child may be in constant motion because he is seeking a pounding heartbeat and fast respiration
• Hunger and thirst sensations might feel good so eating and drinking is purposefully limited
The Big 3

- According to Dr. Jean Ayres, the tactile, proprioceptive and vestibular senses are the “Big 3” for kids with sensory dysfunction. The other senses can’t work properly if the Big 3 aren’t doing their job.
- It is the integration of these three power senses that allow us to experience, interpret and respond appropriately to the constant bombardment of sensory information.
- The proprioceptive and vestibular senses work with the tactile sense to lay the foundation for the development of the other senses.

Why the “Big 3” are Relevant for the SLP

- Tactile receptors are located not only on the skin, but also inside the mouth.
- If the child is over-responsive to tactile input in the mouth (is defensive), challenges related to eating may occur such as:
  - Transitioning from a liquid to a solid diet
  - Moving from smooth pureed to chunky baby food
  - Trying new foods
  - Eating with certain utensils
  - Drinking from certain cups

They may not “feel” right in the mouth.
• When seeking tactile input, the child may always be putting his or her hands and objects in the mouth (long past the developmental stage of oral exploration).

• If the child doesn’t receive appropriate feedback from the articulators, his/her speech may be highly unintelligible (inaccurate oral feedback can hinder the perception, pressure and speed of the articulators). Speech requires rapid and accurate alternating movements of the articulators (think diadochokinetic rate).

The Proprioceptive Sense and the SLP

• Gesturing, pointing and writing are all proprioceptive tasks that are performed without constant visual monitoring of the extremities (which means they require body awareness).

• Oral-motor difficulties may occur that negatively impact talking and/or eating (child may not know where to place his articulators to form sounds; child with inaccurate tongue movements may have difficulty forming a bolus which could lead to choking and other difficulties with eating).

The Vestibular Sense and the SLP

• There is a connection between the vestibular sense and speech and language development.

• The vestibular and auditory systems work together as they process sensations of movement and sound—these senses are closely connected because they both begin to be processed in the receptors of the ear.

• The vestibular system plays a role in the development of language—therefore children with vestibular dysfunction may also have speech, language, and/or auditory processing difficulties.

• The vestibular sense is tied to speech and language development—it is the integration of the vestibular and auditory senses that allows for processing of auditory information. Kranowitz, Kashman & Mora

• Stimulating the vestibular system directly impacts the auditory system, which facilitates speech and language development (this is why an OT can get some kids to talk better than the SLP).

• “Integration of the tactile system, along with the vestibular and proprioceptive systems, allows accurate speech articulation.”

Kashman, OTR/L & Mora, CCC-SLP

• The vestibular system and the cochlea (the hearing portion of the inner ear) are anatomically connected. Therefore, stimulating the gravity receptors impacts the hearing receptors. Research (by Ray, Kin & Grandin, 1988) has shown that vestibular stimulation can increase spontaneous speech productions.

• Movement is important to enhancing speech development in children with speech delays.

Cochlea is the hearing portion of inner ear
Functions of Behavior

Communication impairments often associated with vestibular dysfunction
(Carol Kranowitz)

• Easily distracted; difficulty focusing on speaker
• Difficulty locating source of sound
• Difficulty with reading
• Poor articulation
• Weak vocabulary and immature sentence structure
• Difficulty following multi-step directions
• Trouble responding appropriately to questions or comments
• Difficulty putting thoughts into spoken or written words

We must recognize that...

• You can’t teach a child anything until he is in a ready state for learning.
• All behavior is communication.
• In order to understand a child’s behavior, we need to consider ABC:
  ABC = Antecedent, Behavior, Consequence

Communicative Functions of Challenging Behavior

1. Attention: Child uses behavior to seek attention.
2. Escape: Child uses behavior to avoid an activity or undesirable interaction.
3. Access: Child engages in a behavior to try and access a preferred item or activity.
4. Express Feelings or Physical Needs: Child uses behavior to communicate feelings and emotions (tired, ill, anxious, sad, lonely, angry, frustrated)
5. Sensory Need: Child’s behavior provides some type of sensory input that is pleasing, or removes some type of sensory input that is aversive.

EXAMPLES

• Child flicks an eraser up in the air right as the teacher walks by his desk.
  The communicative function of his behavior was likely...
  To gain **ATTENTION**

• Child gets upset, falls to the floor in a heap and cries until the teacher gives her the bubbles she is holding (at which point the tears end abruptly).
  The communicative function of her behavior was likely...
  To gain **ACCESS**
• Child is asked to pick up his art materials. He whines and complains, “It’s too hard” and then throws the colored pencils on the floor. The student is then sent to the “safe spot” for a time-out to think about his behavior.

The communicative function of this behavior was likely... To ESCAPE an undesirable activity

• Child refuses to sit with the other kids on the carpet during circle time. The teacher invites him to sit on her lap, which he eagerly does. The teacher provides frequent “squeezes” to the child while seated on her lap.

The communicative function of this behavior was likely... To meet a SENSORY need (deep pressure touch)

• A minimally verbal child throws herself on the floor throughout the therapy session, crying and screaming for no apparent reason. The next day the parent emails you that they went to the doctor after therapy and the child had a severe ear infection.

The communicative function of her behavior was likely... To express a PHYSICAL NEED/FEELING

The “3 Ds” (Otten & Tuttle, 2011)

• Not all challenging behaviors need to be addressed.
• Behaviors that pass the “So what?” test, likely do not need to be addressed (while they are irritating, they may lead to unnecessary power struggles).
• The behavior should qualify as one of the 3 Ds before action is taken:
  • The 3 Ds include behaviors that are:
    1) Dangerous to the student or others
    2) Destructive to personal property or the property of others
    3) Seriously disruptive to the learning environment

Behavioral Tantrum vs. Sensory Meltdown

• Behavioral tantrums (temper tantrums) and sensory meltdowns can look and sound similar.
• The causes and appropriate responses from the adult, however, are completely different.
• In order to provide the necessary support, we need to understand how they differ.

Anatomy of a Behavioral Tantrum

• Purpose of a tantrum is to manipulate the caregiver in order for the child to get his way; tantrums are socially driven.
• Child can stop mid-tantrum, when being ignored, and start up again when the adult is looking (which means he is in control of his behaviors).
• Tantrums are typically sparked by not getting his way.
• A tantrum stops once the child gets his way (i.e. if the adult gives in) or once he figures out the behavior is ineffective.
Anatomy of a Sensory Meltdown

- Meltdowns occur due to a cumulative effect of sensory overstimulation – and there is often one final trigger, or stressor, that sends the child over the edge.
- Child is neurologically disorganized and the behavior serves no end result that is obvious to the adult.
- Child isn’t seeking attention or a tangible item from the adult; meltdowns aren’t socially driven.
- Meltdowns slowly lessen in intensity and eventually end due to physical exhaustion or changes in sensory input.

A tantrum is bad behavior...a meltdown is a neurological response due to being overwhelmed.

“A child throwing a temper tantrum looks like he’s giving a performance, while a child having a sensory meltdown looks like he’s fighting for his life.”

Terri Mauro, 2006

SPD or ADHD?

ADHD is a biological condition that makes it hard for the child to concentrate and sit still. According to the CDC, 11% of children aged 4-17 in the United States have been diagnosed with ADHD.

SPD is a neurological condition that makes it hard for the child to focus and attend. Studies indicate that 5-16% of children exhibit symptoms of SPD (Ahn, Miller et. al, 2004, Ben-Sasoon, Carter et. al, 2009).

Sensory or ADHD?

1. Acts impulsively
   - Sensory: child can stop impulsive behavior if sensory input is sufficient
   - ADHD: child is impatient; has frequent tantrums due to poor impulse control; blurts out things inappropriately

2. Extra active
   - Sensory: craves activity that is related to sensory input (usually proprioceptive or vestibular)
   - ADHD: craves novelty and activity that is not sensory specific

3. Seems neurologically disorganized
   - Sensory: is ready to learn and is more organized after sensory input
   - ADHD: sensory input does not improve the child’s readiness for learning

4. Impatient and demanding
   - Sensory: more patient if given sensory input while waiting
   - ADHD: has difficulty waiting and taking turns regardless of sensory input

5. Lacks self-control
   - Sensory: touches people/objects frequently
   - ADHD: talks all the time, impulsively interrupts
6. Doesn’t follow through and finish activities
   • Sensory: struggles initiating activities, but can stick with them when prompted
   • ADHD: starts activities but doesn’t stick with them; schoolwork and desk are disorganized

7. Has difficulty with focusing attention
   • Sensory: often in a daze; can’t filter out distractions
   • ADHD: interested but makes careless mistakes; loses focus easily; gets easily bored

8. Appears disinterested and uncooperative
   • Sensory: fatigues rapidly and appears unmotivated
   • ADHD: daydreams and seems far away

9. Doesn’t follow directions well
   • Sensory: unaware of directions begin given; may have difficulty getting started due to difficulties with motor planning (part of praxis is initiation)
   • ADHD: gets started but has difficulty remembering or following-through completely

10. Doesn’t perform daily routines in a timely manner
    • Sensory: knows the routines but is impossibly slow; dislikes changes in routines
    • ADHD: forgets or gets lost in the middle of a routine but can complete it at a normal pace when focused

Sensory and Autism

SPD and Autism

• Atypical responses to sensory input in children with autism may be as high as 95%.
  (Tomchek, Dunn 2007)

• While most people with autism have sensory processing disorder, not all people with sensory processing disorder have autism!

Uniquely Human: A Different Way of Seeing Autism by Dr. Barry Prizant is an excellent resource for therapists, educators and parents.

Dr. Prizant encourages us to seek to understand the child’s behaviors first, before trying to change them.

This book is under $10 on Amazon

“Sensory Anchors”
Angie Voss, OTR

Voss describes a sensory anchor as “a behavior or repetitive activity which helps the brain organize, calm, soothe and achieve or maintain a ready state.”

Common anchors we see that may help the dysregulated child feel grounded and organized:

• lining up toys or objects
• looking at spinning objects
• making repetitive mouth sounds
• chewing on non-inedibles
• scripting and repeating phrases
• hand flapping

“Stimming”
Seek to Understand, Not Change the Child (Prizant, 2015)

Q: “Why does Joey flap his hands?”
A: “Because he has autism.”

This is a dismissive response. Instead, we need to respect the child and try to understand why he is hand-flapping—
• To increase his alertness level
• To release tension/calm down
• To express joy

This hand-flapping behavior is actually a strategy that Joey utilizes when he is dysregulated.

Strategies for Interacting with a Child Who Has Autism
• Keep requests and questions simple and to the point.
• Avoid figurative language such as “There’s a frog in my throat” or “Don’t cry wolf”.
• Speak slowly and clearly using as few words as possible.
• Give the child ample time to process questions and directions and don’t repeat yourself over and over.
• Provide visual cues as needed to help the child understand and be successful.
• Don’t demand eye contact. Instead, try writing goals related to having the child “visually check in.”

Supporting Children with Sensory Differences
• Be aware of the child’s sensory needs.
• Know the child’s passions/deep interests (avoid referring to them as “obsessions”).
• Use the child’s interests and preferences to facilitate attention, focus, concentration and learning.
• Understand and accept self-stimming behaviors as sensory anchors that may be helping the child regulate his nervous system.
• Pick your battles wisely (remember the 3 Ds: dangerous, destructive, seriously distracting).
• Remember, each child is unique and will act and react differently, so be patient, kind, empathetic and supportive.

All About __________
• Create an individualized handout to use at team meetings that provides an overview of the child’s strengths and needs
• Be sure to include pictures of the child doing things he or she enjoys
• Include topics such as:
  ➢ Things I like
  ➢ Things I don’t like so much
  ➢ When I get upset I...
  ➢ Here’s how you can help me calm down

Traditional Expectations of Young Learners
• Sit still
• Both feet on the floor when seated in a chair
• Hands are still
• Eyes on the adult
• Listening ears are on
• How easy is this?
• Do we sometimes have unrealistic expectations for attention and time on task for young children?
Question to Ask Ourselves

“What supports can I provide to help this child be successful today?”

- How can we modify the environment, activity or expectations to help this child be successful?
- What can we do to help the child achieve a ready state for learning?
- Think of the child’s body as a car engine: sometimes it revs on high, sometimes it putters on low, sometimes it runs just right
- Consider using the “Zones of Regulation”
  - Blue zone = moving too slow
  - Green zone = good to go
  - Yellow zone = a little out of control
  - Red zone = out of control

Strategies for Supporting a Child with Sensory Differences

1. Have a best friend who is an OT.
2. Focus on the Big 3 (tactile, proprioceptive & vestibular) by incorporating deep pressure touch, heavy work, and play-based movement into routines and activities.
3. Consider the need for sensory input when a child starts to lose focus, attention or engagement and prior to difficult transitions.
4. Remember the 3 D’s and choose your battles wisely (if a child who typically refuses pencil/paper tasks will complete it when using a glittery pink pen with feathers on it, then maybe we go with it).
5. Be in tune with what each child needs from day to day (what works one day, may not be effective the next; what works with one child may not be effective with another child).
6. Keep in mind that our overall goal should be to increase the student’s participation, independence and engagement (P.I.E.).
7. Use visual supports to help the child understand what is expected and increase classroom success. Remember, a picture is worth...
8. Respond appropriately to problem behaviors by acknowledging and addressing the communicative function of the behavior.
9. Dim the lights to provide a calming effect.
10. Designate a quiet space for students who need to self-regulate (a quiet space limits auditory and visual input/the “womb” effect).
11. Reduce visual clutter on walls and bulletin boards; place a curtain over open shelves to reduce visual distractions.
12. Be sure the child has a way to ask for a break.
13. Advocate for play-based movement dispersed throughout the day.
14. Provide visual and verbal preparations related to changes in the child’s schedule/routines.
15. Use visual supports to enhance success with challenging tasks and difficult transitions.
16. Allow the child to sit away from doors or windows to reduce distractions.
17. Introduce mindfulness activities.
18. Have a plan in place for assemblies, pep rallies and other chaotic school functions.
19. Read storybooks about sensory processing disorder (Sensory Like You by Rachel Schneider; Listening to My Body by Gabi Garcia; My Magic Breath by Nick Ortner).
20. Help the child achieve a ready-state for learning by determining whether his nervous system needs calming input or alerting input.

Alerting Input
- Jerky movements/ changes in direction
- Fast movements/speech
- Side to side movement
- Inversion
- The unexpected
- Bright/fluorescent/ flashing lights
- Upbeat, loud music
- Light touch
- Loud sounds/voices
- Cold or changing temperatures
- Rough texture
- Strong odors
- Bright colors
- Pokey or prickly
- Bold, bright, colorful, busy background stimuli

Calming Input
- Rhythmic movements
- Quiet sounds/voices
- Warm/neutral temps
- Smooth texture
- Mild odors
- Muted colors
- Deep pressure touch, heavy work
- Subdued backgrounds/ limited visual stimuli
- Slow, natural lighting/dimly lit rooms
- Slower paced music

Alerting or Calming?
- Fast spurts of running
- Carrying heavy books to the library
- Doing somersaults
- Moving a student’s chair from behind
- Swinging on a glider/porch swing
- Being tickled
- Putting objects into a bucket repeatedly
- Lining up or sorting objects

Activities to Address Sensory Needs
- Pushing, pulling, or dragging bulky items (it’s technically called “heavy work” and it provides the path of most resistance)
- Weighted lap pad, heavy backpack
- Jumping jacks, wheelbarrow walk, crab walk
- Yoga, stretching, breathing activities
- Resistance activities: molding with clay, pulling beads out of TheraPutty, tug-of-war, squeezing stress balls
- Offer crash pads
- Stretchy band around chair legs
- Footstool at desk so child’s feet are flat on the floor
- Sensory bins

I purchase the “Large Trinkets” from this website. I put them in sensory bins, plastic eggs, sorting cups, etc.

www.dinkydoodads.com
- Mardi Gras beads
- Noise-canceling headphones
- Lotion (unscented, then scented)
- Moldable sand, play-dough
- Touch and feel books
- Quiet fidgets, fidget boxes
- Mermaid sequins
- Small tent filled with pillows
- Textured surface to draw on (sandpaper, cardboard)
- Gum, water bottles with straws, or chewy pencil toppers if the child seeks oral input
- Offer snack foods to provide oral-sensory input (chewy, crunchy, frozen, high-intensity flavors)

- Fill a “Biter Bucket” with objects that provide resistance and are appropriate for the mouth:
  - Chewelry
  - Ps & Qs
  - Vibrating toothbrush
  - Icemaker tubing
  - Rolled up washcloth

Redirect the child to the biter bucket when inappropriate mouthing occurs

- Alternative seating
  - Ottoman
  - Small step stool
  - Disc'o Sit cushion
  - Spin bucket seat
  - Partially inflated beach ball
  - Coffee can stool
  - Video game chair
  - T-stool
  - Therapy ball
  - Wobble chair (tennis balls on two adjacent chair legs)
  - Tummy time

- Carpet square or small hula hoop to define personal space and allow for some movement
- Velcro on or under the table/desk
- Beanbag chair for floor activities
- Clipboard so child can complete writing tasks lying on the floor
- Rhythmic rocking
- Play-based movement such as running, sliding, rolling, jumping, hopping, climbing (but limit spinning)
  *Work closely with the OT before doing any spinning activities as this type of vestibular input can be disorganizing. Angie Voss, OTR, recommends spinning be limited to 1 revolution per second, with a max of 10 revolutions, then switch directions.

- Swinging in different positions (standing, on the tummy, seated, cuddle swing)

Angie Voss, OTR, explains that swinging can have a powerful effect on the brain’s ability to process sensory input (15 minutes of swinging can have a 6-8 hour effect on the nervous system)
Sensory Diets

“A sensory diet is a group of activities that are specifically scheduled into a child’s day to assist with attention, arousal and adaptive responses.”

www.ssdmo.org

Angie Voss, OTR, recommends that a child have access to different types of sensory input AS NEEDED, rather than providing the input in a predetermined manner.

Voss refers to this as a “Natural Sensory Diet.”

Environmental Modifications

What can we change in the school environment?

• Reduce distractions
• Provide fewer options
• Change the furniture/seating options
• Adjust the amount of sensory input/stimulation
• Adjust the type of sensory input/stimulation
• Change the location
• Use sensory stories (www.sensorystories.com)
• Provide visual cues/schedules
• Offer sensory breaks

Expected Outcomes of Sensory Input

✓ Student will increase participation in ____________.
✓ Student will increase independence in _________.
✓ Student will increase engagement with peers during _________.
✓ Student will remain seated for an appropriate period of time during _________________.
✓ Student will tolerate non-preferred activities.
✓ Student will accept new foods at lunch time.
✓ Student will tolerate changes in the daily schedule.
✓ Student will participate in leisure activities during indoor recess.
✓ Student will reduce the number of sensory meltdowns in a day.
✓ Student will reduce the duration and intensity of sensory meltdowns (can make it measurable).
✓ Student will demonstrate improved attention during _________.
✓ Student will tolerate unexpected noises in the classroom and hallway.
✓ Student will use visual supports to communicate her need for __________.

Documentation

Document the functional problem
Always answer the “so what?” question – what will be improved if the child gains this skill?

• Instead of: Decrease tactile defensiveness
• Better: Joey will demonstrate decreased resistance to painting and clay activities in order for him to participate in art time with his peers.

Case Studies

Analyzing Problem Solving

Child wants to wear boots all the time

Possible explanations
• Boots provide additional proprioceptive input
• The extra weight of the boots provides additional body awareness and can help with balance and walking
• The boots provide added support for weak ankles (like a shoe insert does)
• Boots make a cool sound
• The child just likes boots
• Boots are easier to put on (no laces)

Possible strategies to support this child
• Let the child wear boots when possible
• Offer tight, long socks when boots are not an option
• Provide frequent doses of deep pressure to the lower extremities
• Wear ankle weights
• Embed jumping, stomping, hopping, and marching to play time (jolts of input to the ankles, knees, and hips)
• Consult with PT to see if ankles are weak
Child constantly makes loud, repetitive sounds
Possible explanations
- This may help the child tune out other sensory input that is bothersome
- It can be a strategy the child uses to help self-regulate and to avoid having a sensory meltdown
- It may be a way for the child to communicate that the situation is overwhelming or uncomfortable

Possible strategies to support this child
- Respond to this signal as a need to change the environment and decrease the amount of sensory input
- Offer noise-canceling headphones
- Offer soothing music through earbuds
- Reduce the pressure to engage in social interactions during times of sensory overload
- Use a noise meter in the classroom to monitor the sound levels
- Use a quiet voice to get the child's attention
- Play white noise to block out other distracting sounds
- Offer a quiet retreat that limits sights and sounds

Haircuts cause distress
Possible explanations
- Sensory defensiveness or over-responsivity in one or more of the sensory systems
- This is multisensory activity that involves social interactions with nonpreferred, unfamiliar people, in an unfamiliar environment
- Distress may be triggered by the cape, the sound or vibration of the clippers, the smell of the unfamiliar hair products, the chattering of all the people, hair touching the skin or clothes, the squirt bottle
- Touch is imposed on the child the entire time
- The chair moves unexpectedly

Possible strategies for this child
- Take the child to the park for 15 minutes prior to haircuts—encourage swinging, climbing, and hanging upside down
- Provide deep pressure to the head prior to haircut (head squeezes) or wear a tight hat
- Offer fidget toys during hair cut
- Have child sit on adult's lap
- Use scissors rather than clippers
- Have haircuts in familiar places (home is best)
- Find a barber/hairdresser that is patient and will work to understand the child's needs
- Select a haircut style that is easy and quick
- Cut the hair dry (no hair washing or spray bottle)

- Have the barber chair go up and down periodically throughout the haircut (passive vestibular input)
- Have the child sit in a regular chair or on the floor if the movement from the chair is a problem
- Make appointment during the least busy time of day
- Prepare the child: go visit the barbershop/salon several times before the haircut; allow child to watch parent, sibling or other child get their hair cut
- Remember, one traumatic experience at the barber shop or salon can create a negative memory that is difficult for the brain to overcome—so the first experience is the most important one

Child holds it together at school, then melts down at home
Possible explanations
- Sensory input has a cumulative effect—many kids function well in the morning, but are struggling by the afternoon
- By the time child arrives home, his nervous system is completely overloaded (long day at school, loud bus ride, may be hungry)
- Also, kids tend to let it all out in the environment in which they feel the safest
- School offers more structure and predictability
Possible strategies for this child

• Respect and acknowledge this as a sensory signal that the day was challenging and overwhelming
• Offer a sensory retreat to help unwind and unload (the “womb” effect)
• Offer a snack
• Encourage swinging in slow rhythmic planes
• Offer inversion, full body deep pressure touch, and proprioceptive input
• Decrease stimulation for 1-2 hours after school
• Reduce expectations (related to conversation, homework, chores, sports) immediately after school

Child has difficulty going to sleep or staying asleep

Possible explanations

• The sleep-wake cycle is controlled by the same area of the brain that controls self-regulation
• Children who struggle with self-regulation often have difficulty establishing sleep patterns
• Children who are seeking sensory input often struggle with sleep, because the body is constantly craving sensory input
• Screen time within 2 hours before bed can prevent melatonin from being released

Possible strategies for this child

• Establish a consistent bedtime routine
• Place the mattress on the floor
• Provide at least 15 minutes of rhythmic rocking/swinging prior to bedtime (rocking chair, hammock or cuddle swing)
• Provide a large stuffed animal or body pillow for the child to hug
• Avoid sugar and carbs before bed
• Offer a small nightlight
• Provide white noise (music, humidifier, fan, white noise machine)
• Be sure the child is not too hot

Let’s Practice Creating Sensory-Rich Speech Therapy Activities

Drawing/Writing Activity

What can you do to make this a more sensory-rich activity?

• Add vestibular input: have the child act out what she is drawing first; play charades and have peers guess the word before writing it
• Allow alternative seating options: clipboard, beanbag chair, vertical surface
• Add auditory input: listen to a story on tape through headphones and draw a picture while listening
• Add tactile input: draw letters in sand, salt or cornmeal; use a squiggle wiggle writer pen; write on sandpaper
• Add visual input: use different colored pens and markers
• Add olfactory input: provide scented markers or scratch 'n sniff stickers to put on the paper

Learning with Flashcards

What can you do to make this a more sensory-rich activity?
• Add play-based movement: walk like an animal to retrieve the card on the floor; throw “snowballs” at flashcards taped to the wall
• Add proprioceptive input: stomp or jump on laminated flashcards; slap flashcards with a fly swatter
• Add tactile input: hide flashcards in a sensory bin
• Replace flashcards with actual manipulatives

Worksheets

What can you do to make this a more sensory-rich activity?
• Add tactile input: laminate worksheets and use with Velcro pieces
• Add visual input: laminate worksheets and use with colorful dry erase markers
• Offer dynamic seating options
• Provide a clipboard and encourage child to sit in a beanbag chair or lie prone on the floor to complete the worksheet

Closing Thoughts

Helping children get in a ready-state for learning is critical for success in therapy, in school and in life.

Sensory trumps everything!

References & Recommended Readings

Hannafore, Carla (2005). Smart Moves: Why Learning is Not All In Your Head.
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